PUBLIC HEARING

STATE OF NEW MEXICO

OIL CONSERVATION COMMISSION

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1220 S. Saint Francis Drive

Santa Fe, New Mexico

TRANSCRIPT OF PROCEEDINGS

February 27, 2025

VOLUME V

HEARD BEFORE:

HEARING OFFICER RIPLEY HARWOOD

COMMISSION MEMBERS:

GERASIMOS ROZATOS, Chair

BAYLEN LAMKIN, Member

DR. WILLIAM AMPOMAH, Member

COUNSEL TO THE COMMISSION:

MR. DANIEL RUBIN, ESQ.

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I N D E X

(On the record at 9:03 a.m.)

TRANSCRIPT OF PROCEEDINGS

CHAIR ROZATOS: Good morning to everybody. We'll get our hearing started here.

Again, I'm Gerry Rozatos. I am the acting director of the OCD. I'm also the acting Chair for the Oil Conservation Commission.

We are here continuing our evidentiary hearing. These are the consolidated cases by Goodnight Midstream and Empire New Mexico. They are Case Numbers 24123, 23614 through 17, Case Number 23775, and Case Numbers 24018 through 24020, and Case Number 24025.

All the parties are present, correct? I believe everybody is present.

Is Pilot on the platform, Mr. Suazo?

MR. PARROT: Good morning, Mr. Hearing Examiner, this is James Parrot with Beatty & Wozniak. I'll be representing Pilot this morning.

CHAIR ROZATOS: Excellent. Thank you, Mr. Parrot. Appreciate it.

So we're back on the record. Mr. Harwood, I transfer over back to you.

HEARING OFFICER HARWOOD: I'll probably kick it straight back to you, because I suspect that after

yesterday afternoon's discussion, there may well be preliminary matters.

CHAIR ROZATOS: Yeah, okay. We'll do it that way.

So last night, we had the motion -- the objection that was brought up, and all parties stated what they needed to state. I believe what we'll do as the Commission, we'll go into closed hearing. And so we will excuse ourselves, we'll go upstairs and we will discuss the topic and then come back and bring an answer.

Mr. Rubin, please.

MR. RUBIN: Yes. So if I could have a motion to enter into closed session, pursuant to Section 10-15-1.H(3) and (1) of the Open Meetings Act to discuss the pending adjudication.

CHAIR ROZATOS: I motion to go into closed session.

COMMISSIONER AMPOMAH: I second.

MR. RUBIN: Roll call vote, please.

COMMISSIONER AMPOMAH: Approved.

COMMISSIONER LAMKIN: Aye.

CHAIR ROZATOS: And approved.

(Motion approved.)

MR. RUBIN: All right. We hope to not take

too long with this. So we will let you all stay and we will find a room.

CHAIR ROZATOS: Make yourselves comfortable.

(Commission convened to closed session.)

CHAIR ROZATOS: We have just finished being in closed session. We're now back in open session.

MR. RUBIN: Mr. Chair, standard, what may be boilerplate, but I need to put on the record that the matters discussed in closed session were only those regarding this adjudication as stated in the motion, and no final actions were taken.

CHAIR ROZATOS: Excellent. I was just going to transfer it over to you and let you say all of that. I'll let you talk, Mr. Rubin.

MR. RUBIN: Thank you, Mr. Chairman, Members of the Commission.

Based on our deliberations, I understand that the commission would entertain a motion to deny the renewed motion of Goodnight to strike what it contends is the rebuttal testimony of Mr. Bailey and Dr. Birkhead with the caveat that Goodnight would be entitled to file whatever it deems fit as a surreply in writing by March 15th.

Do I have a motion to that effect?

CHAIR ROZATOS: I move with that motion.

COMMISSIONER AMPOMAH: I second.

MR. RUBIN: All those in favor?

ALL MEMBERS: Aye.

MR. RUBIN: All right. I hear three ayes. No need to ask for opposition. That motion passes.

(Motion approved.)

MR. RUBIN: And then let me turn it over to the Commission if they have any other concerns they wish to express to the parties regarding the issues that were somewhat valid as raised by Goodnight.

CHAIR ROZATOS: Thank you, Mr. Rubin. Appreciate it.

So the Commission also has the concern about the way information is coming over towards the Commission and the way the whole thing is just giving us data and how our data is coming about. I know Commissioner Ampomah had a concern.

So, Commissioner Ampomah, please.

COMMISSIONER AMPOMAH: Thank you, Mr. Chair.

You know, the concern that I do have is that, you know, we started three days, now on the fourth day, listening to, let's say, saturation, site characterization, geology. And today we're going to go into the simulation.

But I do see that there is still some testimony on geological site characterization, saturations that we've not heard yet, you know, but we're going to listen to the simulation. I mean, that is a little bit confusing to me, you know, the way the whole thing is structured.

When I review some of the Empire's earlier testimony that has not been presented yet, you know, it sounds to me that that probably was the case, right? So we did not listen to the actual case and we listened to rebuttals, and the rebuttals more or less being the case here.

So I'm a little bit confused if, let's say, we're going to go through simulation today, and then next witnesses come back still talking about the input that went into the simulation or probably not into the simulation. It just confuses the Commission.

But I'm good, because I can still follow what is going on. But I feel like the structure is not really well presented to the Commission for us to more or less be able to fully understand the whole thing as of now. Four days into it, and it's still gray. Thank you.

CHAIR ROZATOS: So I'll give you a second to

be able to respond. We definitely want to hear it from your end as well about the case.

But it is a flood of information and it is a little bit on the disconnected, because we've started off, especially with rebuttals right off the bat, and we haven't heard everything the way we should.

Now, we've got all the paperwork. I know everybody submitted, and we've got it all the way it was submitted to us. But I must concur with the doctor, the information is kind of difficult to comprehend or to follow sometimes.

So I would definitely -- we definitely would like to hear from the parties and see your thoughts on the matter. Conversation is always good. But we do have that concern and we wanted to pose it to you all.

Would Empire like to start?

MS. SHAHEEN: I think we may want to confer with our client before we respond.

CHAIR ROZATOS: That's fine.

Goodnight, are you in the same thought process?

MR. RANKIN: Probably. You know, I might like to hear what they have to say first, since --

yeah, I think maybe just a break to allow them to get their thoughts together and respond. But I think I would like to do the same.

CHAIR ROZATOS: Okay. OCD?

MR. MOANDER: I didn't quite catch all of what the Empire said.

CHAIR ROZATOS: Empire stated that they would like to have some time to confer with their client.

MR. MOANDER: OCD has no objection to that.

But the comments that I want to put on the record, I've tried my share of cases, I've been around a lot of hearings in my career. One of the unfortunate realities for parties is that witness sequencing is not always optimal.

And it's not an issue of -- and I'm defending the Bar here generally. There can be reasons for stuff to come out of sequence. I confess a personal desire to try to make everything sequential because it does -- it's a story, it makes more sense.

So I think this happens more often than the decision-makers like, but it's also a nature of litigation, schedules, various other things.

So I do hear your concern, Dr. Ampomah.

I've heard it many times, and I can assure you, and I'm comfortable speaking for the attorneys here, everyone has worked extraordinarily hard on trying to make this as organized as possible so it's coherent for your consideration.

So that's my little bit. Thank you.

CHAIR ROZATOS: Thank you.

MR. RUBIN: Mr. Chair, echoing the sentiments of Mr. Moander, we don't want to give the impression that we thought there was any gamesmanship involved by any of the parties that we considered for this decision.

It is complicated and it's not straightforward how the rebuttal works when it's pre-filed. I totally agree.

CHAIR ROZATOS: Agreed. Thank you.

Mr. Rice -- I'm sorry, Mr. Beck. You just became your own entity, Mr. Beck. My apologies.

MR. BECK: That's right. I'm used to four-letter names. Matt and Beck, so Rice is appropriate.

But I have no input, no objection to Empire speaking with its client.

CHAIR ROZATOS: Thank you.

Mr. Parrot, with Pilot?

MR. PARROT: Thank you. No objection.

CHAIR ROZATOS: Ms. Shaheen, Ms. Hardy, would 10 minutes be good for you? You're ready to go. Even better. It's a good thing I asked everybody. Please.

MS. SHEEN: Thank you. It might be helpful to have a little context.

The parties had conferred about this at one point. Mr. Rankin suggested that Empire go first with all of our witnesses, and we agreed to do that. So that's why we've been approaching it this way.

I completely understand the confusion that can arise from that. We've immersed ourselves in this for well over a year now, so I understand how that could be confusing.

So our question is back to you. How would you like to have us present the evidence?

CHAIR ROZATOS: Commissioner Ampomah, I'll let you state your thoughts.

COMMISSIONER AMPOMAH: Well, I think where we are now, it doesn't really matter, you know, because we've already listened to, let's say, all the characterization.

But I will probably suggest, if it's possible, for us to get through all the site

characterization before we get into the simulation, at least we'll get the site characterization out of the way, and then focus on the simulation.

But if it's not possible, I'm still fine with it. You know, I'm okay.

CHAIR ROZATOS: I believe it was just the concern that the Commissioner had and we, as the Commission, also had. And so we were just bringing it up.

If we proceed the way we're going, I think we understand the limitations. We get that. We're just sharing our concern as well. So we can proceed the way we are. I don't think we necessarily have to change everything. But as the doctor mentioned, I think the order may have facilitated it for us a little bit better. But if this is the way we have to go, we have to go. But we did want to put our concern, as well, on the record.

So, if you all are okay with that -- is that okay?

MS. SHAHEEN: Yes. Thank you.

CHAIR ROZATOS: Mr. Rankin, you heard what Empire had to say. Do you still need time to confer with your client?

MR. RANKIN: No, I don't think so, Chair

Rozatos. I don't believe so. I think that, as Mr. Moander stated, presentation of cases is a story, and each party should, I guess, to some extent, be able to present their case in the order they want. I understand that.

I do intend or believe that we'll be following the witness sequence in our prehearing statement. So I think that may help a little bit with just understanding Goodnight's story. But no other comments from my perspective.

CHAIR ROZATOS: Okay. Excellent.

Mr. Moander.

MR. MOANDER: I'm sorry, I had some messages come in requiring my attention. I apologize for that disrespect to the Commission. What did I miss out on?

CHAIR ROZATOS: Ms. Shaheen stated that they're good to go the way they are. Commissioner Ampomah stated, well, that's fine, we're all good on our end. Are you good, as well, from what you've heard?

MR. MOANDER: Absolutely. OCD is ready to proceed.

CHAIR ROZATOS: Okay. Mr. Beck.

MR. BECK: Rice is ready.

CHAIR ROZATOS: Excellent.

Mr. Parrot.

MR. PARROT: We are ready. Thank you.

CHAIR ROZATOS: Beautiful. Let's turn right over to our hearing officer, Mr. Harwood.

HEARING OFFICER HARWOOD: All right. With all that said then, Ms. Hardy or Ms. Shaheen, does Empire have a next witness?

MS. HARDY: Yes, we do, Mr. Examiner. Our next witness is Dr. Jim Buchwalter.

HEARING OFFICER HARWOOD: All right.

THE WITNESS: Good morning.

HEARING OFFICER HARWOOD: Good morning, Dr. Buchwalter. If you'll please raise your right hand.

JAMES LEE BUCHWALTER,

having first been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MS. HARDY:

Q. Good morning, Dr. Buchwalter.

A. Good morning.

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

A. My name is James Lee Buchwalter.

Q. By whom are you employed and in what

capacity?

A. I'm employed by Gemini, and I'm the gem in Gemini. Gemini also means twins, so I had a partner when I started the company.

Q. Have you previously testified before the Commission?

A. I have not.

Q. What is your area of expertise?

A. I would say reservoir simulation, compositional simulation as well.

Q. Have you provided a summary of your education, training and experience as Attachment 1 to your direct testimony?

A. Yes, I have.

MS. HARDY: Based on those qualifications, I request that Dr. Buchwalter be qualified as an expert in reservoir engineering and simulation.

HEARING OFFICER HARWOOD: Mr. Rankin, any objection?

MR. RANKIN: No objection.

HEARING OFFICER HARWOOD: OCD?

MR. MOANDER: No objection.

HEARING OFFICER HARWOOD: Rice?

MR. BECK: No objection.

HEARING OFFICER HARWOOD: Pilot? Pilot?

Mr. Parrot? Parrot for Pilot.

MR. PARROT: I apologize. I thought I was off mute. No objection. Thank you.

HEARING OFFICER HARWOOD: He'll be so recognized.

MS. HARDY: Thank you.

BY MS. HARDY:

Q. Dr. Buchwalter, have you provided direct and rebuttal testimony and exhibits in these cases?

A. Yes, I have.

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

A. Yes, I do.

MS. HARDY: Mr. Hearing Examiner, Commissioners, I request that Dr. Buchwalter's direct and rebuttal testimony and exhibits, which are marked as E, E-1 through E-21, M and M-1 through M-20 be admitted into the record.

HEARING OFFICER HARWOOD: Any objection from Goodnight?

MR. RANKIN: No objection.

HEARING OFFICER HARWOOD: OCD?

MR. MOANDER: No objection.

HEARING OFFICER HARWOOD: Pilot?

MR. PARROT: No objection.

HEARING OFFICER HARWOOD: They'll be so admitted.

MS. HARDY: Thank you.

(Admitted: Empire New Mexico Exhibits E, E-1 through E-21, M and M-1 through M-20.)

BY MS. HARDY:

Q. Dr. Buchwalter, let's go through some of the highlights of your testimony, and I'll go through these slides that I have up on the screen.

A. Okay.

CHAIR ROZATOS: Ms. Hardy, sorry to interrupt. Did you tender the doctor as an expert?

MS. HARDY: I did.

CHAIR ROZATOS: Okay. Sorry. I missed it. My apologies.

MS. HARDY: No problem. Thank you.

BY MS. HARDY:

Q. Dr. Buchwalter, looking at this slide, can you provide an overview of what you did in this case?

A. Okay. Before I get into the details of the case, I'd just like to outline what we do. I know we have a mixed audience here, and some people are very proficient in reservoir simulation, others probably don't even know why I'm here.

So I have a Ph.D. from Rice University. And I created what's called a compositional model. And there's basically three pieces of information that are in the model. The first is PV equals nRT, which basically says we have a box and we take so much of the fluid out of the box and measure the pressure change, we can figure out what was originally in the box.

So we use that relationship to take production and pressure measurements in the reservoir. And once we understand that relationship of the production -- is that me?

CHAIR ROZATOS: No. It's on the platform, someone. Just one second, Doctor. Let's make sure we find who it is. If we can just make sure even here in the audience, just turn off your microphones, speakers on your laptops so we don't get the feedback.

Also on the platform, please make sure that you keep yourselves muted.

My apologies, Doctor. Please proceed.

THE WITNESS: That's okay. I'm not used to being called Doctor, but I think I'll get used to it.

A. So anyhow, if we've got production in the reservoir and we understand the average pressure at

different points, we can actually figure out with very good certainty what the original oil in place is. Okay?

Now, there's two other relationships that we have in the simulator. The first is simple. In minus out is equal to accumulation.

And the third relationship, which I could go into, it's a fractional flow equation called Darcy's Law.

Now, you may be surprised that I went to a very good university. Rice University, gave me a Ph.D., and the only thing I did was use those three pieces of information, which I just explained to you. So anyhow, that's what's in the simulator.

So how do we put a model together and how does it work, okay? Well, if you think about the testimony you've heard today, the way I think of it, it's like pieces of a puzzle. The reservoir simulation model is the only place where you put all the different pieces of reservoir engineering and geology together in one place and actually see what the puzzle looks like. And it's really that simple.

And so in this case, we put all the data that I was given together in one place, build what we call a model that represents the fluid flow and

production and so forth in the reservoir, and then adjust parameters until we can fit the historical production, pressure history in the reservoir. Okay.

So basically, the way this whole process starts is -- I don't know anything about the client's reservoir. Okay? I'm just a consultant. So I ask the client to provide maps to me that I integrate in. They provide production and pressure history. And the most important thing they provide to me are uncertainties. Okay?

So there's certain things that we put in the model that we know with certainty. For example, the production pressure data, hopefully. There's other things we know with certainty, the fluid data can be measured in the lab. And there's a lot of things that have a lot of uncertainty, to be honest, depending on how good the geology is. And primarily, geology is the big thing.

So I put all that data in, and then essentially what we do is we build a representation of the reservoir underground. We turn the wells on, and the fluids all move around, and the physics represent that. And then the first time we run the model, nothing works, typically. And it's always the geologist's fault, of course.

And so what I do is I adjust the parameters within ranges I've been given, and if and when I achieve a fit, we can then use that model to run what we call forecasts. So we can say, what if in the future we do this and that and so forth.

Now, in this case, I honestly did not think I was going to be here. And the reason was I spent, I don't know, four to six weeks to put a model together -- and this is a very complex model. I mean, to be honest, to do this model justice and to history match all 638 wells, and we're talking several man-years. I mean, that would be one great consulting project. Unfortunately, I didn't do that.

But I put the data in, I spent four to six weeks on this thing. And you know what? I went to Empire, I showed them a model that fit all the data, and you know what? The one thing it did not fit was the saltwater disposal volumes. I only had about half of them in.

And I told Darrell, I said, "Darrell, you can take this model, you figure out how to take this model and, you know, testify and so forth. I can't testify to this model."

So Darrell said, "Look, Jim, let me come over to" -- Darrell Davis, I'm sorry, using it as the

first name. So Darrell came over to my office and he said, "Look, give me the model. Let me look at all the data."

You know, as I said earlier, to me, it's just a pile of data. I don't know what the quality of data is. It's up to the client who studies this for years that understands all these intricacies that are built into the model.

So anyhow, Darrell came over. He spent a week or two. I actually gave him a computer with the model and the match. It was a great match, at least for a first-order match. And he looked at it for a couple weeks, and after a couple weeks said, "Jim, you put 638 wells in, but you screwed up on six of them."

And the six wells are actually very important wells; they're the water-supply wells. And if you're a reservoir engineer, this is like -- for me, it was like winning the jackpot, literally. Because I put in the corrected water-supply well data and I turned on all the saltwater disposal wells we had in the model, and we had such -- an almost perfect fit.

So that gave me confidence, at least, that we had a good model. And fortunately or

unfortunately, that's why I'm here.

So I think I've kind of explained most of the things. Let's see if I've missed anything.

Oh, the one thing I would say, this model has almost 90 years of production and pressure history. So with that much data, it doesn't matter who builds this model. If you build this model correctly, you have to fit that relationship between production and pressures.

And whoever builds this model -- all these models can be a little different. They're never going to be the same, but what they will have is they will ultimately have the same amount of oil, water, gas originally in the model in 1938, and we'll all have slightly different parameters for relative permeabilities and, you know, things in the model. But at the end of day, all those models that are good will have a good fit, at least on a first order, of the production and pressures over that, at least on a field-wide basis.

The last thing I'll say -- a couple other things I'll say. When you build a model like that, it's like eating an elephant. You don't eat an elephant in one bite. You have to eat it one bite at a time.

And so the way I approach a model like this is, you know, if you're trying to win the lottery, you've got ten numbers. This thing has got literally thousands of things that you need to fit to get things to work.

So the first step is we try to establish a field match. And we do that by, as I said, running the model and establish the field-wide oil, water, gas volumes, and matching the rates and pressures. In this case, we also matched the leak between the San Andres up into the Grayburg. Once we've got that, we've got the volumes right, because if you don't have the volumes right, you can't do anything else.

The second step, and we did this in the model, is we actually try to match production and rates and pressures and so forth in groups. So as big as this model is, it's 17 miles high and 10 miles wide, I thought originally I could just match the EMSU. And I thought, this ain't so big. I can just match the wells in the EMSU, except maybe some wells on the edge here, and we'll have a good match.

I could not do it. I literally had to put all three leases in here before I could even come close to a history match. And I guess that's because of the 90 years and how big this thing is. It's

surprising the fluids do move between these different leases.

So once you've established that, you've got the right volumes, you can start to look at the details. And the next level of detail that I look at is I try to say, well, I got 630 wells here. I can spend the next two years trying to figure this out. You know, I'm going to run out of time and money, and I wouldn't be here today.

