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

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:

APPLICATION OF OWL SWD OPERATING, LLC FOR AUTHORIZATION TO INJECT, LEA COUNTY, NEW MEXICO. CASE NO. 15723

REPORTER'S TRANSCRIPT OF PROCEEDINGS

SPECIAL EXAMINER HEARING

Tuesday, August 1, 2017

Volume 1

Santa Fe, New Mexico

BEFORE: WILLIAM V. JONES, CHIEF EXAMINER
SCOTT DAWSON, TECHNICAL EXAMINER
GABRIEL WADE, LEGAL EXAMINER

This matter came on for hearing before the New Mexico Oil Conservation Division, William V. Jones, Chief Examiner, Scott Dawson, Technical Examiner, and Gabriel Wade, Legal Examiner, on Tuesday, August 1, 2017, at the New Mexico Energy, Minerals and Natural Resources Department, Wendell Chino Building, 1220 South St. Francis Drive, Porter Hall, Room 102, Santa Fe, New Mexico.

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EXHIBITS OFFERED AND ADMITTED

(9:10 a.m.)

EXAMINER JONES: Let's call to order. This is Docket Number 26-17. This is a special Examiner Hearing for Tuesday, August 1st, 2017. I'm William V. Jones, the Hearing Examiner today. Gabriel Wade, on my extreme right, will be the counsel for the Examiner. And Scott Dawson will be -- is a geologist, and he'll also be assisting in questions for the Examiner.

There is one case on the docket. This is Case Number 15723, application of OWL SWD Operating, LLC for authorization to inject in Lea County, New Mexico.

Let's first ask for appearances in this case.

MR. MOELLENBERG: On behalf of OWL, Dalva Moellenberg, from Gallagher & Kennedy. With me is Rikki-Lee Chavez and Anthony Trujillo.

EXAMINER JONES: Okay. Other appearances?

MR. BROOKS: David Brooks, Energy, Minerals and Natural Resources Department for the Oil Conservation Division.

EXAMINER JONES: Other appearances?

MS. MOSS: Katherine Moss for the New Mexico State Land Office.

EXAMINER JONES: Any other appearances in this case?

MR. NEWELL: Your Honor, Michael Newell for the City of Jal, New Mexico.

EXAMINER JONES: Mr. Newell, did you -- I think we have a copy of a letter from you asking -- requesting a hearing several months ago.

MR. NEWELL: Yeah, the opportunity to be heard. Absolutely. Yes.

EXAMINER JONES: Okay. But you haven't submitted a pre-hearing statement?

MR. NEWELL: We have not. And we don't have any witnesses. And, you know, obviously it's up to the Hearing Examiner to the extent, you know, you allow me to participate or not participate, but at the very least, Jal has a position that it would like to state on the record and have the Hearing Examiner, the Commission [sic], consider as it evaluates the proposal.

EXAMINER WADE: We can hear that comment.

MR. NEWELL: Okay.

EXAMINER JONES: It's up to the Applicant to object if they don't want you to ask questions of the witnesses. Normally, they don't. But that's -- if there is -- I would throw that out there, if there was --

MR. MOELLENBERG: Yeah. Mr. Hearing Examiner, I mean, first of all, our understanding is

that -- with the understanding that Jal's not presenting a technical case, no objection to them making a statement and really no objection to them asking questions, if you so allow.

EXAMINER JONES: Any other comments from the Applicant or the Respondents?

MR. BROOKS: We have no objection to their asking questions.

MS. MOSS: State Land Office has no objections.

EXAMINER JONES: Any other appearances in this case?

Let's first ask if there are any pending motions.

MR. BROOKS: We have none.

MR. MOELLENBERG: We have none, Mr. Hearing Examiner.

MS. MOSS: State Land Office has none.

EXAMINER JONES: Okay. Okay. We weren't expecting any.

And I want everybody to be comfortable today. The attorneys, if they need a break, let us know, and we'll have a little brief recess. So we don't want everybody to be uncomfortable.

And first, in a big case like this, we

would ask if Applicant and Respondents and appearance parties want to make a statement -- opening statement.