So what I do is I create groups of wells. So I'll say maybe the groups of wells up in the AGU and the EMSU and so forth, the group of wells down there. And I try to match the production for those wells within the groups. And I did that. For example, I've got a customized porosity field that fits -- basically has a different porosity for every cell in the model.

And the third thing I did was try to figure out what is the purpose of this simulation study. Well, the purpose of this simulation study is not to figure out, at least for now, where to infill drill wells. It's basically on a field-wide basis to just understand the communication between the San Andres and the Grayburg, if there was some. And so to do that, you just need to have a good field

match. And that's what I did.

But to take it one step further, I identified, as I'll show later, where there were leaks between the San Andres and the Grayburg. And I essentially customized a permeability leak to represent a fracture so that, I think at almost 100 different wells, we've created leaks that are customized to try to fit the water leak at those individual wells with reasonable certainty.

Q. Are you ready for the next slide, or are you done?

A. Yeah, I'm almost ready.

Q. Do you have anything else on this one?

A. I don't -- let's see. No, I don't really have anything else on here.

I'm sorry about that, but I just didn't want to be talking up here and you all not know what I'm doing. So go ahead.

Q. What's on this, which is marked as Exhibit M-2, please.

A. Okay. This is the model itself. It's actually a detailed model in terms of cells. In terms of geology, I started this in the middle last year. So what I was given was the top of the structure for the Penrose. I think I was given the top of the

structure for two different intervals in the Grayburg. And then the top of the structure for the San Andres, and the thickness for these respective layers. We have 638 wells in the model. We have 10 layers, 345,000 cells. The way it's constructed is we have two Penrose layers, five Grayburg and three San Andres.

We've integrated 24,000 startups going all the way back to 1938 and into 2025. And the view you see on the right here, you can see the gas on the top here that's primarily in the Penrose, which is in communication with the Grayburg. Underneath it, you're going to see the Grayburg itself, and underneath that, the blue is essentially the San Andres Aquifer, which is 1,000-plus feet thick.

You're only seeing a part of the aquifer here, the aquifer that's under the Grayburg. We actually had to extend this aquifer out to the west to get a history match, and that's the grid that you're looking at. We had to rotate the grid as well, and you're seeing the saltwater disposal wells in that grid.

Q. What is shown on this slide, which is Exhibit M-3?

A. Okay. When you've got 638 wells and almost

90 years of production, I honestly didn't know what would come out of this model. I didn't know if there was going to be an answer that Goodnight would like or we would like, or whatever.

So the first thing I do is I kind of do what I call data mining. I try to look at all the data I've been given. I was given some reports. And this is one of the earlier reports in 1989 that suggests that we have a solution gas-drive reservoir here, and that there is some communication between the San Andres and the Grayburg itself. And you can see it from these documents here.

So the other thing I did was that the pressure dropped in the San Andres from, at least from this report, from 1527 to 1245. So this gave me an idea of what might be going on in terms of the physics, and this is before I built the model.

Q. What's shown on this slide?

A. Okay. If you going to fall asleep, fall asleep later, but pay attention to this slide, okay, because this is really important.

Now, the way I figured out what was going on in this reservoir, was I said, let's look at 1987 and let's look at the cumulative water-oil ratio of all producing wells prior to waterflooding. Once

there's waterflooding, everything gets mixed up, right?

And so what you're seeing on the right side here is, I've got highlighted squares over the wells that have abnormally high water-oil ratios, some as high as 13. A lot of these wells are, you know, 1 or less.

Okay. And now, if you look, let's look -- I guess I don't have a pointer, huh? You can point for me?

Q. I can point for you.

A. Okay. So, if we look at the top set of squares I have over there on the right-hand side, what I've displayed on the map on the right shows the average thickness of the reservoir. In that area, the thickness of the reservoir is somewhere between 60 and 100 feet.

And if we look over on the left in that same square volume, we've got, I don't know, 20 or 30 wells. And they're all low water-oil ratio wells. In other words, it's the thinnest part of the reservoir, and we're not seeing any water production or very small water production.

Now, keep in mind, if there is an aquifer, a significant aquifer attached to the

Grayburg, you should see that water coming in and an edge water drive from left to right. And the wells on the left side of this reservoir, you could say the west side of this reservoir, should be the wells where the water hits first. Now, obviously there could be some water coming up from the bottom as well, but this is a very big aquifer that's coming into this reservoir, the Grayburg, so it would have to come in not just from the bottom, but from many miles to the west as well. You're not seeing that. So this shows that there's no evidence of a strong aquifer attached to the Grayburg itself.

Now, if you look at the second set of boxes, here's an area of the reservoir that's really thick, so we've got somewhere between 525 and 570 feet from the top of the reservoir there, all the way down to the history match water-oil contact. And you can see on the left-hand side there, we've got five wells in that area that produce extremely high water-oil ratios and, I don't know, probably 40 or 50 wells that produce very low water-oil ratios. So that's inconsistent.

If you're in the thinnest part of the reservoir, in the deepest part of the reservoir, you should see more water. And similarly, if you're high

on structure, you should see, you know, water coming up into all the wells in that area, not just some of those wells.

And I would challenge anyone, if you're not sleeping tonight, I suggest that you, if you can get the production records, put the cumulative water-oil ratio map -- excuse me, put the cumulative water-oil ratio for all the individual wells, put that in Excel, and then look at the depth of the deepest perforation at all 638 wells and then plot it and see if there's a correlation.

Because there should be a correlation that the deeper wells, the deeper in the reservoir and the thinner part of the reservoir, they're closer to the aquifer, if there's bottom water drive, it's going to come up much faster in those wells or deeper in the reservoir, and you'll see a clear trend. And I don't think you'll see that.

So, actually, the real -- so these highlighted wells that you see here, these are the wells where I put the leaks in, and this is basically the way I constructed the model, assuming these were the fracture locations. Okay?

Q. What's shown on Exhibit M-4.

A. Okay. So the first thing I said I wanted to

do is run the model and see even if it's feasible that we could even come close to a history match, just putting the Grayburg in with a -- I've actually got a weak Goat Seep Aquifer attached here as well, and see if I could just fit things.

I actually got a model that could fit the oil, the gas and sort of the pressures. Okay? The problem with this model was, it was very low versus the historical cumulative water production that you see here on the right.

And so, as a result, the conclusion was that I had to have another source of energy coming into the Grayburg itself. And so, you know, I had to -- I didn't -- it had to come from somewhere.

Q. What's shown on this slide?

A. Okay. Keep in mind this is a semilog plot to just kind of accentuate what's going on. So the squares that are purple here, they show the historical production. We actually only knew the cumulative production, I forgot what date that was, from 1938 to sometime -- I have to figure out what that was. But that second point there is basically where we started to get individual well rates on the wells and on the field.

But what you do see in 1986, what I'm

showing here, is the rate we have from the match model that shows the water rate that we're getting from the Grayburg and the Goat Seep by itself, and that's about 3600 barrels a day. And that's about an 8400 barrel of water per day shortfall versus what we had in terms of historical production. And after that 1986, that jump-up is from the waterflood.

Q. What's shown on Exhibit M-5.

A. Okay. So, you know, as I probably said, how did we get the matched model? This is a very -- even though we're just trying to do a field match and get the water leaks, with this much production and having a potential leak between the Grayburg and San Andres, it's a very difficult model. I mean, I've done 350 models plus in the last 20 years, and this one might be at the top of the list. So it was a really hard history match.

There's a lot of moving parts. You have to get the aquifer characterized properly. You have to get this leak characterized properly. You've got these hundred leaks between the two reservoirs. So it was very challenging.

But we managed to finally get a leak -- excuse me, a good fit. And we fit field-wide historical production and saltwater disposal volumes.

And we also fit historical pressures.

Q. What's shown Exhibit M-6?

A. Okay. So this is a field-wide match. You can see oil-water-gas match, the water injection and so forth. It's actually showing a forecast that's well into the future, so you can kind of ignore that for now. And this just shows some of the parameters that we had in the match model.

The gas-oil ratio in that match model is 375. It's a little bit less than what came out of a 1990 working interest owners report, which was 423. The B sub o that they had and they've been carrying for the original oil was 1.2. And I'm guessing that 423 and that 1.2 was from very early data, and I don't know how accurate it was. But because I have a slightly lower GOR, I end up with slightly lower B sub o, okay; a little less gas and solution, B sub o a little less.

These are starting pressures we have for the Grayburg and San Andres shown here. You can see our match of 1986 pressures. San Andres is essentially 1245. The Grayburg is somewhere -- and there's a variable pressure everywhere in this reservoir. It's not like it's one point. Okay?

You take a reservoir that's 17 miles

from north to south, it's not a box. It's anything but a box. But yeah, the pressures range from like 300 to almost 600 pounds.

And I actually tried to create a customized permeability field and kind of move, essentially, the net to gross around between these different areas so that I could better match the pressures in these three respective leases and the fluid flow between the leases as well.

And take it one step further, we match the pressures in 2024 for the Grayburg and the San Andres, as you're seeing here on these two respective wells.

And one of the neatest things about this model actually came out of Larry Lake's testimony. In his testimony he said that currently the San Andres Aquifer is building up between 4 and 10 psi per million barrels of water injected. And, you know, when I had this history match and put all this thing together, I didn't have this information. I went back and looked at my model and I was building up about 4 psi on average per billion barrels of water injected currently.

So that gave me some confidence that, if anything, the model's a little conservative, because

if it's 4 to 10 psi, the 10 is going to correspond to areas in the San Andres that are tighter, where the pressure is building up faster.

And then over here on the right, you can see how complex this thing is. You've got water that's come into the top of the formation here after we've displaced water. In the middle of formation, we've got some oil and water mix. And this is just looking at it from the top view. And down here on the bottom, of course, that's the AGU. And then you see a 2D representation.

Q. Dr. Buchwalter, just so it's clear, Dr. Lake is one of Goodnight's experts, correct?

A. Yeah. I'm sorry.

Q. That's okay.

A. I'm sorry that he's not with us. I like Larry Lake. He told me one time, he said -- you know, I was asking, because we have a geostatistic package in our software, and I asked him, I said, you know, "Larry, all we use is Kriging when we're developing the maps here, and you've got all this fancy geostatistics. Can you explain, you know, how do you use all this fancy stuff?"

You know what he told me? He just smiled and said, "Jim, there's a lot less here than

meets the eye." They had some licenses there at the time for the students. Go ahead.

Q. And what's shown on this slide, please?

A. Okay. Now, this slide is -- what is it showing? It's showing my relative permeability curves. Okay?

Now, the first thing I would say is these are not relative permeability curves that would -- they're indicative of the dual-porosity system, which is what we have here. Okay?

These are relative permeability curves that were required to come up with a history match of a single-porosity system.

And I know Dr. Ampomah, yeah, you were wondering about this yesterday, so I decided to put some slides here and just kind of explain our workflow and why we did what we did.

Okay. What is this?

Q. Oh, do you want me to...

A. Yeah, let me see. Here's some adjustments that we made, and it's just in terms of how much production we've had up here on the top. We produced about 150 million barrels primary. That's about 16 percent recovery factor. The water-oil ratio at that time was 1.

Currently, in water flooding, we're at 185 million barrels of cumulative production, and our cumulative water-oil ratio is 10, and we're at about 20 percent recovery factor. If we run this forward to 2038, the recovery factor is about another 7 million barrels.

And as far as the relative permeability adjustments we made in the model, there's 30 percent water saturation reported in a 1990 report. We're using 35. The residual saturation that we're using is slightly different. We're using 21 versus 25. It's a little different. Of course, these parameters were made so we could come up with a good history match. And then the data that was in that 1990 report here is shown on the bottom.

Okay. Next slide, please.

Q. What's shown on this slide, which is, "Dual Porosity Modeling Experience."

A. Yeah, I mean, I don't want to brag, but when I was at Texaco, I was supporting in Texaco, we had a simulator that we used to represent fracture simulation in the North Sea, and we were the first company to actually incorporate anywhere in the world the gravity contribution, which I'll talk about. We had studies in different fracture reservoirs around

the world as well.

This is primarily for the -- this isn't for the attorneys. This is for the reservoir engineers. Next slide, please.

Okay. Now, we have a single-porosity model, and I will concede that those relative permeability curves in a perfect world are not the right relative permeability curves. We have two sets of relative permeability curves, don't we? We have a relative permeability curve for the matrix and a second one for the fractures.

And here's the problem with starting with the dual porosity model. You double your number of unknowns. You need to know the matrix block size, and there's a gravity contribution, which I show over here on the right, that you don't have in the single-porosity model.

So, for example, if we've got oil in the fractures and -- yeah, if we've got water in the fractures and oil in the matrix, a 5-foot block and a .1 psi per foot difference, what we have, essentially, is we have a gravity contribution that's acting over the box itself.

So, if I pretend this is my fracture and I poke a hole in it, what happens? The water comes

out, right? Well, that's the same thing that I'm showing here. Okay? And the other thing you have is you have a duplicate set of different properties. You have to characterize both the fracture and the matrix porosity, the fracture and the matrix relative permeability curves. There's something we call relative capillary pressure that needs to be characterized. And then permeability for both the fractures and the matrix. Okay? So, there's a lot of unknowns if you start with the dual-porosity approach.

So, what we use is a single-porosity approach to figure out -- basically, to simplify this and then switch it to dual porosity, if need be.

MR. RANKIN: Mr. Hearing Officer, I have not seen these slides. This is all new information. I don't even know what to say. I did have a chance to depose this gentleman, but I have not seen any of this before. And these are not exhibits, it's not testimony.

This is supposed to be a summary. We're now into 40 minutes with what was supposed to be a summary of his testimony. This is all new, all new.

HEARING OFFICER HARWOOD: Ms. Hardy.

MR. RANKIN: I mean, you know, I have a couple -- I mean, I have a lot of questions for him,

so I don't know how to proceed here, other than just to raise it as an objection, because it's patently unfair to have a 40-minute narrative of information that wasn't provided to us.

The intent from the prehearing order was to provide us with the direct testimony so that we could then evaluate the input, you know, the assumptions, the inputs, the parameters of all -- and the conclusions of all these witnesses. And now we're getting something different and new the morning of the hearing, at a time when we were supposed to be getting a summary only of the testimony that was provided in writing.

HEARING OFFICER HARWOOD: I'm not seeing -- the document we're looking at, I'm not seeing it in Subsection M of the exhibits. Is it somewhere else?

MS. HARDY: Mr. Examiner, I'm happy to respond.

So these -- some of these slides are background slides that have been provided. They're demonstrative exhibits. They are not new. I mean, the slides are new, but the information is from the exhibits that we've included; they're more detailed.

And we've provided them to address Dr. Ampomah's questions, largely, that have come up

during the hearing, because it seemed that this was information that he wanted.

HEARING OFFICER HARWOOD: It's not really a question of whether they're new or not. It's a question of whether or not they've been provided to Mr. Rankin so that he's not being sandbagged with new information that wasn't provided. Have these been provided to Mr. Rankin or the other parties?

MS. HARDY: These are demonstrative exhibits to explain Dr. Buchwalter's testimony.

HEARING OFFICER HARWOOD: Okay.

MS. HARDY: Most of them have been provided. The ones that are not marked as exhibits have not. But I will note that Mr. Rankin deposed Dr. Buchwalter for many hours and obtained the basis for his opinions.

HEARING OFFICER HARWOOD: I still don't think it's fair to present demonstrative exhibits that have not been shared with the other parties.

MR. RANKIN: I guess if I -- if I had a -- I mean, you know, obviously, as Dr. Buchwalter testified, this is one of the more complex models he's ever put together. Okay?

And if I at least had a chance to review and understand how the information now he's saying

he's relying -- I mean, obviously this is information he thinks is really important. Okay? And as a lay attorney, who is supported by his experts, you know, I did my best to evaluate and understand what he thought was important during the deposition.

But if I had understood, you know, at least, you know, this morning, what maybe he thought was really important, I would at least not been taken totally flat-footed by this.

But I don't know, you know, how to proceed. Because I would like to be able to review these slides and have at least an understanding of the import of them relative to his updated model now, because he has, my understanding, substantially updated significant portions of the model in his rebuttal. And that's fine. We pointed out lots of issues and problems with it during the deposition, and he's adjusted it.

But I would like to have the opportunity to actually review these slides before I have to undertake a cross-examination.

MR. MOANDER: And, Mr. Hearing Officer, I just took a look through the deposition and rebuttal, just for, like, this slide. And I'm not making any accusations here, but I'm not seeing gravity physics

show up in that rebuttal, which seems to be a term of art, as far as I'm hearing today.

Perhaps, and I'm a fan of this, an offer of proof of some form that this has been disclosed would quell any dispute here so we can keep moving.

HEARING OFFICER HARWOOD: Well, I mean, my concern is unfairness. And, you know, it seems to me that it's -- demonstrative exhibits or not, if they've not been provided to the other parties, I don't think it's fair to be questioning the witness about demonstrative exhibits that have not been provided to the other parties.

So, the only solution I can think of, unless there -- how many of these are there?

MS. HARDY: There are only a couple -- there are only a few. Most of our discussion focuses on actual exhibits. These were provided as, really, sort of background today based on the questions of the Commission of other witnesses.

HEARING OFFICER HARWOOD: So, Mr. Rankin, how much -- when she says "only a few," we'll assume it's less than half a dozen. How much time do you think you would need to review them before you'd be prepared for cross-examination?

MR. RANKIN: Well, I mean, I think that

there's a few questions I could ask, I think, that would -- I mean, let me put it this way. I would like to have, you know, I don't know, a couple hours to sit down with my experts and just, like, evaluate what he's saying in these slides, because I just -- you know, I'm a layperson.

Maybe one of the reservoir engineers could say, "Okay. I could get through this fast and understand what he's doing." But I need to understand a little bit before I can engage in meaningful cross-examination exactly how this relates to what he said in his initial testimony and what he's saying now in his rebuttal, written testimony. I just need a little bit of time.

HEARING OFFICER HARWOOD: Well, and that wastes the Commission's time. I mean, that's the problem. You know, that's the problem with surprise stuff.

I don't know how much of this was covered in the witness' deposition, how much of the information is actually new versus how much is, you know, just a demonstrative aid to stuff that has already been covered with the witness.

But that's a risk that you bear when you present demonstrative exhibits that haven't been

shared with the opposing counsel.

Mr. Rubin.

MR. RUBIN: Mr. Harwood, I do echo the sentiments, and I do think it is patently unfair to include demonstrative exhibits that have not been disclosed. Pictures are worth a thousand words. To the extent that the substance of these demonstrative exhibits were part of what has been disclosed in depositions, that's fine.

But I would strongly recommend to the Commission that any exhibits that have not been previously disclosed, even if they're, quote, unquote, demonstrative, should not be presented today.

MS. HARDY: And that's fine. I mean, I'm happy to proceed to the slides that are exhibits. I think that these are matters that will be asked about by Dr. Ampomah and probably Mr. Rankin during the questioning of Dr. Buchwalter. So we were trying to head some of that off. But that's fine. We can go ahead with the slides that are exhibits.

HEARING OFFICER HARWOOD: Well, you know, I think -- and maybe I can suggest that on a break, you share these demonstrative exhibits with Mr. Rankin. If he chooses then to use them in cross-examination

then the fairness problem is solved.

MS. HARDY: Sure. That's absolutely fine.

HEARING OFFICER HARWOOD: But for now, they're not -- don't be showing the witness demonstrative exhibits that haven't been provided to the parties.

MS. HARDY: Understood.

BY MS. HARDY:

Q. Okay. Can you describe what's shown on this slide, which is Exhibit M-7?

A. Okay. If you look at the model, essentially we have -- in order to get this thing to fit, you have to have, essentially, a small -- it doesn't seem small, it's 1.5 billion barrels, the Penrose, Grayburg, Goat Seep Aquifer, that's the fit that we established in order to come up with the history match. And the San Andres, by comparison, is 157 billion barrels.

So basically, 99 percent of this aquifer contribution is really -- potentially that we're going to get is coming from the San Andres.

Now, if I make the -- attach an aquifer, as I'll show you, to the Penrose, Grayburg, Goat Seep, and make it larger, then I lose the history match of all the wells on the western side of the structure.

Essentially, this is what we call edge water drive on the right side here. You can see these colored lines are depth lines, and you can see how the water is moving up and following those depth lines. And that's essentially what we call edge water drive.

And then on the left here, you can kind of see the initial ternary diagram for this bottom of the Grayburg, and then you can see it in 1986.

Q. And what's shown on Exhibit M-9.

A. Okay. This shows -- what you're seeing on this exhibit here, on the far right-hand side, you can see the reservoir that we have itself for the Grayburg, Penrose, and it's cut off a little bit of the Goat Seep, Grayburg Aquifer, but it's the top view of the reservoir.

And this gray area out to the west represents the aquifer that we've added to this model. And what we do is, we go into the aquifer, we step the cells off -- out by a factor of 2, so we get the physics properly represented.

And then on the edge here in the forecast, one of the forecasts, is we added 11 spillover wells to say, well, what if in the future when we run these forecasts, what happens if we put 220,000 barrels of water per day, of water disposal

well out here on the edge, how would that affect the San Andres Aquifer and then the leak up into the Grayburg and so forth?

Q. And what's shown on Exhibit M-10?

A. Okay. This basically shows you what's going to happen in the future. And I wish I could show you why, a fig. picture of it, but I won't be able to. But I'll describe it, nonetheless.

So over here on the left-hand side, we show the saltwater disposal rates, and we can see it jumping up to 350,000 barrels a day, and that's the case where we had the new saltwater disposal wells. So we've got two curves that jump up to that point, and that's the blue curve, and then the red curve.

The blue curve corresponds to a case where, in the future, we take the history match model from 2025 forward and we turn on these 220,000 barrels a day disposal wells. Okay.

And then the -- if we take the -- let's see. The red curve has got the new saltwater disposal wells, with no spillover, the blue curve has got the spillover, and then we've got these dash curves. The dash curve that's green has got the existing saltwater disposal wells in the future with no spillover. That shows what the rates will be in the future. And the

orange dash curve shows what will happen with the existing wells with the spillover.

Now, you would think that if you crank up and add these new saltwater disposal wells, we've drastically increased the water that's going into the San Andres. Okay? So you would think that all these cases would produce different results as far as the water influx in the Grayburg, but over here on the right, we can see how much water is going into the Grayburg. In all these curves, it doesn't matter which case you run, they all go up to about 50-plus thousand barrels a day.

Intuitively, it doesn't make sense, right? So we have a higher injection rate. In the future, we should see a higher leak and higher disposal rate into the Grayburg. And let me explain -- I had a figure, but I can't show it. But let me explain why this happens.

What happens, it's really cool, it's one of the coolest things about this whole study, is when you inject that water, that aquifer goes up 30-something miles, and what happens is, you're injecting water so fast, that within the next three years, under the -- under the San Andres part that's underneath the Grayburg, it's building up about 2700

pounds. And, essentially, at that point, you can't inject any more water because if you did, you'd frac the rock. I gave it a 3,000 pound maximum injection pressure.

So from that point forward, if you look at the model in 2038 -- 2028 versus 2035, the pressure in the San Andres under the Grayburg is essentially the same. And what's happening is the water now is pseudo-steady state. It's either moving up at 50,000 barrels a day, or it's actually moving out into the aquifer itself.

So essentially what's happening is we're injecting water at such a high rate that we very quickly reach pseudo-steady state underneath the Grayburg and we're at 2700 pounds, and from that point forward -- it's a huge aquifer. I mean, it's got the capacity to take a tremendous amount of water, 159 billion barrels. And if we say, hey, we can build this up to 3,000 pounds, that's great.

So technically, from an intuitive standpoint, you think you can get all that water in, but you can't because it takes a long time for that water actually to move from where it is in 2028 to move out that 33 miles. Until that water moves, and they have water movement, basically what creates that

pressure wave.

Now, the other thing you'll notice that this saltwater, in the future, what happens is the leak rate increases about 50,000 barrels a day into the Grayburg and very quickly within the next few years.

Can I get back to the last slide? There's one other point I wanted to -- oh, that's okay. Go to the next slide.

Q. M-11?

A. Yeah. You weren't supposed to show that. Sorry.

Q. I'll skip through it.

A. If anybody saw that, it was a really good slide.

Okay. Anyhow, let's talk conceptually about what's happened up to today. Well, up to today, what's happened is we ejected 573 million barrels of water, saltwater disposal. But at the same time, about 77 percent of that water's been used to create our waterflood in the Grayburg. So, really only a little more than 20 percent of the saltwater injection water has net been injected into the San Andres. So really we haven't seen a lot of water coming in through these leaks up to now, partly due to this.

Now, in the future what's going to happen is that the pressure is going to build up in the San Andres and the difference in pressure between the San Andres and the Grayburg is going to become greater. At the same time, we're not going to have the benefit of that water-supply well. So, what's going to happen in the future is we don't have the water-supply well production to offset that injection, and at the same time, we're building up this pressure difference between the San Andres and the Grayburg. The net result is you're going to have a rapid increase in the water that's moving into our Grayburg Reservoir.

Next exhibit, please. Don't show that, please. Don't show that either.

Q. What about Exhibit M-12, please?

A. And they were all just demonstrative things to really just show what I just said. But nonetheless, you just have to trust me.

So what we did after the hearing, there was a lot of concern that, hey, maybe there is an aquifer in the Grayburg somehow and we have a seal between the Grayburg and San Andres. But the first thing we did is, I had a slight mistake in the model, I wanted to add a couple of saltwater disposal wells

that you see here, so I made a pressure correction in the model and adjusted the match. And I think you'll see it on the next slide.

Q. And what is shown on Exhibit M-13?

A. Okay. This just shows the new match. It's basically the same match I showed you on a previous slide. So we've added the saltwater disposal wells. We've adjusted starting pressure. We come up with a good match as far as the pressure on 2024. And over on the right here, you can see the match on the oil, water, gas and so forth. So it's a good match.

These changes were not big changes in the model, but they did improve it slightly.

Q. What's shown on this, which is marked here as M-14?

A. So first thing I said is, well, let's put an aquifer on the Grayburg. Let's seal off the San Andres and see what happens. And this is the latest model that's got these couple additional wells put in there as well for saltwater disposal.

And you see we've got an aquifer going out basically 33 miles into the San Andres -- excuse me, in the Grayburg.

Q. And what about this slide?

And I want to note, it's my

understanding there may be just a discrepancy in the exhibit numbers with what was filed. So this is M-15 on this presentation, but I believe it's M-16 in your filed exhibits. Because I think our cover page was marked as an exhibit in the filing. So just wanted to make sure that's clear.

MS. HARDY: So this is M-14? Okay.

In the filed exhibits, but it's the same document.

A. So all I tried to do here is, let's put an aquifer on the Grayburg and see what happens and see if it's feasible.

If you look at these curves, hey, we're fitting the oil, we're fitting the gas, we're fitting the water. Everything's good, right? So at least on a field-wide basis it looks okay.

This aquifer, once again, goes up about 33 miles. This aquifer is actually much smaller than the aquifer I needed for the San Andres because now the aquifer -- you've got many, many wells on the downdip side of the Grayburg, and so you've got all these wells are soaking in water instead of just these few little leaks or these hundred or so leaks that we have.

So as a result we have a much smaller

aquifer to match the water production because we're just trying to fit the production. This isn't really at this point a history match. It's just a what-if.

Q. And what's shown on this slide, which is marked here as M-16? But I believe in your filed rebuttal it's M-15.

A. So what you see here on the left, in the bottom, is I've got a number of wells on the left-hand side in yellow. And all those wells that are in yellow, I call that a group. And so I add up the production for the group and I compare that to historical water production on a field-wide basis. And in this plot on the left side, on the bottom, you can see now, because we've got water not just hitting these hundred or so wells where we have these leaks that are small to large, depending on which well we selected, we've got all these wells on the west side of the reservoir where the water is hitting due to edge water drive. Okay?

As a result, we're making far more water. So even though we're matching the field production, we're making far more water, and, of course, if we just look at San Andres by itself, what happens in the -- even though it's a huge aquifer, it still builds up pressure to 22, 21 psi on 11/8/24

because you're still injecting that water, it takes time to move out. And from a physics standpoint, it just hasn't had enough time to move out before it builds up pressure, so you have those two problems.

Q. And what's shown on M-17, which is M-16 in your filed rebuttal?

A. Okay. So this is showing another match where we said, well, let's have the Grayburg in the San Andres, let's create what we call -- I'll call it a combined aquifer.

So we've got water coming from the bottom, water coming from the Grayburg, is there some combination there that would make sense? And, once again, it's the newest model. And I sent the aquifer the same distance in both models. I adjusted that distance until we came up with the history match.

Q. What's shown on M-18, which is M-17 in your filed rebuttal?

A. Well, this shows the Grayburg Aquifer in blue here. And the gray area would have been the extent of the San Andres Aquifer. As you can see, it's a much smaller aquifer, but once again, the aquifer is going out in both the Grayburg and the San Andres in the same distance.

Q. And what's shown on M-19 here, which is M-18

in your filed rebuttal?

A. Okay. So once again we've got a good fit of the production on the field-wide basis, everything looks reasonable. But it -- I'm sorry, I'm getting ahead of myself.

Q. And what about M-20, which is a M-19 in your filed rebuttal?

A. I mean, it's got the same problem, right? We've got edge water drive hitting all these wells on the deeper part of the Grayburg, on the west side. We're never going to get a fit, and so it's just not going to work.

Q. And, Dr. Buchwalter, can you please summarize your conclusions.

A. Okay. So we have 87 years of historical production pressures. As I've said earlier, if you have a model with this much data, you can establish the relationship between the average pressure -- the average pressure -- you can use all these pressures to establish the initial volumes of oil, water, gas you have in these reservoirs. You can also come up with good estimation what this leak is. And I think these forecasts are, you know, quite reasonable with the data we've got.

The original oil in place is about 900

million barrels in both reservoirs, the Penrose, Grayburg and then the San Andres ROZ.

I didn't mention that, but the ROZ is in here as well, sits right below the Grayburg. It's in the top. We have three equal layers in the San Andres. I think I got 500 -- maybe it's 500 millidarcies permeability in there as well.

As far as future forecasts, it almost doesn't matter whether they drill the saltwater disposal wells or not; either way, very quickly in the next few years, we're going to have a leak of about 50,000 barrels a day. And unfortunately for them, their saltwater disposal rate is going to tank.

And then we did some alternative matches that, you know, just didn't work putting an aquifer into the Grayburg.

And the one thing I'm going to leave with you to kind of keep in mind is that, you know, per Larry Lake's testimony -- I guess that was a Freudian slip when I said he was working for us. But, you know, he said in his testimony, he said the aquifer is increasing 4 to 10 psi per million barrels injected. And, you know, we're confirming the 4 in our model after the fact.

And let me just leave you with a couple

comments and just my impression of how you should take all these slides and just think of what we've done.

I mean, as I said earlier, what the simulator does is take all the pieces together and look at it as a puzzle. And, you know, a lot of times, I think when you look at all the pieces -- they're all important; I mean, I'm not denying that. You need to put all these pieces in as best you can to get the best answer possible.

But, you know, I would say if you're looking at this, if you look at all the little pieces, it's a lot like trying to look at the Superdome and it's the lights are out and you turn on a flashlight, you look in one place, you see a seat, another place, you see the field. The nice thing about the simulator is it looks at the model from 50,000 -- big picture, 50,000 feet. And then you can see how all those little pieces may impact what's really going on this reservoir, and you look through pieces.

You know, for example, there's got to be water coming up from the bottom. It's got to be a substantial amount of water. And there's no way you can put it in the Grayburg Aquifer unless you can extend it down thousands of feet.

And, you know, the model is not perfect.

I mean, I could work on this model for the next two years. But is it good enough to match the initial volumes in the reservoir and to match the production changes of time and the pressures? It does a really good job. So I think for the purposes of determining this leak between the San Andres and the Grayburg, I think it's a really good model, and for doing forecasts at least on a field-wide basis.

If you ask me, "Do you have a perfect match on this well or that?" I don't. You know, it's pretty good, at least in groups of wells and so, forth, but it's not perfect, and it wasn't designed for doing that. So that's just about all I've got to say.

Q. Dr. Buchwalter, is the takeaway from this, based on your model, that fluid is migrating from the San Andres into the Grayburg?

A. Yeah, I mean, I think it really is. I mean, I've seen it in testimony, there's some wells that were completed down into the San Andres and they're probably making some water. Okay? I don't deny that.

But I would say you can identify the 50 wells that have the highest water-oil ratio in 1986 and see how many of those wells were actually completed down in the San Andres. And if it turns out

that those are the -- every well, the top 50 that are making high water-oil ratios, if those are all completed in the San Andres, then, you know, Goodnight's got a good case. If not, then, you know, that water's coming up through a fracture network.

Q. Dr. Buchwalter, is it your opinion to a reasonable degree of scientific probability, based on your modeling, the water is migrating from the San Andres into the Grayburg?

A. You know, I don't see how it could not be, to be honest.

Q. And, Dr. Buchwalter, a large part of the discussion in this hearing has focused on detailed information regarding the top picks of the formation and interpretations and logs and petrophysical data.

Would these different interpretations change your match model and forecast results?

A. You know, actually, I don't think it's going to change it too much. I mean, you can change the picks here and there. It's got to change a lot. You got to put a large aquifer on the bottom of the Grayburg somehow. So unless that's -- you can put an aquifer going down, you know, a thousand feet and then put the San Andres on top of it, you might have an argument. But I don't see how you could otherwise.

Q. And my last question, Dr. Buchwalter. As you've explained, you've integrated all the parts of the puzzle into your model. And has Goodnight prepared any model to support their argument that this water influx is not occurring?

A. It's a really good question. I wish I could answer it. I don't -- I don't know why they haven't. I can't explain why they wouldn't.

But yeah, if you don't have a -- you know, a lot of things are interpretation. What I do is I just take the data and you give me ranges and I get the fit. You give me bad data, I'm going to give you bad answers. Right?

But yeah, there's a lot more details we can put in this model. I can see that. But for the answer it was designed to -- for what it was designed to answer, I think it's very adequate.

MS. HARDY: Thank you. Those are all my questions.

HEARING OFFICER HARWOOD: All right. Let's take our mid-morning break and come back at ten minutes.

MR. RANKIN: Mr. Hearing Officer. I cannot agree to proceed with the cross until I have a chance to review the additional slides that I didn't see.

And we just went through more than an hour of a summation of testimony, especially his rebuttal was six pages, that was it. And there was a lot of stuff here.

I mean, he said, you know, point blank that -- we skipped through one or two slides, he said, "Those slides were just to show what I just said." Okay? I was taking notes fiercely to understand what he was saying.

I need a little bit of time to confer with my experts, to understand what he said today, how it relates to what was in his testimony, what we understood was in his testimony previously, how it relates to what was in his deposition. I cannot agree to go forward without having the opportunity to see those slides and just to confer with my experts to understand how I need to adjust my cross-examination. I cannot agree to it.

HEARING OFFICER HARWOOD: How much time do you need?

MR. RANKIN: I would like -- I mean, so we're at 20 minutes to 11:00. I mean, frankly, I need to -- I mean, I just need to sit down in a conference room with these guys and figure it out.

So I would like -- I mean, I would

request that we come back at 1 o'clock and then allow me to proceed with the cross-examination of Dr. Buchwalter.

HEARING OFFICER HARWOOD: I think that's fair.

MS. HARDY: May I raise one issue? And it's just that Dr. Buchwalter didn't testify about the slides that we didn't show. So I guess I'm sharing them and then there will be cross on them, even though he didn't testify about them?

MR. RANKIN: Understood, Dana. If you would exclude the slides that you didn't show, 100 percent agree. The slides that you didn't show, you can take those out, but I would like to see the slides that -- everything that you did show, except for the ones that -- you know, it looked like there were four or so towards the end that you didn't show.

But I would like to have, otherwise, the complete slideshow so that I can have an opportunity to evaluate what was presented. The hour plus that he gave as a summary that I can't discern what was in his written testimony or not, and I need to understand -- I just need a little bit of time.

CHAIR ROZATOS: Mr. Hearing Officer, I actually do have a question for Mr. Rankin.

You said you wanted to see the whole slide show, and I understand your thought process behind it, but just so we understand, at least my question, how is the whole slide show going to help you with what was presented to the Commission? Just so I can understand.

MR. RANKIN: Yeah, I mean, what I'd like to do is I'd like to drive that slideshow and I'd like to walk through part of my cross to investigate with Dr. Buchwalter what was on -- what he said with respect to the slides. A lot of those were already -- many of them were already in his -- if you just want to send me the slides that were not in the slideshow -- I mean, that we're not exhibits that were in the slide, that's fine. But she'd have to edit it.

I'm just suggesting that she send what was presented, excluding the ones that we skipped over after I raised my injection. That way I can just sequentially walk through on a cross basis, like, what he just presented to the Commission.

CHAIR ROZATOS: It's not that I'm not -- I don't think you should have it. I'm just asking, if we didn't hear those slides, how does that help the case?

MR. RANKIN: No, no, I'm sorry. I do not want the slides that we didn't -- that he didn't talk to. I don't want those slides.

CHAIR ROZATOS: Okay. Got it.

I apologize Mr. Examiner. It's your call.

HEARING OFFICER HARWOOD: No apologies necessary. I would have gone further and said he gets all the slides, just so that -- you know, I mean --

CHAIR ROZATOS: Mr. Harwood, if you could also bring the microphone just a little further down. Everybody may not have heard you. But I leave that all to you.

MR. RANKIN: I guess, not having seen them, to your point, Mr. Harwood, I don't know what he spoke to that may have been in the slides, so I don't know.

I mean, I shouldn't prejudice myself, but if it's something that he spoke to that wasn't presented, then I would like to see that slide. How about that?

MS. HARDY: I'm happy to send all of the slides.

HEARING OFFICER HARWOOD: Yeah, I don't want

to open a door, but there were several times when the witness said, "I wish I could present this," or "say this," or "show this."

And in the interest of fairness to your opponent, I'm thinking maybe he should see all of those slides. And if he wants to open that door with slides that haven't been presented, well, there you go.

MS. HARDY: I will send them right now.

MR. RANKIN: And, Ms. Hardy, maybe if you could just let me know which ones were presented and which ones weren't, that would be helpful as well. I appreciate that.

MS. HARDY: Okay. I think I could do that.

CHAIR ROZATOS: So, Mr. Hearing Examiner, if I'm hearing it correctly, we're just going to go to break until 1 o'clock, correct?

HEARING OFFICER HARWOOD: I don't see any other alternative.

CHAIR ROZATOS: Perfect. Thank you all. See you at 1:00.

(Recess held from 10:42 a.m. to 1:08 p.m.)

CHAIR ROZATOS: Good afternoon everybody. We're back. It's a little past 1:00. Apologies for

the delay.

Can you please mute yourselves if you're on the platform.

Just wanted to notify everybody that the legal team for Goodnight did request for an extension of some time. They needed another half hour. So we will be reconvening at 1:30. So for everybody on the platform, we will be reconvening at 1:30. Thank you for your patience.

(Recess held from 1:08 a.m. to 1:30 p.m.)

CHAIR ROZATOS: So we're back on the record. We are on our continuation of the case that we were on this morning between Goodnight and Empire.

And out in the audience and on the platform, if you could please turn off your volumes on your electronic devices and mute yourselves, we would appreciate it.

We'll transfer it over to Mr. Harwood, who is our hearing examiner.

So, go ahead, Mr. Harwood.

And here in the audience, someone has a phone or something on. You need to mute it, please.

THE HEARING OFFICER: Mr. Rankin, are you prepared for cross-examination of this witness at

this time?

MR. RANKIN: Mr. Hearing Officer, no, I'm not. And I initiated an effort to confer with Empire counsel and other counsel. I won't be prepared today, but I will be prepared in the morning.

And I'm asking that instead of having Mr. Buchwalter stand for cross, that we have, if they're available -- I understand at least one of Empire's witnesses is only available today, and that's Dr. Trentham. So in order to accommodate his schedule and my ability to integrate the information I received today from Dr. Buchwalter, that we defer his examination till tomorrow morning and that we instead take on Empire's other, hopefully, three witnesses this afternoon so that we can then pick up with Dr. Buchwalter in the morning.