OPENING STATEMENT

MR. MOELLENBERG: Mr. Hearing Examiner, I can make a brief opening statement and just outline OWL's presentation.

As you're obviously aware, OWL has filed a pre-hearing statement in this case and also has filed, more recently, an amended pre-hearing statement. Those pre-hearing statements included as attachments a report by Mr. Chad Kronkosky, one of our witnesses, who we'll be presenting, and also Mr. Neil Blandford, who we'll be presenting. So hopefully you've had an opportunity to get at least somewhat familiar with those reports, recognizing that they're -- that they're very technical.

The C-108 application in this case has been filed some time ago, and I guess -- well, I'll get to that in a little bit.

Anyway, the application by OWL proposes an injection well called the Bobcat #1 well that is intended to inject produced water or saltwater transported in by a pipeline system that OWL has constructed.

OWL has been operating an existing injection well, the Maralo Sholes No. 2B well, which is

the subject of a hearing to follow this one, but will probably be the topic of some discussion here, as there is some relevant data from that well as to how the injection has performed.

Generally, our understanding of the issues in this case are issues relating to, particularly from OCD, whether the injection as proposed and, frankly, currently being conducted by OWL could impact the Capitan Reef Aquifer. So we're speaking -- our witnesses will be speaking directly to that point. They'll also be speaking to the points raised by the State Land Office, and those issues relate to water quality really in the formation where the injection is currently taking place and proposed to take place with the new well.

This well -- if approved by OCD, it would be OWL's intent to construct this new well and then plug and abandon the existing well. That'll be discussed again somewhat in the next case. OWL's view is that the existing well is operating just fine, but it's obviously an old well. And I think if the preference is to do something with that well, OWL's preference would just be to put in a new well and have everybody comfortable with it.

In addition to Mr. Kronkosky and

Mr. Blandford, we'll be presenting Mr. Johnson from OWL. He's going to start the testimony and talk a little bit about OWL's process, what the project is, the need for the injection wells as part of the project and so forth.

This presentation may be a little bit unique in that based on some of the discussions between OWL and OCD regarding the existing well, our direct testimony actually addresses a lot of issues that have been raised in some of the reports that have been issued in that regard. Obviously, we haven't heard the full presentations from OCD and the State Land Office yet, so we may present rebuttal testimony if needed after we hear those full presentations.

And I believe, unless you have any questions to start with, that's all -- that's all we have. If you're going to take opening statements from the other parties, that's fine. Otherwise, we'll call our first witness.

EXAMINER JONES: Any opening statements from Mr. Brooks?

MR. BROOKS: We'll reserve our opening statement until we begin our case.

I would point out that the witnesses have not been sworn.

EXAMINER JONES: Ms. Moss?

OPENING STATEMENT

MS. MOSS: I would just simply say the SLO's position is in our pre-hearing statement. And I believe you know that we oppose the drilling of the Bobcat SWD No. 1 at the proposed depth on the basis that the disposal will impact protectable waters in the Capitan Reef.

Thank you.

EXAMINER JONES: Okay. And we'll probably, at the conclusion of the hearing, if Mr. Newell wants to make another -- another summary statement, that sounds good.

And will the witnesses for the Applicant please stand and the court reporter please swear the witnesses?

(Mr. Kronkosky, Mr. Blandford, Mr. Burns, and Mr. Johnson sworn.)

ROGER JOHNSON,

after having been first duly sworn under oath, was questioned and testified as follows:

EXAMINER JONES: You may proceed.

MR. MOELLENBERG: Mr. Hearing Examiner, our first witness will be Roger Johnson, and Ms. Chavez will conduct his examination.

EXAMINER WADE: Mr. Moellenberg, will you

have additional exhibits to hand out to the Division, or did you -- we notice we have several copies of an Exhibit 1 binder and only one copy of Exhibit 2.

MR. MOELLENBERG: So for this particular examination, we have a PowerPoint presentation which we'll put paper copies in the record as a demonstrative exhibit. We're not intending that to be admitted as evidence.

Do we have the other two parties' notebooks?