We're going to have several of our experts go back and work on integrating what we heard from today so that I can further integrate that into my cross for tomorrow. I think that would be -- my sense is that would be the best use of my time and your time as well, because I think it would make my cross much more efficient. And I think it would save everybody time. And that would allow for any prejudice to be resolved between today and tomorrow.

THE HEARING OFFICER: Have you conferred with Ms. Hardy on that?

MR. RANKIN: I initiated with doing so, but didn't complete it. So I've asked her if that would work for her, for Empire and their witnesses, and I haven't had a chance to complete that effort with her.

HEARING OFFICER HARWOOD: Ms. Hardy.

MS. HARDY: Mr. Examiner, that does not work for Empire's witnesses. Dr. Buchwalter is planning to travel home tomorrow. He's here to testify. This information was not new. It was more explanation of what Dr. Buchwalter already had in his testimony.

Goodnight had a two-hour break to review four slides that were just supplemental slides that were explanatory. So they already have more information now than they would have had if they would have just proceeded with the cross earlier.

And so we object. We don't know whether our other witnesses are available right now. The plan was for Dr. Buchwalter to proceed this afternoon, and so that's what we are prepared to do.

THE HEARING OFFICER: I'm going to have to defer to the expertise on the Commission to evaluate

this, because I'm not qualified to really understand, you know, the depth of the technical issues that were involved in the demonstrative exhibits, whether it warrants what Mr. Rankin is requesting or doesn't warrant it.

So, I have to turn it back on -- I'm not trying to pass the buck, Mr. Rozatos, but, you know, it's a technical question more than a legal one.

CHAIR ROZATOS: Mr. Rubin, you had your microphone on first, so I'll let you start with what you had to say.

MR. RUBIN: Is it feasible that Mr. Buchwalter can appear virtually tomorrow?

MS. HARDY: No, I don't think so. He's one of our primary witnesses and I think it's important for him to be here in person and for the Commission to hear from him in person.

MR. RUBIN: Because it is hard for us to sort out which one of you is correct as to how new this information is, having not heard it all and seen it all.

MS. HARDY: It's not new. I think it's just additional explanation that Dr. Buchwalter would have given verbally, but now Goodnight has the benefit of having depictions of it as well. So I think they're

actually better off than they would have been without the information.

So, you know, their experts can address it when they testify. But at this point I think it is best to proceed with the cross of Dr. Buchwalter.

CHAIR ROZATOS: Before you continue, hold on. I understand. I think this is basically the concern that we were having earlier, right, that the Commission was having. Because we're getting this type of information and this is what's coming over to the Commission as well. And I think it is a concern for the Commission also. I don't have the Ph.D. I know I'm not a -- anything. I don't have a Ph.D. Dr. Ampomah lives and breathes this and he has the concern as well.

We heard from you, Ms. Hardy. Thank you.

Mr. Rankin, we heard from you. And I know you have more to say. I saw your microphone go on.

Mr. Moander, you were ready to say something?

MR. MOANDER: So I'm going to renew my suggestion that I think it would clarify the --

CHAIR ROZATOS: Wait up, Mr. Moander.

If we can make sure that you keep yourselves muted on the platform. It's becoming a problem, so please keep yourselves muted.

Thank you, Mr. Moander. Go ahead.

MR. MOANDER: OCD would renew its suggestion that an offer of proof of disclosure of the materials should resolve some of this in order to clarify what was disclosed and what wasn't, which would lend credence to potentially either side as to their positions.

I did take a look. I did not do a detailed look. I'm not seeing it. I could certainly be wrong. But an offer of proof from Empire that this material in some way, shape or form was disclosed should, like I said, resolve this. So that's a renewed suggestion.

CHAIR ROZATOS: I'm going to go through everybody and then I'll come back to you, Mr. Rankin.

Mr. Beck.

MR. BECK: Well, I, like I think a significant number of people in the room, do not have the technical expertise to speak to the new material. I think no one disputes that there are at least four new slides that were disclosed and that Mr. Buchwalter testified about.

Mr. Rankin is leaps and bounds smarter than I am in this material. And, you know, as an advocate, representing his client, has said that it's unfair and it prejudices is him, it prejudices his client. It's not the first time we've seen new material coming in late. I hope it will be the last. But I don't know if that's too optimistic.

I think that asking for a few hours to digest the material tonight and come back tomorrow is incredible. It's certainly an olive branch that I don't think necessarily he should extend, but that he's done so, I certainly think that request is infinitely reasonable.

And I think everyone agrees that -- it's certainly looking to me like Empire will not even finish with all of its witnesses by tomorrow afternoon. And so I don't think that putting Mr. Buchwalter back in the mix to appear some other time, whether it's tomorrow, whether it's later when we reconvene, is going to upset the pace that we're at right now.

CHAIR ROZATOS: Okay. Thank you.

Mr. Parrot.

MR. SUAZO: Hi, Commissioners.

CHAIR ROZATOS: Oh, I apologize, Mr. Suazo.

You're back. My apologies.

MR. SUAZO: No problem. I had OCD hearings this morning, so I'm back and was able to tune in for the last couple of hours.

And I've sent Ms. Hardy's PowerPoint to Pilot, but obviously everybody's busy, and I have not heard back from their technical folks. So we also would like some additional time to review.

And I concur with Mr. Beck that, you know, this is going to go on for some time. And I think we just need to make sure that everybody has the chance to really examine all the information that the Commission is considering and also have a fair chance to ask the questions that we would like to have answered as a result of that information. So I support Mr. Beck and Mr. Rankin's position.

CHAIR ROZATOS: Thank you, Mr. Suazo.

I see you, Mr. Hearing Officer. Before you continue, I have two questions, but I want to see what you have to say first, and then we go from there.

THE HEARING OFFICER: Okay. Maybe we're reading each other's minds.

I guess what I would like to hear is from Dr. Buchwalter himself whether or not you could

change your travel plans and be here tomorrow.

THE WITNESS: I'd rather not, but if I have to, I have to.

CHAIR ROZATOS: So that was kind of along the lines -- and I apologize, Ms. Hardy, I was kind of conferring with Dr. Ampomah as you were answering about the doctor being on the platform tomorrow instead of potentially being here. And I didn't hear what the answer was. I apologize.

MS. HARDY: I said that we -- I don't think that -- it's our preference to have him here in person because I think his testimony is really critical. And he's supposed to be traveling tomorrow, so being on the platform tomorrow doesn't solve that.

CHAIR ROZATOS: Okay. That was the answer that I missed. I apologize. Give me one second.

Mr. Rankin, my question to you. Which slides are the four extra slides? My apologies. Because the Commission didn't see certain slides either, right? Empire skipped through those. I realize that this is information that you were working on and that Goodnight is definitely concerned.

Please explain to us, as well, the

slides that we didn't see, how is it pertinent? And I apologize. As I said, I'm a layperson, so I'm trying to figure it out myself.

MR. RANKIN: Part of the problem, Chair, is I'm not going to be able to fully articulate this because I'm still integrating it. I mean, however long it was, it was a fire hose. Okay? And so the reason I'm telling you that I can't go forward is because I'm not in a position to articulate -- to explain to you how to integrate what I learned today and what I knew before.

My point is that we have six pages of double-spaced testimony that explains, you know, 18, 19, 20 exhibits that are his final model and all the different things he did in his final model. The six pages of written testimony is woefully insufficient to even explain what he has here.

The problem I have is that, you know, what I had laid out was to explore what was missing in his testimony in these slides. Okay? Now I'm hearing things, over an hour of summary, that was new, not in written testimony and couldn't easily be discernible from the slides.

I think perhaps maybe some of our experts could intuit some of that perhaps based on

the slides because they're intimately familiar with the data. But I have not myself integrated that. That's my problem. I'm the one who's charged with cross-examining him, and I'm not in a position to integrate what I learned this morning with what was in the slides today and what little bit was in the six-page rebuttal testing.

CHAIR ROZATOS: And I understand the frustration. I apologize. I'm not trying to come across to anybody -- and I'm not necessarily pointing a finger. We have to understand as well.

Go ahead, Mr. Hearing Officer.

THE HEARING OFFICER: I'm just thinking if Dr. Buchwalter can be here tomorrow and if he can be prepared tomorrow, that seems like a reasonable solution. That would appear to accommodate Ms. Hardy's interest in having Dr. Buchwalter here in person and would give you the time you need, Mr. Rankin, to complete your preparation for cross. Just don't come tomorrow and say, "I need more time."

CHAIR ROZATOS: So before you even answer that, Mr. Rankin, here's my thing. This Commission has heard individuals off of the platform before. I realize it's the best to have someone in person, but we also have to take into account that people travel

and people come from out of state.

And, Ms. Hardy, I believe this question is to you and to your team, and for the doctor, as well, but you're the lawyer we're talking to. Could we not just continue this witness for another time? He could be on the platform. Mr. Rankin will be able to gather all of the information, questions that he has. And we don't have to necessarily have the doctor here in person. We could have him on the platform.

Of course, you all have to agree to this. This is just a suggestion that I have. And I think it would allow Goodnight the opportunity to be able to get the information that they need, to get their experts' time to be able to review the differences that are between the written and the PowerPoint. But it also gives your witness the opportunity to be able to explain what he has to say, but just not in person.

MS. HARDY: Mr. Chair, I would need to consult with my client, but I think that we would rather proceed with Dr. Buchwalter tomorrow, if he can change his travel plans.

CHAIR ROZATOS: That would be perfect with us, but I'm just trying to offer options.

MS. HARDY: Yes, I understand.

CHAIR ROZATOS: Because both sides have pertinent points, but we're trying to accommodate as well. So, 15 more minutes?

MS. HARDY: Fifteen would do it. I mean, if we're going to proceed this way, then we need to make sure our other witnesses are available, because we had not planned on that.

CHAIR ROZATOS: Okay. Let's reconvene at 2:05, that gives us the 15 minutes, and then we can discuss again. Thank you.

(Recess held from 1:47 to 2:05 p.m.)

CHAIR ROZATOS: It's 2:05. We're back on the record.

Ms. Hardy, we'll start off with you. We posed a couple of options, so could you let us know what the decision was.

MS. HARDY: Yes. Thank you, Mr. Chair. We are prepared to proceed with Dr. Trentham as our witness next.

CHAIR ROZATOS: Okay. And our other doctor will be here tomorrow?

MS. HARDY: Dr. Buchwalter will be here as tomorrow. And after Dr. Trentham, we can proceed with Mr. Melzer and Mr. McShane, if we get that far.

CHAIR ROZATOS: Okay. I love your optimism. That's great.

Mr. Hearing Officer, we transfer it back to you.

THE HEARING OFFICER: Okay, great. So it's Robert Trentham?

MS. HARDY: Yes, that's correct. And Mr. Padilla is presenting Dr. Trentham.

CHAIR ROZATOS: And the doctor is on the platform, correct? Okay. So we'll get him to be on the Zoom. Thank you.

THE HEARING OFFICER: Okay, great. Doctor, if you'll please raise your right hand.

ROBERT CRAIG TRENTHAM,

having first been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. PADILLA:

Q. Dr. Trentham, please say your name for the record.

A. It's Robert Craig Trentham.

Q. I'm sorry, I think I called you Dr. Trentham.

A. Well, that's okay.

Q. Give the Commission, Dr. Trentham, a little bit about your educational background.

A. Okay. I have a bachelor's and master's in geology from the City College of New York, and a Doctorate in Geological Sciences from the University of Texas in El Paso.

Q. What have you done in terms of preparation for this hearing and the self-affirmed statement that you've signed?

A. Well, obviously, I've written the statement. I've reviewed many of the materials provided to me by Empire. I've had discussions with Steve Melzer and with Bob Lindsay, both of whom I've known for decades and have worked with also for decades.

Q. Give the Commission an overview, briefly, of what you prepared.

A. My expertise, I guess, to bring to the table on this project is an understanding of residual oil zones. And I've been -- like many geologists, I've worked in exploration production for over 20 years before I came to the university.

It's always been frustrating that there are these zones that have oil shows, have shows, calculated as potentially productive, and yet they turn out to be dry holes because they make mostly all water.

And in the last 20 years or so, along

with Bob Lindsay and Steve Melzer and others, we've been coming to realize that there are these intervals that have residual oil but are not productive in the classical sense of primary or waterflood production.

Q. Let me stop you there, Dr. Trentham. Your resume or curriculum vitae states all of the qualifications that you have, especially with respect to ROZ developments in the Permian Basin, correct?

A. Yes, sir, that's correct.

MR. PADILLA: We tender Dr. Trentham as an expert with regard to ROZ in the testimony in this case.

HEARING OFFICER HARWOOD: Any objection from Goodnight?

MR. RANKIN: No objection.

HEARING OFFICER HARWOOD: OCD?

MR. MOANDER: No objection.

MR. BECK: No objection.

HEARING OFFICER HARWOOD: And that was Rice. And from Pilot?

MR. SUAZO: No objection from Pilot.

THE HEARING OFFICER: Dr. Trentham will be so recognized.

BY MR. PADILLA:

Q. Dr. Trentham, you prepared a self-affirmed

statement regarding a little bit of what you said with regard to your expertise in ROZ developments in geology. You have prepared what are Exhibits D-1 through D-22. Well, attached to your self-affirmed statement are Exhibits D-1 through D-22, correct?

A. Yes.

Q. And you also have six tables. They're labeled D-1 through D-6, correct?

A. Yes.

Q. Dr. Trentham, to your knowledge, are the contents of your tables that are attached to your exhibits, true and correct, to the best of your knowledge.

A. That's correct, sir.

MR. PADILLA: Mr. Chairman, we tender Dr. Trentham's self-affirmed statement and the exhibits attached to it, specifically D-1 through D-22 and Tables D-1 through D-6 into evidence.

HEARING OFFICER HARWOOD: Any objection from Goodnight?

MR. RANKIN: No objection.

HEARING OFFICER HARWOOD: OCD?

MR. MOANDER: No objection.

HEARING OFFICER HARWOOD: Rice?

MR. BECK: No objection.

HEARING OFFICER HARWOOD: Pilot?

MR. SUAZO: No objection from Pilot.

THE HEARING OFFICER: They'll be admitted.

(Admitted: Empire New Mexico Exhibits D-1 through D-22 and Tables D-1 through D-6.)

BY MR. PADILLA:

Q. Dr. Trentham, we've prepared a few slides for you to summarize your testimony as shown by the self-affirmed statement that has been introduced into evidence. Let me try to share those slides.

HEARING OFFICER HARWOOD: Before we go there, these have been shared with -- we're not going down the same rabbit hole we were this morning, are we? These have been shared with Goodnight?

MR. PADILLA: Yes, they have. They've had them for quite a while, matter of fact.

MR. RANKIN: I mean, assuming that they're just right out of his exhibits, that's fine. But if it's something different that I haven't seen -- I haven't seen slides for today, but if they're right out of his exhibits, that's fine. He hasn't shared what slides he's going to present, so I don't know.

HEARING OFFICER HARWOOD: I'm just trying to avoid another train wreck. All right.

MR. PADILLA: I don't think I'm going to have a train wreck for you, Mr. Harwood.

CHAIR ROZATOS: Are we having issues sharing?

MS. HARDY: We are. But I think Mr. Padilla can e-mail me the slides and I can share them. Because it seems that he's having a problem with this sharing.

CHAIR ROZATOS: I'm going to just make this suggestion, Ms. Hardy. They should send you all the slides. So then we don't have the --

MS. HARDY: Understood.

CHAIR ROZATOS: From here on out, send all the slides to Ms. Hardy so she can have them ready, please.

MS. HARDY: We will do that.

CHAIR ROZATOS: Thank you.

And, Doctor, thank you for your patience. We apologize.

THE WITNESS: No problem. He's probably better at it than I am.

BY MR. PADILLA:

Q. Dr. Trentham, I finally got help on this thing, and I'm glad for that. Let's look at the first slide, which is Exhibit D-2, and that comes from your

testimony before, correct?

A. That's correct. They used -- the same exhibit numbers are on the original documents.

Q. Tell us what's contained in this slide.

A. Okay. This is a slide that shows or places the EMSU-B, EMSU, the AGU fields along the Artesia trend, which is one of the number of trends that we have identified as having had this meteor-derived flushing, where the original oil columns were much thicker than they are today, and the lower portions of the oil columns have been essentially swept by what we refer to as Mother Nature's Water Flood.

This particular base map here is from Alton Brown, who was working independently on ROZs, trying to figure out ROZs when he was at Arco in the late '90s. And what he was doing is he took this data from unitization agreements and other information, and noticed the tilted oil water contact on the base in these fields and that each one had a different flow direction. And so he was the first one to kind of point out that even today, there's still this flow that is moving through these trends and beneath these fields.

Q. You have some dark arrows there in black. What do those represent?

A. Those are the arrows -- that's the direction and the number associated with the arrow, the amount of tilt in feet per mile on the base of the water-oil contact in those fields. And this is directly from Alton Brown's presentation that he made. He made a couple; one in 1999 and another one in 2001.

Q. You've also identified the Wasson Field there with a red arrow.

A. Correct.

Q. Why did you do that?

A. Because it's probably the largest of the fields where we have documentation over probably 15 miles of these tilted oil water contacts from the Wasson Field and on up along the trend along the eastern edge of the Northwest Shelf. And then the other fields, of course, are places where he's documented.

And you can see by the direction of the arrows that there obviously is more than one trend or direction of flow, and each one of those is associated with a different trend.

Q. In terms of the Artesia trend, what else do you find in there that is significant?

A. The Artesia trend, part of it extends across the southern edge of the Northwest Shelf, and so

there's data from Vacuum Field. And we also have ROZ information down to the south in Texas beyond the limit of this map.

Q. Do you have anything else on this slide?

A. No.

Q. Dr. Trentham, we've seen this with Dr. Lindsay, this next slide.

A. Yes.

Q. Give us your version of this slide as appropriate or pertinent to this hearing.

A. Okay. Well, the lower cross-section is a representation of the cross-section that hangs in most geologists' offices. In the Permian Basin, it's the east-west cross-section of the basin that was done in the 1950s by the people who preceded us.

Then what Bob Lindsay did was he kind of reconstructed what it had to have looked like before the late-stage tectonics, which cut off the hydraulic head to the west. He reestablished that it would be easy to have this hydraulic head flushing from as far west as the San Andres Mountains between Alamogordo and Las Cruces, and that this water, these waters, would be flushing down through the San Andres, especially, but other intervals as well, and so that we have enough horsepower or hydraulic head for this

flushing to occur. And this flushing, then, is responsible for removing the movable oil from the residual oil zone intervals. And you can see the direction of flow that he's indicating with his arrows in there.

Q. If we look at the top of the top depiction, we see the Central Basin Platform. Does that correspond to the bottom depiction of the Rio Grande River?

A. Yes, it does.

Q. Okay.

A. Yes, it does.

Q. And where would you find ROZ in the Central Basin Platform?

A. Well, we find them on both the east side and the west side of the Central Basin Platform, extending from, say, Hobbs on the north, on the northwest side, all the way down to north of Fort Stockton. On the east side of the platform, we see them from the Seminole Field, north of Seminole, all the way down to Upton County and Crockett County on the south in the McCamey Field.

Q. Is ROZ generally found in a conventional oil development?

A. Well, let's see. Yes, that's true. We find

them under many existing fields. And a little further on in my testimony, I'll talk about the different kinds of ROZs. But yes, we find them associated with Grayburg, San Andres, Clear Fork, Tubb or Drinkard fields on the Northwest Shelf on the Central Basin Platform, and also in a couple places on the Eastern Shelf.

Q. Is that generally where you've had primary production in an upper zone?

A. Yes. The one example which I'll talk about a little bit later is the Tall Cotton Field where there is no upper arc, there is no main pay.

Q. Okay. Can we move on to the next slide.

A. Okay. So this is the slide that Steve Melzer put together, actually, probably 15 years ago now. And this is after many, you know, days, hours, months of discussion about these different trends. And so this shows where we see the different trends across the basin. And you can see they extend as far west at this point as the Guadalupe and the Sacramento mountains, and they extend across the basin.

So the trend on the north is the Slaughter Levelland trend, which extends then across the northern part of the Midland Basin, over to the Eastern Shelf. The lower trend of the -- kind of the

darker color, that's the Artesia trend, which then comes down to the -- down the west side of the platform and then down across and out towards the Ozona Platform. Then kind of the fatter arrows include the trend where the Wasson Field is located, and then the other set of yellow arrows on the east side of the platform indicates where we see the flow paths on the east side of the platform.

We also have a couple of other flow paths. There's a Roswell trend that's kind of the smaller arrows in there, where there's just a limited amount of production and just smaller ROZs. And then there's another one across the Midland Basin, where we know there are thick intervals that have residual oil type values in the San Andres, but the San Andres is not productive there, but it just hasn't been explored as yet. As I've said to Steve many times, "We just can't do everything."

Q. Dr. Trentham, it's fair to say that you're going to find ROZ throughout these pathways?

A. Yes. Not continually, but certainly, yes. Along those pathways you'll find fields with brownfield ROZs beneath them, and you'll see areas where there are ROZs without an associated existing productive field.

Q. Let's move on to the next slide. What does this Exhibit D-4 show?

A. Okay. This is the three types of different ROZs. And this was, again, put together by Steve Melzer. The first one would be where you have the oil migrate into the traps and then at a later date, you tilt the basin and allow the oil to migrate out past the spill points of the different traps. That's a Type 1. That's not common in the Permian Basin.

The Type 2, that's where the oil is migrating into a trap and we've seen a failure of the seal, and oil is migrated out past the trap. And we have that as a Type 2-type ROZ. There are a limited number of fields in the Permian Basin where Type 2 is present.

Type 3 is the one that's associated with our Mother Nature's Waterflood. In this case what happens is that the area to the west has been tilted up, and as a result of the uplift to the west, we see these meteoric-derived flushing fluids coming down from the area -- the watershed, essentially, from as far west as the Rio Grande, across the San Andres Mountains and across the Sacramentos and Guadalupes and into the basin and flushing out the lower portion of the ROZs -- the lower portion of the original oil

column and creating an ROZ.

Q. Dr. Trentham, is Type 3 the type of ROZ that you would find underlying the EMSU and the AGU and the EMSU-B?

A. Yes, it is.

Q. And that would be in the San Andres Formation?

A. That is correct.

This is just a little zeroing in on this to better understand the relationships between the ROZs and where they're found. So in the upper one there, the lower portion of the oil column has been flushed by Mother Nature's Waterflood beneath an existing field. And the field itself, it retains the oil and you do not see it flushed out completely as you see in the -- flushed out -- moveable oil flushed out completely as you do see in the ROZs.

So where we have ROZs beneath an existing field, we call those brownfields. And in areas where, for one reason or another, either a lack of trap or more hydraulic head, the entire column of oil has been flushed except for some little areas where there's lower permeability and porosity, where higher oil saturation is retained, where all of the column has been removed. And the example of that is

the Tall Cotton Field in Gaines County. And that's a greenfield.

Q. In the lower depiction, the dynamic system, as you've labeled it, do you see, when you drill through it, any oil?

A. Yes. And this has been the conundrum that we, as an exploration production geologists, have had for decades, that you do see the types of shows. You see drilling breaks. You see maybe oil on the pits. You see gas and oil in samples. You might even see a calculation on the logs of productive well saturations. And so, yes, you can see all of those.

However, when you attempt to complete those wells, they're doomed to failure because you're looking at residual. Basically, the residual in those fields, those greenfields, is similar to the residual to a waterflood you see in a well-established and well-run waterflood, so you'd be -- your oil is, at this point, not movable except through the use of CO2.

Q. So you need CO2 flood in order to get the oil out?

A. Yes, sir, that's correct.

Q. Okay. Let's move on to the next one. Okay. Here we have a slide, Exhibit D-6, and this is a Tall Cotton slide that you talked about earlier. Tell us

about the Tall Cotton.

A. Okay. Tall Cotton is in kind of west central Gaines County. To the east is the Seminole Field and the town of Seminole. Between Seminole and Tall Cotton is the west Seminole Field.

And Tall Cotton was actually keyed off of two wells that had been previously drilled in the area. The one being the Anschutz Keating Well, to the northwest. That was actually a well that was drilled looking at a Clear Fork anomaly on seismic. They cored that well. They had good mud logs. And the mud logs and the electric logs and all the information they had, as the geologist who had that well told me, he said, "It's a no-brainer."

They set casing. They completed in the interval where there was oil saturation in the core and in the mud logs. And over about a three-month time frame, they made eight barrels of oil and 3600 barrels of water and eventually plugged the well. That is kind of what we believe to be a typical response of an ROZ to an attempted completion.

So that's an area -- so in this area, we know there's ROZ potential. The Reed & Stevens Charlene Well actually made a few thousand barrels of oil, but it was not an economic discovery. And it was

also eventually plugged.

At a later date, Kinder Morgan came in and with the information they had on the Reed & Stevens, they borrowed the core -- actually, I had the core from the Anschutz Keating. They borrowed the core from me and they had the mud logs, and so they evaluated this area and determined it was a good place to initiate a greenfield ROZ flood.

And in 2014, they initiated a CO2 flood. It took about six months, but they eventually started to make oil and they got up to 2,000 barrels a day or more in production with ROZ only.

Q. So would you say that the Tall Cotton was a successful play?

A. Oh, it's an excellent successful site, yes.

Q. And there had been no primary production or waterflood in that field?

A. There had been lighter production from the Reed & Stevens Charlene Well, but that's it.

Q. Okay. Let's move on to the next slide. What's shown on this Exhibit D-9?

A. Okay. This is information from a presentation made by Hess on the Seminole Field. This is the Seminole Field. The city of Seminole is right at the very southeastern end of the field. And in the

1980s, they were drilling deeper because they also had Clear Fork production, and they noticed that there was all shows in the interval below the main pay in the San Andres.

And so management, with foresight, determined that they needed to get more information about this interval. They started to take moderate sweeps of logs through the interval, and they took cores, and the cores they took ranged from conventional cores to sponge cores to pressure cores.

And what they determined was that there was a range of saturations that they saw between the conventional cores and the sponge cores and the pressure cores. And that these saturations, assuming that the better estimations of the actual oil in place and the saturations were from the pressure cores, that these were indicating that this was a potential target for CO2 enhanced oil recovery.

Then in the late 19 -- or middle 1990s, they actually started their first -- what they called their ROZ Phase 1, which was they mixed injecting CO2 into the main pay, which was already under CO2 flood, and the ROZ, and they saw a response.

And then they decided that they weren't quite sure how much was coming from the ROZ, so they

did ROZ Phase 2. And in there they did an ROZ-only CO2 flood. And then they demonstrated to their confidence that ROZ was floodable in this area. And they have since gone in through a series of stages to complete ROZ production throughout the field.

Q. On the right side of this Exhibit D-9, what is that?

A. That was a pattern where you'd see where the producers and the injectors were located for the ROZ flood in Phase 2.

Q. This was a Brownfield development, right?

A. That's correct. This is a Brownfield development.

Q. How far away is the Seminole Field from EMSU, more or less?

A. Probably about 45 miles. But it's on the other side of the Central Basin Platform, so essentially you have the same -- the same reservoirs are present on both sides of the platform.

Q. Okay. Do you have anything else on -- well, okay. Let's move on to D-10.

A. All right. This is a chart that was put together by Steve Melzer. And so the upper numbers or the upper curves are actually the number of wells, so just kind of ignore those, other than to see that they

did an infill drilling project in the mid-1980s, like a lot of other companies.

But what they were seeing was that they were seeing a decrease in the production. They were on the decline curve. So the kind of decline curve that you would normally expect, that's that kind of light blue line there.

Then, though, they had started -- as I mentioned before, they had started a CO2 flood in the main pay in the mid-1980s. So the red curve, as you can see, rapidly increasing, you know, in production, that's the response of the main pay CO2 flood.

And then in 1996, with the first introduction of the ROZ flood, then you see that there's that uptick in production off that other curve, kind of a little bit darker blue curve over there. And then you can see where Phase 1 was, where Phase 2 was, and then where they started to do the more in-filling to the remainder of the field.

You can see that it's a mix of the production from the main pay RO -- main pay CO2 flood, and then you can see how the line extending to the right is the additional production they have gotten from the residual oil zone.

Q. What's the graph at the top, the very top

one?

A. That's just the producing well count.

Q. So, what conclusion do you draw from this graph?

A. The conclusion that you draw from this graph is not only is the CO2 enhanced low recovery project in the main pay successful, but the CO2 enhanced low recovery project in the ROZ is also successful.

Q. Now we have Table D-1. What do you show here?

A. Okay. What I did was just put together as an example of how thick ROZs can be, the relationship of field main pay thicknesses and ROZ thicknesses that I am confident in. And that would be the Platang, the Seminole, Vacuum, Wasson, GLSAU, Goldsmith-Landreth San Andres Unit, Seminole East and McCamey.

And you can see that the ROZ thickness will vary. It's not a uniform thickness. But Platang, Tall Cotton, neither one of those have an associated main pay. So their entire floodable interval is the ROZ.

At EMSU-B, the reason I've said zero is that in the San Andres, there is no main pay, or just a few wells that made a few barrels. So the EMSU-B San Andres ROZ thickness is potentially as thick as

370 feet. And that's based off the work that Bob Lindsay did in the mid-1990s when he worked for Chevron and was working this area where he identified stain in the San Andres as deep as 370 feet below the top of San Andres. And those are in documents that I know he's already submitted.

Q. That would be in the upper San Andres, correct?

A. That is correct, yes.

Q. And the Tall Cotton is on the third line here -- or second line, I should say. That's 400 feet of pay?

A. That is correct. Let me modify that just slightly. That's the deepest oil saturation that they saw in the cores. And I've seen the cores for Tall Cotton, so I'm familiar with that.

Q. In terms of EMSU, at the very top, what kind of oil saturation would you expect to see there?

A. I've seen two of the cores, the 679 and the Number 4 Bell, and in there I've seen -- the cores start up in the Grayburg, but they have the upper San Andres, the interval above the Lovington Sand, and the TD -- one of them anyway, TDs below the Lovington Sand. And there is oil saturation identified in core throughout that interval. So, you know, I have

confidence in at least that much of it. We haven't seen core beneath that, so we're hoping to get that at some point.

Q. And going back to the EMSU, where you show zero main pay, you're talking only about the San Andres?

A. That's correct.

Q. Now, if you were to develop ROZ in the Lower Grayburg, what kind of thickness would you expect?

A. Well, that is a question that I can't answer. I am aware from my discussions with Bob Lindsay that there is a flanking or edge ROZ to the west side of the EMSU, kind of down off the structure to the west where there is an ROZ in the Grayburg. There is no ROZ in the Grayburg across the top of the structure, as is my understanding.

There is actually one field, it's the George Allen Field, which is in northwestern Gaines County on the Northwest Shelf, where a company has gone in and, in using CO2 EOR on the flank of the structure not immediately beneath the main pay, but just off the flank, similar to what we believe is going on here at EMSU.

Q. It is fair to say that you would find a ROZ above the San Andres and a ROZ below the top of the

San Andres?

MR. RANKIN: Objection, Mr. Hearing Officer. Dr. Trentham did not offer rebuttal testimony. Mr. Padilla is eliciting rebuttal testimony in the summary of Dr. Trentham's direct testimony.

HEARING OFFICER HARWOOD: I'm not sure I understand the objection, frankly. It's technical. It's over my head.

MR. RANKIN: Well, Mr. Hearing Officer, we had a prehearing order in which we were following the disclosure of witnesses. Dr. Trentham was disclosed as a witness for direct testimony. He was not included as a rebuttal witness.

Mr. Padilla is now eliciting testimony that goes beyond the scope of his direct testimony, his rebuttal. Okay? He's introducing a new concept that Dr. Trentham did not address in his direct testimony about whether the EMSU has more than one ROZ in it. That was not addressed in his direct testimony.

HEARING OFFICER HARWOOD: Mr. Padilla.

MR. PADILLA: We've had -- we've gone through this Table D-1. What's shown there is that you have brownfield and greenfield ROZ developments. The EMSU in the San Andres has zero main pay. All

the others after the third line have pay probably in the Grayburg. I haven't asked that question.

And I'm just simply asking -- it's not rebuttal. I'm just simply asking if you would expect to have or could find ROZ above the San Andres below the San Andres.

HEARING OFFICER HARWOOD: Well, that sounds like an opinion that you're seeking from this witness. Is that an opinion that was disclosed as part of his testimony?

MR. PADILLA: Well, it's inherent in all the discussion between the Grayburg and the San Andres. I don't know -- everything -- there's been ample discovery in this case, above and below the San Andres.

This morning, for example, Dr. Buchwalter talked about the Grayburg and the San Andres and how water penetrated above and through from the San Andres to the Grayburg. I mean, it's inherent in all of the discussion.

I'm not asking for a rebuttal, and I don't know what I would be rebutting.

MR. RANKIN: Mr. Hearing Officer, what's happening here is that Empire is shifting its position. They recognize that there's a potential

issue about a composite sequence boundary that divides the San Andres from the Grayburg.

Dr. Trentham has not addressed this issue. In his testimony, he simply took from all of his papers and presentations and put a summary together giving an overview of the -- not even the EMSU, but of the Permian Basin and his experience and understanding of ROZs and how they came about.

He has not reviewed any -- other than the two cores, he has not reviewed any data or information related to the EMSU. He did not address his direct testimony -- and that's all he submitted, that's all he was disclosed to submit on his direct testimony.

Mr. Padilla is now eliciting, based on the evidence that was presented here, now today, additional testimony that is not part of his direct testimony. The purpose of this summary is --

HEARING OFFICER HARWOOD: Some other Empire witnesses have covered this territory.

MR. RANKIN: Absolutely. And so --

HEARING OFFICER HARWOOD: I'm going to sustain the objection. I'll find it's cumulative.

MR. PADILLA: Mr. Harwood, I don't know where I go. You've sustained the objection that I

can't inquire into whether or not there's a ROZ in the Grayburg?

HEARING OFFICER HARWOOD: Stick to what has been disclosed to Goodnight in terms of what this witness is expected to testify to.

MR. PADILLA: Okay. We'll move on. That's the end of the show. So we pass Dr. Trentham for cross.

CROSS-EXAMINATION

BY MR. RANKIN:

Q. Dr. Trentham, how are you today?

A. I'm good, sir. Is this Adam? I can't tell.

Q. This is me, Adam. Sorry that you're not here in person. And I would love to have gotten to meet you. Someday I hope that we cross paths in New York and we can have a dark at McSorley's Old Ale House, but another day.

A. Yeah, I go back with McSorley's before women were allowed in.

Q. Yeah, yeah. I guess it's a little different, although not too much, I think.

Dr. Trentham, what did Empire retain you to testify about in this case?

A. Residual oil zones and the potential for the presence at EMSU-B and the EMSU and AGU.

Q. And more broadly than that, didn't they ask you to give a general overview of ROZs in the Permian Basin?

A. Yes, they did.

Q. Okay. But you've not been asked to evaluate whether the purported ROZ in the San Andres at the EMSU is recoverable?

A. No. They asked me if I believe there was a potential for a ROZ there, which there is.

Q. And you haven't been asked to opine on what the recovery factors might be?

A. No, I have not.

Q. Or whether the purported ROZ in the San Andres is economically recoverable?

A. I have not made an evaluation of that, although I probably believe it is.

Q. But that wasn't -- you weren't asked to provide that opinion, were you?

A. No.

Q. And you haven't been provided any data or documents or evidence that would allow you to make an opinion or conclusion on that in this case, have you?

A. On what?

Q. On whether the potential ROZ in the San Andres is economically recoverable.

A. From what I have seen, I believe it is.

Q. Let me ask this question again. Have you been provided any documents, any economic information or evidence from Empire on what the cost would be to develop this proposed project?

A. No, no economics.

Q. You're not offering any opinions about petrophysics?

A. I have opinions, but I haven't been asked for them.

Q. And they weren't included in your direct testimony, were they?

A. Well, that's what I mean, yeah.

Q. And you did not review any of the underlying unitization documents, the evidence, exhibits, or testimony that were submitted to the Commission here in New Mexico at the time the EMSU was formed, were you -- did you?

A. I've seen the unitization agreement, and that's all.

Q. And you haven't reviewed the transcript that was prepared -- the transcript of the hearing resulting from that statutory hearing on the EMSU, have you?

A. No.

Q. At the time you prepared your direct testimony, you didn't review any of the well files or production data separate from any of the witnesses' testimony or exhibits that you reviewed in this case?

A. I've looked at the core and the logs, but other than that, I just have secondhand information from Bob Lindsay.

Q. And during the course of this hearing this week, have you observed or listened to any of the expert testimony in this case?

A. Bob Lindsay's.

Q. But you didn't participate in or listen to any of the other experts who gave testimony or opinions in this hearing this week?

A. That's correct.

Q. And I think I understood you to say this, but the information that you depict in Table D-1 -- I'll see if I can pull it up real quick.

The information that you depict in Table D-1 is entirely based on information you obtained from Dr. Lindsay?

A. The only information on that table that I've gotten from Dr. Lindsay is about the EMSU. All the other is my information.

Q. Got it. Thanks for that clarification.

At the time you prepared your direct testimony, you were not aware of any ROZs thicker than the intervals you provide on Table D-1, correct?

A. That's correct. These are the ones I'm confident of. Let's put it that way.

Q. Okay. Let me ask you again. Are you aware of any ROZs out there that have been documented to have thicker intervals than what you've presented on this table?

A. I'm not -- I don't have any information to tell me that there's any ones that are thicker. I have anecdotal information that tells me there may be two. But nothing I could testify to.

Q. And at the time you prepared your direct testimony, you were unaware of the volumes of water that were produced from the six EMSU saltwater -- water-supply wells, correct?

A. I had kind of peripheral knowledge about them.

Q. But you weren't aware of what the volumes were, correct?

A. That's correct.

Q. And you did not investigate, prior to preparing your direct testimony, what zone in the San Andres those water-supply wells were producing

from?

A. I was just told that they were deeper in the San Andres than the ROZ.

Q. Okay. And you're also not aware of the approximately 20 additional water-supply wells that have withdrawn water from the San Andres in the area offsetting the EMSU?

A. No, I'm not.

Q. At the time of your direct testimony in this case, you were also unaware that there was a produced water disposal occurring in the San Andres within the exterior boundaries of the EMSU since the 1960s?

A. Again, only just anecdotal information.

Q. At the time of your direct testimony, you were unaware that Empire was also disposing of produced water into the same San Andres disposal zone within the EMSU; is that correct?

A. That's correct.

MR. RANKIN: No further questions.

THE HEARING OFFICER: Mr. Moander, do you have cross-examination?

MR. MOANDER: Briefly, Mr. Hearing Officer. May I proceed?

HEARING OFFICER HARWOOD: Please proceed.

CROSS-EXAMINATION

BY MR. MOANDER:

Q. Good afternoon again. It's nice to see you. And always you can see where I'm at there, Doctor. Appreciate your time.

Just a few questions. I wanted to confirm, you didn't submit any rebuttal testimony for the cases before the Commission, correct?

A. Correct.

Q. Now, let's step back in time briefly. Do you recall being deposed on November 5th, 2024, in these matters?

A. Yes.

Q. And do you recall when I inquired of you whether you had an opinion on the migration of injection fluids from the EMSU San Andres Formation to the Hobbs Channel and the Capitan Reef? What you stated was you didn't have, and I quote, "No, at this point, I would make -- I have no -- nothing. I would say no."

Do you recall that statement?

A. Yes, I remember.

Q. And would it be fair to say that what you were trying to say in the deposition is that you didn't have an opinion to provide at that point on the

query posed to you?

A. Yeah. The way my mind works is I had to create a three-dimensional picture in my head before, and so I just kind of stuttered through that. That's why I was hesitant.

Q. I've known several folks like that, Doctor. I appreciate it.

Later on in that deposition, you then opined, when inquiry was made by Goodnight counsel Rankin, that the EMSU San Andres hydrologically was separate from the Capitan Reef. Do you have any reason to dispute that statement?

A. The Capitan and the San Andres are not in communication. That's true.

Q. And then do you recall that you were asked -- well, I inquired about the authorities upon which you relied for that. Do you recall testifying that your opinion was based on observation and discussion?

A. Yes.

MR. MOANDER: Thank you. I'll pass the witness.

HEARING OFFICER HARWOOD: Okay. Mr. Beck, questions for Dr. Trentham?

MR. BECK: I don't have any questions.

Thank you.

HEARING OFFICER HARWOOD: Mr. Suazo?

MR. SUAZO: No questions from Pilot.

HEARING OFFICER HARWOOD: Commission?

CHAIR ROZATOS: I don't have any questions.

EXAMINATION BY THE COMMISSION

BY COMMISSIONER AMPOMAH:

Q. Bob, this is William?

A. Hey, William. How you doing?

Q. I'm good. Nice meeting you. I do have just some few questions for you.

A. Sure.

Q. So I'm looking at your direct statement, and on Page 3 of that, the last but one paragraph, you talk about the results of the above studies and others shows the identification of the ROZ is not necessarily difficult or expensive. Can you quantify what you mean by "not expensive"?

A. Well, first of all, my opinion is, if you don't develop the ROZ, that's real expensive.

A lot of the -- our early work, especially, of trying to determine what exactly a ROZ looked like was done off mud logs, core reports, anecdotal information from people that came up and said, "Oh, yeah, I had one of those and here it is."

So developing the potential for an ROZ in any area can be relatively inexpensive. It's data mining. Then, of course, what I would recommend always, and I recommended it to Empire as well as anybody else, would be full sweeps of logs, whole core, you know, good quality mud logging, you know, the basic tools that you would use to evaluate the potential for any prospect.

DSTs don't work in ROZs because of their very nature, because of the saturations, they're so low. DSTs usually recover all water. One of the things historically about DSTs has been that because of the waterflooding by Mother Nature and this meteoric-derived water which brings in oxygen, the water chemistry in an ROZ is, almost everywhere I've seen it and have data for it, different than the water chemistry in the main pay.

And so if you have DST information, I did a large study on the west side of the platform centered around the Monohans area from Kermit down to the south, DSTs, historically, almost every single one of them that encountered a DST recovered sulfur water. And in the cores we also see native sulfur.

And so, you know, evidence like that, it's cumulative evidence. We see sulfur in the cores.

We see sulfur water on DSTs. We see mud log shows. We see calculations of oil saturations that if you're not using the right m's and n's and Rw's you're going to be wrong. You know, all those things together, they're relatively inexpensive, relative to a failure.

Q. Bob, so you made mention of a recommendation and you described that to the Commission. Now, my question to you is, based on your discussions with Empire, do you believe they've done enough analysis to solidify the argument about the existence of, let's say, potential recoverable ROZ in the San Andres?

A. From what I've seen, and this is basically off the two cores, the 679 and the Number 4, what I've seen in those wells and in some of the logs that I've seen, looked at with Dr. Lindsay, and my understanding of what it takes to have an ROZ, I believe that they are -- their money is well spent doing a further evaluation.

We don't know where the base of the ROZ is at this point. The one core that penetrated below the Lovington Sand had oil saturations to the very bottom of the core. So I don't know if they've seen the bottom of the ROZ; it could extend all the way down to the base of the G-8, for all I know, another 200 feet. I just don't know.

More work needs to be done in the form of gathering more data, core analysis and good logs, maybe even FMIs, those kind of things. But yes, there is an ROZ there, and now we have to quantify how good it is, how thick it is.

Q. You know, I do like the FMI. Can you confirm to the Commission that certainly the FMI will also help us to know if there are any existing fractures?

A. Yes, yes. And the other reason I like an FMI is that you match it to the core. And then in other wells, if you want to save a little bit of money, take two or three cores, and then as you further develop, you do more FMIs. But have FMIs in the wells where you've got core, match your FMI to the core, and then go forward with FMIs.

Q. Thank you. Bob, so back to your direct testimony on Page 3. The last paragraph, on Line 2, you said: The waterflood-swept intervals still have 20 to 40 percent residual oil in the pore space.

Bob, this one, are you referring to the flooded area or it also applies to the exterior area of the flooded area?

A. I would restrict that to the waterflood area. I'm not sure what would be outside the

waterflood area.

Q. So, Bob, do you have an example of where we have an effective waterflood where the residual oil saturation goes to like 40 percent?

A. All right. The Platang Field, those are -- that's up in Yoakum County. It's northwest of Wasson and west of -- and just east of the Texas/New Mexico state line.

That area, there are saturated -- higher oil saturations at the top of the San Andres pay, and the top of the San Andres pay there is actually in the Lower San Andres, beneath the Brushy Canyon bypass surface or the Pi marker.

Okay. So in the upper portion there, you have what I refer to as shingles of thin, mostly tidal flat or subtidal rocks that have higher oil saturations. And you can call them heavy ROZs, if you want. They're not going to produce oil by themselves in any large amount, but they have higher oil saturations than 40 percent. And that's in the kind of greenfield area like where Platang is located.

Q. Bob, so on that same page, you talk about on average an additional recovery of 10 to 20 percent of the original oil in place in a field is possible using CO2. Can you tell the Commission if you have any

reference for this?

A. This is based on the types of recoveries you get in a main pay ROZ relative to the waterfloods and the -- the waterflood and the primary production in the main pays. It's just a kind of -- I guess a shorthand that people like Steve Melzer and Bob Lindsay and I use. We know that in main pays you can get that kind of recovery factor in a San Andres field, and there is no reason to believe that with similar oil saturations in the ROZ, too, residual for an effective waterflood, that you wouldn't expect to see similar kind of recovery factors of the oil in place.

Q. Bob, on Page 4 of your direct testimony, the first section, the last sentence: The movable oil was swept by a natural waterflood, leaving behind the ROZs, hence the name.

Bob, my question to you is that, do you have any experience -- or, let's say, within the Permian Basin, some of these fields that you talked about, has there been any of these fields that has undergone high volume of water injection and then you still be able to recover the ROZs?

A. I am not aware of any. I've just not studied any.

Q. So will this area that we are talking about be the first one?

A. Yes. I'm just not aware of any. So, yes, this would be the first one.

Q. Okay. So, Bob, during the direct, you talked about Kinder Morgan. On your Exhibit D-6, you were talking about the Tall Cotton Field and you said that there was a field attempt at first, but Kinder Morgan came back and then started the CO2 injection.

So I want to know, do you know how long it took before Kinder Morgan was able to see oil coming out, let's say, from the CO2 injection?

A. Six months.

Q. Did they produce a substantial amount of water prior to that?

A. Oh, yes, yes.

Q. Okay. So, Bob, I'll go back to Page 4, the last but one paragraph. You talk about a percentage of the oil is forced from the pores and the CO2 is trapped, becoming incidentally sequestered.

Let me go to the top. You say that the process also changed the surface tension of the oil and its attraction to the rock. So you're talking about wettability there.

Now, the earlier question that I asked,

the EMSU, the San Andres has undergone significant amount of water injection. There is a possibility that the wettability might have changed and also introduce water chemistry which is different from the one, let's say, in the San Andres.

Do you believe that the potential changes in the wettability might also impact how much residual oil we do have in place as of today?

A. Okay. When changing the amount of oil that we have in place, I think it would have produced some of that oil if it was available, so I'm not sure if the change in the water chemistry has changed the wettability. I've not thought about it, I haven't studied it, but that's off the top of my head. If that were the case, I would imagine that you would have started to produce some oil out of the interval for the water-supply wells.

Q. Then let's talk about the water-supply wells that has been within the area that we are talking about, you know significant amount of water that has been produced from the San Andres. And like you're saying, I mean, if there's potential changes in the wettability, there is a possibility that some of this residual oil will become mobile.

So do you believe that if there is some

kind of oil there, at least we should have seen some production through the water wells?

A. Oh, I'm not sure about how much water has been produced. Or, you know, the thing is that if you're producing water and injecting it into your wells, you may very well just slap yourselves on the back and say, "No, we're producing more oil."

Did they ever test the water that they were -- their makeup water? Did they ever run it through a barrel to see if any -- if there was a slick of oil in it? I don't know if they ever produced any oil or not.

I know that at Yates Field, back in the 1990s, the methodology that Marathon was using was to produce as much oil as they possibly could. And they were producing 50,000 barrels of water a day to try to draw down the water and make more oil.

Well, they were selling that water or giving that water to Burlington Resources for use in their McCamey flood, their McCamey Field flood, and Burlington was seeing an increase in their water -- in their oil production. And they also noticed that in their large volume tanks, their settling tanks, basically, where they were storing the water until they were using it for injection, they were seeing

oil. And they were seeing 500 barrels of oil coming out of 50,000 barrels of produced water from Yates Field that Burlington -- McCamey said, "Well that's our oil now."

So yes, there are examples of where, you know, produced water, unless properly treated, may have enough oil in it that we don't recognize.

Q. Bob, so is it your testimony that as of today, the bottom of the ROZ is not known in the EMSU?

A. That's correct. I have some inferences. Bob Lindsay says that he's seeing oil in the core as deep as minus 700 feet in the San Andres, but that was -- that's kind of anecdotal information.

We just see -- we've seen those two cores, the 679 and the 4, and in there, we don't see the bottom of the ROZ because the core stopped in the ROZ.

Q. So as of today, you can confirm that, at least, there is an ROZ in the Upper San Andres?

A. Oh, absolutely.

Q. But not extensively in the Lower San Andres?

A. Don't know.

COMMISSIONER AMPOMAH: Thank you, Bob. Thank you so much.

THE WITNESS: Thank you. Thank you,

William.

HEARING OFFICER HARWOOD: Commissioner Lamkin, questions?

EXAMINATION

BY COMMISSIONER LAMKIN:

Q. Good afternoon, Dr. Trentham. I think I just have one clarifying question for you.

So there's been discussion about how Mother Nature's Waterflood has potentially changed the wettability of the reservoir. Is that something that would only happen with volumes on the order of what Mother Nature's Waterflood would have produced, or could that potentially be something that's an effect of injection from SWDs?

A. I've never studied the wettability changes as far as, you know, produced water or injected water goes. But the wettability probably -- you know, has the potential to change, but I'm just really not sure. There's -- well, I'm just not sure.

COMMISSIONER LAMKIN: Thank you.

CHAIR ROZATOS: Mr. Hearing Officer, forgive me. We forgot to ask Pilot if they had any questions.

HEARING OFFICER HARWOOD: Oh, we did.

I'm sorry, Pilot. It was inadvertent

oversight. Pilot.

MR. SUAZO: No problem. No questions from Pilot.

HEARING OFFICER HARWOOD: Okay. And we did ask you, Mr. Beck?

MR. BECK: Yes.

HEARING OFFICER HARWOOD: Thanks for that reminder.

Mr. Padilla, then, do you have much redirect? It's 3:20, I want to take an afternoon break. But if you don't have very much, we'll just continue until you're done.

MR. PADILLA: I don't think I have too much redirect, if any. But I'd like to confer with my clients.

HEARING OFFICER HARWOOD: Sure.

CHAIR ROZATOS: Was that a request for a break, Mr. Padilla?

MR. PADILLA: Yes, it is. Thank you.

CHAIR ROZATOS: I apologize. I think we were all left kind of hanging with that one.

Mr. Hearing Officer, I think that was a request for a break.

THE HEARING OFFICER: Okay. Well, do we excuse this witness or are you coming back for

redirect?

MR. PADILLA: No, we don't excuse him yet. I'll let you know.

HEARING OFFICER HARWOOD: Great. Fifteen minutes?

CHAIR ROZATOS: So can we do a 15-minute break, Mr. Harwood.

HEARING OFFICER HARWOOD: Let's do that.

CHAIR ROZATOS: Okay. We will be back at 3:35.

(Recess held from 3:21 to 3:35 p.m.)

HEARING OFFICER HARWOOD: Okay. I see Dr. Trentham there. And are you ready to proceed, Mr. Padilla?

MR. PADILLA: Mr. Harwood, we don't have any redirect.

HEARING OFFICER HARWOOD: Okay.

MR. PADILLA: The witness may be released.

THE HEARING OFFICER: Thank you. You anticipated my next question.

Okay. Dr. Trentham, thank you. And you may not be aware of it, but you hold the record so far as the shortest witness of all.

THE WITNESS: I don't know if that's good or bad.

HEARING OFFICER HARWOOD: It's very good. Thank you for your time.

THE WITNESS: Okay. Thank you. Thank you for your attention.

THE HEARING OFFICER: All right. Let's see. I show Steve Melzer is next on my list. Is that who you're calling?

MR. PADILLA: We'll call Steve Melzer at this time, Mr. Harwood.

LORD STEPHEN MELZER,

having first been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. PADILLA:

Q. Mr. Melzer, please state your full name.

A. Lord Stephen Melzer.

Q. And you're a petroleum engineer?

A. I'm actually a geological engineer.

Q. Okay. Can you tell the Commission what a geological engineer is.

A. When I'm with engineers, I'm a geologist, and when I'm with geologists, I'm an engineer. I try to ride the middle. It's an interesting discipline. Not many of us around.

Q. And for what purpose have you been retained for this hearing?

A. They wanted to look at the ROZ, its producibility, its analogs and the like.

Q. Mr. Melzer, I've seen your resume or curriculum vitae, and it's impressive. Can you give us a little bit of flavor of what your experience is with regard to ROZs.

A. Okay. I actually kicked off an assignment that the University of Texas Board of Regents put me in in the University of Texas Permian Basin back in 1994 to create an organization that looked at CO2 flooding in the future. CO2 flooding in West Texas is a way to kind of avoid a quicker decline in the reservoirs in West Texas.

I hired a fellow from Exxon that just retired. He just came on to be my mentor in CO2 flooding. We created several short courses together with the majors, like Exxon, Mobile, Texaco and the like, and I got to learn from all of them and their experiences.

They were thinking of moving from West Texas investments to offshore investments and selling the properties in West Texas, which many of them did, and they needed so much --

Q. Mr. Melzer, I'm not sure if everyone hears you. You might pull that a little closer.

A. And so we had to educate the smaller companies about CO2 flooding. And then we created a proposal in 1992, I think it was, to submit a research proposal to do work on the residual oil zones that the majors were developing and reporting in our conferences.

And so we ended up creating a conference. We just conducted our 30th. We call it the "CO2 Flooding," and did that last December.

Q. Does that Co2 Flooding involve ROZs?

A. It does. And I'll show in some of my testimony where it's been done. And it's being done internationally.

By the way, I made the mention that I left that post four years after creating it and went to consulting on the subject of CO2 and CO2 EOR. And in that role, I've been around the world basically at several places evaluating whether they have ROZ potential and CO2 potential in many fields around the world.

Q. In those around the world fields that you've been to, do you find the same type of geology for ROZ?

A. The geology is varied dramatically. Almost every field is a different animal to itself. And what I've found over the years is that there are at least

three types of ROZs, and let me -- we'll define that here in a minute.

But you can vertically flood, Mother Nature can vertically flood a field and leave a residual oil zone below it. Or you can laterally flood it, which is the case in the Permian Basin. Or you can actually have tectonic movement that alters the water-oil contact and then have that kind of a CO2 ROZ flood.

And so the one that dominates everybody's attention is these laterally flooded zones that we have in West Texas.

Q. Do you find ROZs in what you would call an aquifer?

A. Well, I don't like the term "aquifer." I tend to think of those as water that's used for human purposes. Very seldom would that be the case in a ROZ. It does produce only water, generally speaking, except in the upper part. But the opportunity to use that for official use is kind of limited because of the high salinities involved in the ROZs.

So I know people use the word "aquifer" because it makes only water, but I think it gives a misrepresentation of the fact that it's an ROZ.

MR. PADILLA: Mr. Chairman, we tender

Mr. Melzer as an expert witness in geological engineering.

HEARING OFFICER HARWOOD: Mr. Rankin, any objection?

MR. RANKIN: No objection based on the direct testimony that Mr. Melzer has provided on that expertise.

HEARING OFFICER HARWOOD: Mr. Moander?

MR. MOANDER: No objection from OCD.

HEARING OFFICER HARWOOD: Mr. Beck?

MR. BECK: No objection.

HEARING OFFICER HARWOOD: Mr. Suazo.

MR. SUAZO: Pilot has no objection.

HEARING OFFICER HARWOOD: He will be so recognized.

BY MR. PADILLA:

Q. Mr. Melzer, you prepared a self-affirmed statement with a number of exhibits on it, correct?

A. Yes. Those are my statements.

Q. Now, attached to your self-affirmed statement are Exhibits C-1 through C-17, correct?

A. Correct.

Q. Mr. Melzer, are the contents of your self-affirmed statement true and correct to the best of your knowledge, as well as the exhibits you

attached to it?

A. Yes, they are.

MR. PADILLA: Mr. Chairman, we offer the self-affirmed statement together with the exhibits C-1 through C-17 into evidence.

HEARING OFFICER HARWOOD: Any objection from Goodnight?

MR. RANKIN: No objection.

HEARING OFFICER HARWOOD: OCD?

MR. MOANDER: No objection from OCD, Mr. Hearing Officer.

HEARING OFFICER HARWOOD: Rice?

MR. BECK: No objection.

HEARING OFFICER HARWOOD: Pilot?

MR. SUAZO: Pilot has no objection.

HEARING OFFICER HARWOOD: Self-affirmed statement on Exhibit C-1 through 17 will be admitted.

(Admitted: Empire New Mexico Exhibits C-1 through C-17.)

BY MR. PADILLA:

Q. Mr. Melzer, we have a series of slides to summarize your testimony, so we'll start off with the first one. And tell us what is in there, what it did.

A. I think this was introduced perhaps by Dr. Lindsay, but this comes from an author, 1999,

Alton Brown. It's a highly idealized water and oil profile set of saturations in the Seminole Field. And I might add that this particular field was where the term "ROZ" started. And Hess, at the time, realized that the shows of oil continued down well over 300 feet below their oil-water contact.

And so they did a pretty careful analysis, as you've heard, with core, both conventional, one or two sponge cores and one pressure core, which they have reported on at our conference in past years.

And I want to note, particularly this top zone is the main pay zone, much like the case in the EMSU or in the Grayburg. And what you see is a transition of oil and water saturations where the water saturation is increasing through an interval that's usually about 35 to 50 feet in most fields. And then it goes into a constant oil and water saturation for some distance. And then it transitions off at the bottom again to zero. And so that would be the base of the ROZ where the oil saturation gets very close to zero.

Q. Mr. Melzer, would you say the main pay zone here in the Seminole, is that the Grayburg zone?

A. The green?

Q. Yes.

A. Analog would probably be a very good one for the EMSU from Seminole here.

Q. And the residual oil zone, is that San Andres?

A. Well, in this case, this is all San Andres from top to bottom, top of the main pay to the base of the oil saturation.

Q. Okay. So, effectively, the ROZ is at the bottom of the pay zone?

A. Actually, there's a lot --

Q. Below -- below the main pay zone.

A. Yeah, the ROZ is below what I like to call the producing oil-water contact. Because the company that develops the main pay will generally want to stop before they make much oil -- much water, excuse me, and that would be somewhere in the neighborhood of 80 to 85 to 90 percent oil. And then that's the producing oil-water contact. The actual static water-oil contact would be where you make no more oil, which is just a few feet below that.

Q. Now, I've heard you and other technological witnesses that we have talk about the transition zone. Can you explain to me what a transition zone is? I'm sure it's the difference between the main pay zone and

the residual oil zone, but you call it "transition zone." What is that?

A. Well, it's a smearing of oil and water saturations. There's hardly ever a step change in that oil and water saturations, and it transitions over an interval that's 20 to 50 feet, roughly speaking. And it depends on the properties of the rock as to how thick that will be.

And I might add, too, that the reason that ROZ technology has come about is because of fields like this, like Seminole. Where most fields will have an oil zone that's only 10 to 50 feet, and the transition zone is what they saw below the producing oil-water contact, and so they never saw a thickness like this.

This is, you know, over 100 feet of constant -- roughly constant oil saturation, so we had to come up with a different name. And Hess saw that first; Shell at Wasson Field saw it next. And that's kind of where it all started.

Q. Mr. Melzer, explain to the Commission what that scale at the bottom on water saturation, how that plays into your --

A. I think this has been covered in the previous testimony. But oil saturation and water

saturation are related in that the combination of the two add up to 1 in situ. Now, there's some gas saturation that can enter the picture, but we're talking about oil zones here in particular.

Q. This slide defines a residual oil zone. Explain to the Commission -- first of all, I want you to explain, you have, in parentheses, "(POWC)." What does that mean?

A. Producing oil-water contact.

Q. And how does that play into a ROZ?

A. Okay. You'll notice, first of all, that I don't use numbers here, except in the case of the water saturation. And that's arbitrary, too, because the operator may decide he's willing to put up with 20 or 30 percent water. But usually, it's closer to 85 percent or 90 percent where he says, "I'm not drilling deeper." And then we call it the producing oil-water contact.

It's usually defined in the unitization agreement; oftentimes, very arguably, between the owners of the field. And so that's right in the middle of the transition zone, where they've cut off the producing water-oil contact and defined it there.

And then what happens is that in normal fields, that just buries down to zero, say a few feet,

tens of feet below the producing oil-water contact, and they call that a transition zone.

However, where you have a deep field, a deep interval of shows, like they do at Seminole and San Andres formations, in general, that'll be 50 feet -- maybe 30 to 50 feet interval of transition where you get a varying and declining oil saturation. Below that, it'll stay constant for a while if the zone of oil shows it's thick enough.

Q. Is an ROZ typically below the producing oil-water contact?

A. In most definitions, yes. And so the main pay is above it. And then the ROZ starts below that. Some people will still define a transition zone at the top of the ROZ. I like to do that myself.

Q. Does your definition define a greenfield ROZ?

A. It can. If there is no producing water-oil contact, it means there was no main pay. And so you have a transition at the top of the ROZ and a transition at the base of it.

Q. Okay. This is marked Exhibit C-3, and what is this?

A. This is part of what Dr. Bob Trentham likes to call the -- his terminology, yeah, his cookbook, he

calls it. And what it is, is things to look for if you think you might have an ROZ.

And we take this concept to various folks and try to determine whether they have one. It is broad, like I think was mentioned in the early testimony. And not all of these pieces of evidence will be present, and some of them will give you a false reading.

But generally speaking, it is sort of like the job that lawyers and hearing examiners have. You piece a lot of information together to try to figure out what the right answer is, and that is what we use here, and make a judgment as to whether the ROZ is present or not.

Q. Does this cookbook apply to the San Andres ROZ --

A. Oh, yes.

Q. -- underlying --

A. Well, the ROZs in the San Andres will have most of these attributes.

Q. Have you applied this cookbook recipe to the San Andres underlying the EMSU?

A. Yes, I sure did, and it passes in my judgment as to being an ROZ through a thick interval.

We don't have a lot of core data, as you

know, and we have been talking about it. So we just know that it is present for some thickness to where the core ended, but we do not know how deep it goes.

Q. So you can't tell below the core whether there is ROZ?

A. Well, I'm not a skeptic of petrophysics, because I use it a lot. But by itself it is not enough to say that it is going to tell you where the ROZ is.

In other words, there are so many factors, as you have heard, that play into that, m and n and water saturation. And the water saturation can vary on these laterally swept Mother Nature Waterfloods. So it is a very good diagnostic, but not a perfect one.

So, yes, I don't know where the bottom is, frankly.

Q. In terms of the depths above the core in the 679 well and the RR Bell Number 4 well, do these factors play a prominent role in deciding whether or not there is a ROZ?

A. They do play a factor, yes.

Q. And what was your conclusion?

A. That enough of them were present that it's, I guess I'm am trying to pick my right word,

conclusively a ROZ.

Q. In the San Andres?

A. Yes. Well, I was also asked to show where ROZs are present, and this is just the Permian Basin examples. We've got a number of them around the world. And what happened as a result of the recognition of the residual oil zones, in general, is that companies started to say, "Wait a minute. I need to be flooding, CO2 flooding, below the producing oil-water contact."

And so most of them, at least all of them here, that saw those shows below the producing oil-water contacts, said, "I guess I can deepen the wells and inject into the ROZ," the upper ROZ, in many cases.

And so as you see, there's 24 that we've identified. It's very hard to find the literature to back this up, but I feel very confident that that's exactly what -- that they knew what they were doing. And sometimes they commingled them with the main pay because they were already flooding the main pay zone above, and most of them are that way.

And then you see the 5 and 6 line there, the Tall Cotton phase, we talked about that earlier. And what that is -- and once we determine, as the next

slide will show, the fairways of sweep, Mother Nature's sweep of the oil, this is a greenfield.

And we define a greenfield as a flood -- an area of oil shows that doesn't have a main pay. In other words, when many of them drilled into the ROZ and were frustrated that they got very little oil show at all and made only water. And as you get deeper into the ROZ, it's really rare that you see any oil show or not in the produced fluid.

So we'll talk a little bit about the Tall Cotton project in a minute. And that is what we call a "greenfield ROZ"; whereas, the others are brownfield ROZs.

Q. Mr. Melzer, I noticed that Numbers 7, 8, 9 10 and 12 are in Lea County, New Mexico.

A. Yes, they are.

Q. Are they in the area of where the EMSU is?

A. Yeah. They're not far. Probably the closest one is Hobbs, if I remember my geography right. And a thing to note on some of those, maybe all of them, is that they have commingled the ROZ and the main pay zone. In other words, that they decided from the get-go they would produce them both simultaneously, not just try to separate the main pay from the ROZ.

And that's become a trend of late that folks, they know they're going to make oil with CO2 or an EOR process in general, enhanced oil recovery process, and so they will design the project to include part of the ROZ, if not all of it.

Q. And the ROZ is -- well, explain to us how all of these, except the bottom, are San Andres production. Right?

A. I think all but one. There's a flood in the Horseshoe Atoll area. Let's see what number that is. It's got to be in here. Let's see. Anyway, it's a Pennsylvanian. There it is, Salt Creek. And that's over in the eastern part of the Permian Basin. And they had a ROZ underneath that Pennsylvanian Reef.

Q. And that's the one that's producing out of the Canyon Reef?

A. It is.

Q. This exhibit, C5, this slide, what does that tell us?

A. Okay. I updated this in early January of last year. And these are published numbers on the original oil in place and the main pay. Many of them have -- the ROZ floods have added oil-in-place numbers for the ROZ. But what I thought I'd do was demonstrate some recoveries that they've had. And

some of this analysis is difficult, but I've had some help from Hess, especially, who owns Seminole, on doing this.

And you can see, these are large fields in general because the capital expenses are pretty high on putting in a CO2 flood. And then the primary recovery in Seminole was only about 11 percent of the main pay, and they decided to go to waterflood pretty quickly. And we attribute 338 million barrels to the waterflood recovery there. So now we're up to -- well, 30 percent from the waterflood, so we're up to 41 percent. And that was all main pay zone. So we produced 41 percent of the oil in place in the primary and secondary recovery phase.

Then they decided to go into CO2 recovery. And you can see how successful they were there. They got 28 percent; that's a really good number. It's actually up to 30 now in the recovery from the -- enhanced oil recovery in the main pay zone. And they added the ROZ later in the life of that.

So part of that recovery from CO2 is now in the ROZ, from the ROZ, and you can see that's 68 million barrels, so not insignificant. I've got a graph of this later.

And then the total recovery to date is 70 percent of the original oil in place. So it's a big number. And that's an impressive credit to Hess, which is now owned by Oxy, I might add, the field is.

Q. So, essentially, out of the ROZ, as I understand this compilation, is that it's 68 million additional barrels of oil?

A. Yeah, just from below the producing water-oil contact.

Q. Now you show us the next slide, Exhibit C-7.

A. This is the Denver Unit. This is part of the Wasson Field that you've heard about already. And you can see the main pay zone oil in place there is about twice what it was at Seminole. They've recovered about 38 percent of the oil in place from the main pay to date. That would include primary, secondary and CO2.

And so the recovery of CO2 by itself is 351. Let me back up. 851 is not including the CO2. The 351 adds to the CO2, and so they're up to, you can see, over 50 percent.

And they also instituted in -- I guess later, about 2005 or 2006, they started flooding the ROZ portion with CO2. And it's a little different, more difficult analysis to figure out what's coming

from them, from the ROZ. But it's got to be greater than 50 million barrels. I just used a conservative number there.

So their total recovery to date is about 54 percent of the total oil in place, original oil in place.

Q. So, Mr. Melzer, how does an operator go about looking for ROZ and developing ROZ as they did in the Denver Unit? I mean, what type of strategy or exploration technique do they use to find the ROZ?

A. Well, in the case of Seminole, let me answer that one, it's a real easy answer, because what they did is they were drilling deeper to look at the Clear Fork Formation. And what tipped them off was, they said, "Oh, we're getting shows through the whole interval."

And so in 1985, they said, "Oh, we better deepen our unit." And so they petitioned the Railroad Commission and the mineral interest owners to deepen their unit from the producing oil-water contact down through the San Andres. And fortunately, they did that because now they could flood the entire ROZ.

So same thing sort of went on at Wasson with the different operators and the different units there. And they saw, going through the Clear Fork

again, that they had very thick zones of oil saturation. And I think fortunately there, they had decided to unitize down through the entire section of the San Andres. And so they instituted CO2 flooding into the ROZ. I think early on, they called it transition zone. It only went 150 feet into the ROZ there. And you can see what they recovered at the Denver Unit.

Since that time, two or three of the other units in the Wasson Field have done the same thing. So there's probably well over 150 million barrels that have been produced from the ROZ in the Wasson Field today.

Q. So the Denver Unit is an actual unit, correct?

A. Inside the Wasson Field, yes.

Q. And it covers all of the San Andres?

A. Yeah. The unit goes down to the base of the San Andres, as far as I know. I don't know if that's true for Tall Cotton -- I mean, for Bennett Ranch and the other units there. But Shell did try to get the full unit to the bottom of the San Andres.

Q. What does Exhibit C-8 show.

A. Well, I apologize for the complexity of this graph, but it says a lot of things. Number one is

that the Denver Unit production, again, in the Wasson Field shows the production from January of '70, where the Railroad Commission -- well, the digital data started. And you can see the peak of the waterflood there in the '70s, and then the decline.

And the waterflood was starting to mature out. And if you project that waterflood decline down to zero, or near zero, you'd see that the field would have been abandoned on January 12 or 14, 2014, as that shows.

And so they decided that they wanted to continue the field to recover more oil, of course. And so extending in the red is the contribution now from the CO2 flood. You can see it almost flattened the production decline out to zero for a while. And then it started to decline again and they said, "Oh, let's go after the ROZ."

And you can see the first bump on that was '97, that's when they instituted their first phase of the ROZ development, and then did another addition. And then they continued to do additions, very small areas, inside the Denver Unit.

And what I tried to do was look at the difference between the decline from the main pay zone ROZ that starts about '95, and the total production to

give you that purple or blue curve -- and what color is it? Well, purple I guess. The bottom one anyway. And you can see that the ROZ is contributing something just around 9- to 10,000 barrels a day from the right scale there. And so it continues to hold the production pretty flat at the Denver Unit.

Q. Mr. Melzer, you pointed out a very interesting thing here on this graph when we were going over it. And in the purple line, towards the right of the graph, there's a sharp decline there. Can you explain what that is?

A. Oh, out there in 2020?

Q. Yes.

A. I think we'll all remember that year. That was COVID and price drop associated with that. And they ceased injection and production, I think, for a few months right there.

Q. Anything further on this slide?

A. Oh, I think you see a little bump up there in '23. And I think they're adding some more zones. I haven't confirmed that with Occidental. That's the operator. I'm pretty sure they're adding more zones to keep the production pretty flat.

Q. We've seen this thing before in different form, but tell us what you have here.

A. Well, this came about in 2002, I think it was, when I was reviewing a lot of New Mexico literature; I think some by the New Mexico Tech folks and mining organization there in Socorro. And I noticed that the oil fields in the San Andres were aligning in a certain pattern. And not know -- knowing enough about the history, the paleogeography of the Permian Basin, I said wow, these things are lining up nicely.

And it turns out -- we call them "fairways." And Dr. Bob Lindsay talked about this, where there was an uplift in New Mexico associated with the Laramide and then the basin in-range tectonic events, and the water -- the San Andres is outcropped.

If you drive from, say, Roswell to Plains, and aren't asleep, you see these sinkholes off to the left, about halfway up, and that's where that water comes in, at least in one of the fairways there, the Roswell Fairway and then the Slaughter Fairway.

And so it went through the uplifted sections of the San Andres. And what we define as the fields that are indicated in the various colors there, San Andres blue, is it swept out about half of the oil that was entrapped prior to those uplifts.

And so we would decide then that there's

sweep going on in all the San Andres zones there, and we decided well, gee, there's areas that didn't have a bump on top of the ROZ, on the field, and that's what we looked for for 70 years in the Permian Basin, bumps on top of the ROZ. And so you define those as greenfields, where there was no primary production. Brownfields, you know, the production was there and they deepened into the ROZ.

So I've named off a few fields. And I should point out that EMSU and the whole complex there, Monument Field area, is in that Artesia Fairway.

Q. What does Exhibit C-10 show?

A. Okay. This is the Tall Cotton, the example of the greenfield. And I like to show this because there were people coming out of the woodwork saying, "What are you doing out there?" because there was no primary production.

And Kinder Morgan said, "Well, we believe in greenfield ROZs," and so they drilled the wells. You can see there's 40 wells in less than a section area, by the way. This is about 580 acres now, a little less than that before the Phase 2 program.

And so it took them a few months to see

any oil because you started to have to have the CO2 interact with the oil that was residual oil, and sure enough, it did. And then they got pretty excited, as you can see there in mid second decade of the 2000s, and added more wells and infill drilled mostly, but added a few wells on the periphery to create a peak of production of about 3,000 barrels per day.

And we added this little insert here because it's made now over five million barrels of oil.

Q. And that's a greenfield?

A. Those are greenfield ROZ in less than a section of land.

Q. Would that be pretty easy to overlook if you didn't study it for --

A. Well, you can say it was overlooked for 70 or 80 years.

Q. You show oil saturation in these exhibits, C-11, C-12, and then you have a C-13 which shows a map?

A. Yeah.

Q. Tell us about the RR Bell core and what you saw there.

A. Well, interestingly enough, you have a main pay zone in the Grayburg there, in the left one, the

RR Bell 4. And you notice that at the base of the Grayburg on the top of the San Andres, you can see pretty much similar in terms of oil saturations. And these are from conventional core again, so they're running about 15, say, on average, say, 15 percent oil saturation.

And I completely agree with what Drs. Lindsay and Trentham have said about conventional core being the lowest possible value for the in situ core saturation, the in situ saturation. And so we commonly will double that. That's a little less than what Dr. Lindsay was talking about. But very typically in the San Andres Formation, typical lithologies in the San Andres Formation, something like a double of the conventional core saturation will be representative of what it is in situ. So Seminole helped us with those numbers with their pressure core.

So anyway, that's the interpretation I put on the data you've seen already. And that's clearly a definition of a ROZ in my mind.

And then over in the middle, Exhibit C-12, you see the EMSU. And I think these numbers are very consistent with the scatter that you always see in the lithologies within the San Andres, and even worse in the Grayburg.

So I think it's hard -- in my mind, it's hard to argue that we don't have some ROZ down to sea level of minus 700. And that's my interpretation.

And the base of the oil saturation, if you go by the interpretations on the logs, would look like maybe 4300 feet. So if I had to guess where the base was, I'd say it's minus 700, from this graph. We need more data, but that's at least from the data we have.

And then you all are familiar with the graph on the right.

Q. What's this, C-16?

A. I want to take a minute to say that the world has changed in the oil and gas business. It doesn't take a rocket scientist to say that horizontals are dominating our world. And that's because they contact more reservoir.

And so one of the beauties of this area in the Monument area is that you have fractures. And a lot of those fields over in West Texas don't have the fracture network that you've got because of the intense folding that went on in the Monument area.

And so what I did, with a little help from the folks at Empire, was look at a new flooding technique. And it turns out that a company in Texas

is doing exactly this and they're flooding from bottom to top. And you can do this with horizontals in the bottom, try to contact as much of that oil near the base of the ROZ, and allow the buoyancy of CO2 to float that oil up; basically interact with the oil and create a front.

The problem, typically, has been these baffles. And we talked a little bit about baffles already. But the beauty is, we've got these fractures because of the intense folding. And I do very strongly believe we'll be able to vertically flood all the way up, maybe even into the Grayburg.

We're going to have to re-pressure the Grayburg here because you need miscibility. And that term means that the oil and CO2 mix and create a new material that is more mobile than the very typically lower gravity ROZ oil. But we've proven that that works in the other fields that we've CO2 flooded.

And this would be a wonderful new concept, which is going to take some capital to do, of course. But I think we'll be able to watch the folks over in Texas when they raise their money to do their project. So that'll be an analog for us there.

Q. Mr. Melzer, just so that I understand this exhibit, you have an injector on the right and it's a

horizontal, and it disperses CO2 and it floats up to the top, and you have a producing well at the top?

A. Correct. It could be done with verticals, too, in the main pay, which would save a lot of money, perhaps. Both concepts are real, in my mind.

Q. This is the last exhibit you have, C-17. What do you try to tell us here?

A. In the study we did back in the 2008 to '15 time frames, this is research work that we did with the RPSEA Research Partnerships during our Energy for America. And we were working with UTPB. And Bob Trentham and I were kind of the leaders on that project.

We asked a company called ARI, Advanced Resources International, to help us with assessing what the total oil-in-place numbers might be in the ROZ in the greenfields only. These are areas that didn't have fields over the top, you know, those areas that were empty, if you will, in the fairways. And they looked at five counties. I wish we had done Lea County. I think they may have done that since this time.

But you can see the total areas and acreage and total oil-in-place numbers they came up with. I'll highlight that fifth column over there,

which is 150 million barrels -- 150 billion barrels, excuse me, of oil in place in the greenfields in those five counties.

And they divided into higher quality and lower quality. That would be based upon the facies; not so much on the oil saturation but on the facies of the rock. And you can see even with a small 15 percent oil recovery factor, 16 billion barrels of producible oil in those five counties in the ROZ.

And at the time, RPSEA was very interested in how much CO2 you would store with a typical utilization rate of 16 mcf per barrel of oil. I won't go into that. It's another whole subject to itself. But there's a lot of CO2 you'll store when you're making that oil.

Q. So when you're talking about 15 percent oil recovery factor, is that a conservative figure that you inserted here?

A. Say that again. I'm sorry.

Q. The 15 percent oil recovery factor, which is the column second from the right, how did you arrive at 15 percent?

A. I wanted to be ultra conservative because that is a typical number we get from a main pay that's been waterflooded. And so we'll get 15 percent of the

original oil in place.

But when it's been naturally waterflooded, we've already lost the waterflood barrels, so the oil-in-place number is going to be a different number than the original oil in place, because now we're at apples and oranges.

This is really complicated and I'm going to lose everybody. But 15 percent, if it was a main pay zone, is a very conservative number. We think we'll double that with an ROZ recovery factor because of the fact that it's been waterflooded.

Q. But these are greenfield ROZs that you're --

A. Correct. Only the greenfields.

Q. Okay.

A. Yes.

Q. What conclusions do you draw from all of your exhibits that we've --

A. Well, first of all, I was tasked to say whether it's an ROZ in San Andres in the EMSU. Clearly it is, in my mind. And then is it amenable to water -- or CO2 flooding, and I think it is. And I think that it may even allow -- because of the vertical fractures, it may even allow a more novel approach to get even more oil than you would expect from, say, this table.

And so what I would think is that more data is required. I mean, unfortunately, that's the world we live in. We never have enough data when we need it. But I think all the symbols -- signals are pointing to a successful ROZ project in the San Andres in the EMSU.

MR. PADILLA: That's all I have, Mr. Chairman, Mr. Harwood. I pass the witness for a cross.

THE HEARING OFFICER: Thank you.

Mr. Rankin.

MR. RANKIN: Thanks, Mr. Hearing Officer. I do have cross.

CROSS-EXAMINATION

BY MR. RANKIN:

Q. Good afternoon, Mr. Melzer. How are you today?

A. Good.

Q. Good. I understand you were retained by Empire to provide an overview of residual zones in the Permian Basin; is that correct?

A. That is correct.

Q. And based on your experience having worked with them over the years in the Permian Basin?

A. Yes sir.

Q. Okay. Now, as part of your direct testimony that you filed back in August of 2024, do you recall that you were requested to provide all the documents that you had referenced or relied on in preparing your analysis and coming to your conclusions?

A. Once requested, yes.

Q. Is your understanding that the prehearing order required all experts to provide all the documents that they referenced or relied on in coming to their conclusions?

A. I think I did that. Much of it was in a form, a website. Yes, sir.

Q. All right. So I'm going to just bring to the -- once I get onto this sharing page here. When we received your expert report, your testimony back in August 2024, Empire's counsel provided us with a document that identified for each expert who provided direct testimony the documents that those experts reviewed or relied on.

This is part of the record, so I'm not going to admit it as an exhibit. But I will just scroll down here to the entries where you have identified the -- where it identifies where you have provided two documents that you had referenced or relied on in support of your testimony.

Now, obviously those numbers don't mean anything to you, so I'm going to pull them up so you can see them. Okay?

But there are two documents, and the first one is 30 years of ROZ studies dated February 2023. It's a six-page document that is a sort of overview of different types of CO2 EOR projects and ROZ projects.

Do you recognize this document?

A. Yes, sir, I do.

Q. Is that one of the documents you provided?

A. Yes.

Q. Okay. And then the second document is this final report. You may have actually even been referring to it in your testimony. But it's a 231-page report that addresses an overview or case studies of ROZ CO2 flood in and around the Permian; is that right?

A. Correct. Yes.

Q. But neither of those two reports address the EMSU unit, correct?

A. That's correct.

Q. So, as to the EMSU, you get a -- I think I see in your testimony you did review two cores specific to the EMSU, correct?

A. Core reports.
Q. Core reports?
A. Yes.
Q. And that was the 679 and the RR Bell Number 4, correct?
A. That's correct.
Q. Is there any other data or information specific to the EMSU that you reviewed in preparation for your direct testimony that you submitted in August?
A. '24?
Q. Mm-hmm.
A. I have to think about that, but I'm sure I read some testimony that was presented, yes. But that would have been afterwards, so no.
Q. No. Okay. So the time you prepared your testimony in August 2024, only the data specific to the EMSU were those two cores -- core reports, right?
A. Correct.
Q. And you were not asked to evaluate whether the purported ROZ in the San Andres or even the Grayburg is recoverable in this case?
A. I was asked to look at the ROZ as the potential for CO2 flooding, yes.
Q. Okay. Let me ask the question again. Were

you asked to evaluate specifically whether the purported ROZ in the Grayburg or San Andres is technically recoverable?

A. Not exactly. Not explicitly.

Q. Okay. Let me ask -- I think it's a yes or no question. Were you asked to opine on whether the ROZ in either the Grayburg or San Andres is technically recoverable?

A. I'm thinking about the conversations.

Q. Is it in your direct testimony?

A. No, it's not in my direct testimony.

Q. Okay. And you wouldn't be able to do that by just looking at two core reports, would you?

A. It would be difficult to do, yes, sir.

Q. And along the same lines, you wouldn't be able to determine, based on the two core reports, what the recovery factors might be in the EMSU?

A. That's correct.

Q. And you wouldn't be able to determine, based on those core reports or anything else you reviewed with respect to the EMSU, whether the ROZ, purported ROZ in the San Andres or Grayburg is economically recoverable, would you?

A. No, sir.

Q. So you're not offering any opinions on

whether the purported ROZ in the San Andres or Grayburg is economically recoverable, are you?

A. Only by analog with the two fields.

Q. Have you established any basis that those fields are analogous?

A. Some ways, yes, sir.

Q. Okay. What data have you reviewed to confirm that, and where it is in your testimony?

A. It is the oil saturations from the core.

Q. Okay. Now, have you looked at the API, the gravity, viscosity, any other elements or components of the oil that was in the San Andres in the EMSU?

A. No, because you can't sample residual oil.

Q. So you're telling me that it's not possible to -- is it not possible to determine whether ROZ is economically recoverable from the San Andres at this point?

A. Only by analog.

Q. Okay. So your contention is that just based on the oil saturations in the core that you can draw a comparison and confirm that or make an opinion that the EMSU ROZ, the purported ROZ, is analogous to all the other ROZs that you discussed today in your testimony?

A. Say that again.

Q. So is your opinion that just by looking at the oil saturations in those two core reports for the EMSU that you can opine that the EMSU is analogous to every other field in ROZ development that you discussed in your testimony today?

A. Well, not in every field, but the analog to the Seminole is pretty good.

Q. Based on the oil saturations?

A. Yeah. And the saturation levels, yes.

Q. So that's the sole basis for your opinion, that they're analogous?

A. Proximity and rock types also.

Q. Okay. You gave us a lot of different examples of ROZ plays. Are you aware of any commercial or pilot ROZ developments on the west side of the Central Basin Platform and south of the San Simon Channel?

A. I'm not. Well, you mind if I caveat that?

Q. Sure.

A. I think the commingled north and south Hobbs fields do include the ROZ.

Q. Are they south of the San Simon Channel?

A. I'm thinking geography here. It's really close. I think they are north of the San Simon.

Q. You're familiar with the tilt, the oil-water

contact tilt study that Mr. Brown did that Dr. Trentham referenced in his testimony?

A. Yes.

Q. Now, I can bring it up if you'd like, but as I understand, that study documented oil-water contact tilts, which is an indication of a Mother Nature's Waterflood event occurring?

A. That's correct.

Q. Now, I didn't see any oil-water contact tilts indicating anything in the EMSU. Is that right?

A. That's correct.

Q. Were you aware at the time you prepared your August 2024 testimony that there were six water-supply wells in the EMSU that were completed in the San Andres in the EMSU?

A. No, I was not.

Q. And are you aware of the approximately 20 additional water-supply wells that have been and were withdrawing water from the San Andres in the area immediately offsetting the EMSU?

A. Water-supply wells?

Q. Yeah.

A. No, sir.

Q. At the time that you prepared testimony in August 2024, were you aware that there was produced

water disposal occurring in the San Andres in the EMSU since the 1960s?

A. I was not. I might have expected that there would be.

Q. Yeah. They have to put the water somewhere, right?

Were you aware at the time you provided your testimony that Empire was also disposing of produced water into the same San Andres zone within the EMSU?

A. Yes.

Q. You were aware of that?

A. Repeat it. Better repeat it.

Q. Sure. Were you aware at the time of your testimony in August 2024 that Empire was also disposing of produced water into the same San Andres zone within the EMSU?

A. No, I was not. Sorry.

Q. Now, I think I'm anticipating your answer, but just to be clear. Because ROZs have low oil saturation and high water saturations, when you try to produce them, they generally will produce high volumes of water, by definition, correct?

A. By definition.

Q. Yeah. And that's the experience at Tall

Cotton, correct?

A. That is correct.

Q. Okay. Let's see. Now, I think we kind of addressed this already, so I'm not going to ask that one?

Are you aware, Mr. Melzer, of any commercial or pilot ROZs currently under development or that have been producing that are thicker than 400 feet?

A. Almost of the same mindset that Bob Trentham is, anecdotally, I can say that. But I can't prove it.

Q. Okay. So you're not, as you sit here, aware of any that are thicker than that today?

A. No. That's a fair statement.

Q. Okay. You referenced in one of your exhibits the Seminole San Andres Unit, the SSAU. That particular unit, as I think I understood from your testimony, that it was developed in conjunction with the main pay zone, is that right, or subsequent to a main pay zone?

A. Yes, it was. All the extensions were into the ROZ from existing wells. And then they drilled some dedicated injection wells, but that's it.

Q. And in the Denver Unit that you referenced,

is that also the case, that they developed that ROZ either in conjunction with or subsequent to the development of the main pay zone?

A. Correct.

Q. On the Tall Cotton, were you involved in that project?

A. Depends on the definition there. They called me down to talk about ROZs, and it wasn't too long after that they started buying leases. So I guess you could call me involved, but I wasn't buying any leases, no.

Q. Okay. Let me ask this. Were you consulting for the company at the time they were developing that project?

A. Actually, it was more of a trade. They support our Co2 Conference really well. If they asked me to do something, I usually did it. So I went down and briefed them.

Q. Okay. So in other words, were you there with them from the inception of that project?

A. I was watching it from the inception. "With them" is probably too specific.

Q. So did you consult with them at the time they were initiating that project?

A. Pretty close to the time they initiated it.

A little bit before that.

Q. What did you do when you consulted with them on that project? I guess "them," just to be clear, who was the initiator of the project, the operator?

A. It was Kinder Morgan.

Q. Kinder Morgan. Okay. Did you consult with Kinder Morgan on how to develop this ROZ?

A. Oh, they asked for my advice. I don't think they took it all.

Q. Got it, got it. Now, you know, that case, did you participate with Kinder Morgan or assist with them in any way? I mean, what was your role when they -- I think they went to hearing before the Texas Railroad Commission, correct?

A. They went to?

Q. Hearing before the Texas Railroad Commission. Were you involved with that hearing at all?

A. I did not participate.

Q. Okay. So you say you tracked that project, you've been watching it. Have you tracked it from inception to the current?

A. Correct.

Q. You have. And you've been tracking the production from that project?

A. Yes, sir.

Q. And you're aware that Kinder Morgan has divested it?

A. Yes.

Q. Okay. I just want to talk a little bit more about that project, since you have some familiarity with it. You allude to it and you give us some background, limited background on it, but you don't go into any detail. Correct?

A. Correct.

Q. On the Tall Cotton project, Dr. Trentham did give us a little bit of -- let me find where that is. One second. I guess, let me just ask this question.

The Tall Cotton project, it was a one-section project, right?

A. Correct.

Q. That was it, just one section, right?

A. Well, they had leased a whole nine sections and developed the one on the east.

Q. So the first phase -- it was a two-phase project, I think I gathered from your slides. Right? It was a two-phase project?

A. Correct.

Q. But both phases were entirely within the one section, correct?

A. That is correct.

Q. Okay. Do you recall what the well spacing was for the first phase?

A. I think it was 80.

Q. Eighty-acres spacing?

A. It was 80 acres.

Q. Are you confident of that?

A. Sixty to eighty, for sure. And then they -- the infill was tighter because it was infill wells.

Q. Now, this is a greenfield, though, correct, the Tall Cotton?

A. Correct. Yeah. Yes, sir.

Q. So there wouldn't be -- so the initial well spacing -- is that the 80-acre pattern, you mean?

A. That's correct.

Q. Okay. So how many wells in a pattern?

A. I think there were 16 in that original.

Q. Sixteen total in the --

A. Doesn't fit, does it?

Q. I think you're almost right. Would it surprise you if it were 20 producers?

A. I think there was 18, if I remember correctly.

Q. Okay.

A. So it may have been less than 80. So 60

acres.

Q. But you've been tracking that project from the inception. Are you familiar with how that project has produced over time?

A. I am.

Q. And did you hear Dr. Trentham's description of it as an excellent ROZ project?

A. It made a lot of oil, yes, sir. Economically, I won't -- well, if you ask me, I'll not comment.

Q. Do you have information on the economics? You can answer that as a yes or no. Do you have information on the economics?

A. No, not from them.

Q. You have information on the economics. Where did you get that information from?

A. Back of the envelope. I know what a well costs, I know about what it takes to operate those vertical wells. My weakness is on the cost, on the front-end cost.

Q. Okay. So if someone wanted to, they could go to the Texas Railroad Commission and they could look up and see what the costs were proposed by -- what Kinder Morgan thought the costs would be to undertake that first phase of that project?

A. I don't think that data is available.
Q. Okay. So you're unfamiliar with what the cost is, the actual cost that was incurred by Kinder Morgan to undertake that project?
A. I think that's the same question. I think the weakness I had is in the capital cost.
Q. Do you know how many injecting wells the Phase 1 project employed?
A. I think there were 28 and almost as many as the producing wells. So 18, plus or minus 4.
Q. Do you know whether they employed a water curtain to help contain the CO2 injection?
A. That was why I was hesitating. They do have a water curtain, so there were more injectors since -- there were water and CO2 injectors.
Q. Were they using the water produced from the ROZ to manage the water curtain, do you know?
A. I can only speculate.
Q. Okay. So you're not sure how they managed the produced water from the ROZ development?
A. I know they had a deep injection well, so --
Q. It was not the same zone? You know it was a deep injection well? You understand it was not the same zone as the ROZ?
A. Yes.

Q. Was the Tall Cotton operated as a continuous CO2 injection or a water-alternating gas injection?

A. Initially, it was constant, and then they did a WAG afterwards.

Q. Do you know why they switched?

A. It's typical. We call them papered floods nowadays. We try to go as long as we can to the point where we're making too much CO2, and then we start to WAG. And usually in the WAG cycles, the water cycles go longer over time.

Q. Okay. Are you aware what the volumes of water production were from that ROZ?

A. Reported numbers weren't accurate. They typically aren't. And sometimes not even reported in the Railroad Commission.

Q. Okay. So are you saying that because you believe that the reported volumes are not accurate? You don't know what the actual production volumes were?

A. I can only estimate them. Sorry. It would have been high water cut.

Q. What's your estimation of the water production volumes?

A. Oh, probably seven or eight times the well volumes.

Q. Okay.

A. It varies over time.

Q. Let's see. My eyesight is gone these days. I can't see anything anymore. Sorry. One second.

Do you know what the -- so the Phase 1 was a smaller pattern within the one section pilot project area. What was the Phase 2 portion of the project?

A. I think the acreage involved in the CO2 was 480 acres initially and 540 after Phase 2.

Q. So it increased approximately 60 acres to Phase 2; is that your understanding?

A. I think that's --

Q. Something along those lines?

A. -- the case.

Q. Well, and was the Phase 2 different orientations or different collections of patterns?

A. Infill drilling, basically trying to decrease the time from injection to producing wells, transit time of the CO2.

Q. Did they down-space to do that?

A. They did.

Q. Do you know what the down-spacing was?

A. I think it was to 40 acres.

Q. Per pattern?

A. Yes.

Q. What were the patterns they were using?

A. A modified line drive. You can call that five spot, too, if you're clever about it.

Q. So five wells per pattern, and your recollection is they started at 80 acres. So what's the per-well spacing on that to start on Phase 1?

A. I haven't done my geometry that detailed. But it went from 60 or 80 acres initially to 40 acres in the infill drilling program.

Q. So almost down to 10 acres basing?

A. Between injector producer, yeah.

Q. So something on the order of between 15 and 20 acre spacing per producer injector down to 10, 15 acre per producer injector?

A. Sounds about right, yeah.

Q. Do you think that spacing is appropriate for a greenfield ROZ?

A. No, I don't.

Q. In what way?

A. I think what they did was they -- they could have stayed with their larger spacing and just been more patient.

Q. But you think the original spacing at 15 to 20 acres per injector producer was appropriate for

that ROZ?

A. I do.

Q. I guess I'll just go ahead and share this other exhibit. I'll put this into the record, Kinder Morgan. I'm going to ask this to be marked as Goodnight Cross Exhibit Number 5. It's the press release that was issued by Kinder Morgan back on July 17th, 2024. I pulled this down from the website. It's got a lot of material that's extraneous. It is complete.

But I was just going to scroll down, Mr. Melzer, and point you to the language where Kinder Morgan in this press release addresses the status of their CO2 projects. And they indicate that -- or they state that during the quarter that they're reporting on, "Kinder Morgan CO2 optimized its asset portfolio through two transactions in the Permian Basin for a net outlay of approximately $40 million. The segment divested its interest in the Katz Unit, the Goldsmith Landreth, San Andres Unit, Tall Cotton Field and Reinecke Unit, along with certain shallow interests in Diamond M Field and acquired AVAD Energy Partners' interests in the North McElroy Unit and a leasehold interest in an undeveloped leasehold directly adjacent to the SACROC."

It goes on to say, the last portion I've highlighted here, "The impact of these two transactions is to replace fields with high production decline rates and limited CO2 flood opportunities with fields that have attractive potential CO2 flood projects."

Had you seen this press release before Mr. Melzer?

A. I did skim it, yes.

Q. Okay. So your understanding is, based on that press release, that Kinder Morgan was divesting the Tall Cotton Field because it was subject to -- going through a high decline rate, with limited CO2?

A. That's what it says.

MR. PADILLA: Objection. This is speculation.

MR. RANKIN: I'm asking what his understanding is. He was involved with the project. I was just asking what his understanding is.

MR. PADILLA: The question was pure speculative, asking for speculation.

HEARING OFFICER HARWOOD: Well, I've heard the answer. No, I'll allow it. It's overruled.

BY MR. RANKIN:

Q. You can answer the question now.

A. Yeah. Let's repeat it, so I can get it right.

Q. Well, I'm asking you -- I guess, I don't know, we have the court reporter. I don't want to mess up my question again, since it was overruled. I don't know if we can have it read back.

Because I think I was trying to ask you if your understand was that Kinder -- what your understanding was, based on this press release, why Kinder Morgan divested its asset at the Tall Cotton.

A. That's a complicated answer. My feeling is they had something in mind to invest in, and it looked better than this.

Q. Okay. Fair enough.

MR. RANKIN: May I move the admission of this exhibit into the record?

HEARING OFFICER HARWOOD: Any objection from Empire?

MR. PADILLA: Yes, I'm going to object that it's hearsay. We don't know where this -- whether this information on a press release is accurate or not. It's not from a government source or anything. It's from Kinder Morgan, and it tells us nothing in terms of the issues involved in this case.

Now, if Mr. Rankin is trying to show

profitability or market analysis or market value, I don't know, that's not at issue here.

HEARING OFFICER HARWOOD: Mr. Rankin, what's the purpose for this, beyond what you've already elicited from the witness? Why does it advance the Commission's decision-making in this case, other than what you've elicited?

MR. RANKIN: I think that based on what I've elicited, I don't need the admission of the evidence, Mr. Hearing Officer.

HEARING OFFICER HARWOOD: Okay. So you're withdrawing?

MR. RANKIN: Withdraw it as an exhibit.

HEARING OFFICER HARWOOD: All right. Great. Solves one problem.

Before you go on, Mr. Rankin, I note that it's 4:56 p.m., so give us a forecast of how much more you have. Not to pressure you, but at some point soon we need to make a decision about adjourning for the day and continuing this.

MR. RANKIN: Mr. Melzer, are you planning to travel tomorrow?

THE WITNESS: I'm here through the day tomorrow.

MR. RANKIN: Okay. I don't want to rush

myself. I didn't interrupt Mr. Padilla's hour-long summary of Mr. Melzer's testimony. I probably have, I don't know, 20 to 30 minutes of additional cross. So I could pick it up in the morning, at the most.

HEARING OFFICER HARWOOD: Mr. Chairman, Members of the Commission, does that sound like a good plan?

CHAIR ROZATOS: Sounds like a good stopping point, yes.

HEARING OFFICER HARWOOD: All right. Mr. Rubin, I thought maybe you said there's something you wanted to cover before we adjourn for the day?

MR. RUBIN: Thank you, Mr. Harwood. I did send an e-mail to counsel for all the parties, so I'm covered.

HEARING OFFICER HARWOOD: Okay. Great. All right. Well, thank you all.

MR. RANKIN: Can I raise a housekeeping question? I haven't had a chance to confer with counsel on it. But one question I have is whether or not we can have any indication of when we might reconvene for this hearing.

I don't know if the Commission has been able to confer amongst themselves or have any dates that they may offer or date ranges that we may be

thinking about ourselves. So even if it's a range, so that our experts who have lots of different projects, and ourselves as well, can think about what may be on the horizon.

CHAIR ROZATOS: We've been so absorbed in this case, we have not talked. So we'll get you something tomorrow.

MR. RANKIN: Okay. Understood.

HEARING OFFICER HARWOOD: Okay. Thank you all, thank all of today's witnesses. And last, but certainly not least, thank you, Madam Court Reporter, for all your help today.

We'll be off the record in this matter. We'll reconvene tomorrow morning promptly at 9:00.

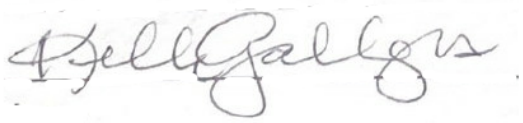
(Proceedings adjourned at 4:58 p.m.)

AFFIRMATION OF COMPLETION OF TRANSCRIPT

I, Kelli Gallegos, DO HEREBY AFFIRM that on February 27, 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 18, 2025



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