MS. CHAVEZ: And I can -- I can pass out the exhibits as they're introduced, or we can do it all at once. It's really your preference. I spoke with the court reporter at the beginning, and it sounded like it might just be simpler to do it as the exhibits are entered as opposed to having the large binder to --

MR. BROOKS: Yeah. The custom at OCD is to admit all your exhibits at the conclusion of the witness' presentation rather than the way it's done in court.

MR. MOELLENBERG: Right. Right.

MR. BROOKS: Those of us who would be following along with the presentation, it would be helpful for us to have a notebook at the time of the presentation.

MS. CHAVEZ: And just for everyone's information, the large binder we handed out, the presentation is towards the back. There is an index in the front.

EXAMINER WADE: Do you happen to have more than one of these for each Examiner?

EXAMINER JONES: Actually, I'm going to.

EXAMINER WADE: You're going to follow that?

EXAMINER JONES: Yeah.

MS. CHAVEZ: I'll keep one to make the record for.

EXAMINER JONES: Sounds good. It goes to her (indicating).

MS. CHAVEZ: I do have one more copy if you'd like.

EXAMINER DAWSON: Thank you.

EXAMINER JONES: Go ahead.

ROGER JOHNSON,

after having been previously sworn under oath, was questioned and testified as follows:

DIRECT EXAMINATION

BY MS. CHAVEZ:

Q. Good morning. Could you please state your name, address and place of employment for our record?

A. Yes. Roger Johnson. The address is 8214 Westchester Drive, Suite 850, Dallas, Texas 75225.

Q. And your place of employment?

A. Oilfield Water Logistics. We go by OWL.

Q. Okay. And, Mr. Johnson, how long have you been with OWL?

A. Almost four years, since its founding.

Q. Okay. What is your position at OWL?

A. Chief investment officer.

Q. Can you tell us today a little bit about OWL?

A. OWL -- OWL's business plan is to gather disposed -- recycle and resell produced water. What we built in Lea County is a gathering system that collects the water aggregates, and we're currently, you know, reselling it and disposing of it.

Q. Okay. And can you elaborate on the kinds of services that are provided by OWL in New Mexico?

A. We gather water. We dispose of water. We supply water. We're cooperating with operators who recycle water. We're about to get into the waste business as well, salt waste.

Q. And what do you think makes OWL a unique company in matters of produced water injection?

A. Well, before we built the assets we've got in Lea County, most all produced water was disposed of by

truck or small gathering systems. What we developed was a system that aggregated the water where the production is today and transported it 30 miles outside of the core of the production area.

Q. Okay.

A. That didn't exist before.

Q. Okay. Can you tell me a little bit about the corporate responsibility that OWL has?

A. Yes, ma'am. We take that very seriously. We have 24/7 monitoring. We have full-time safety personnel on staff. We have flights -- we've got -- our lines are flown. We double check for leaks, and we're a good-size company that carries a large amount of insurance, too.

Q. And, Mr. Johnson, what is OWL's request from the Department today?

A. Our request -- I guess it's on slide six. We're requesting an order authorizing the injection of water for disposal into the Yates-Seven Rivers Formation in Lea County. We're proposing the completion of the well injection of water by open hole from 2,915 to 360 feet.

Q. Okay. Can you tell me what the timeline for the new well's construction would be?

A. This well will be drilled very quickly and

easily in 30 to 60 days.

Q. And what is the purpose of this new well?

A. Given, you know, the request for the current well, we feel like it's a better, longer-term answer given those requests to just replace the well with new construction. So we're going to replace the current well with a new well.

Q. Okay. And how does this new well factor into the overall service provided by OWL?

A. Well, again, we have a 30-mile pipeline that gathers all the water from the field and transports it out of the area where all the drilling is. So this well is part of the anchor on the eastern end of this line. It's very -- we're currently permitting a 500,000-barrel reclamation pond adjacent, where we will gather water, re-treat it, send the treated water back out to the field, but there will always be a need for a disposal well. In fact, we would not develop that recycling pit without a disposal well. We've got to be able to dispose of the water to something.

Q. Following up on your mention of the pipeline system, what is the purpose of this pipeline system?

A. It's to aggregate and gather the water instead of trucks. The other alternative is to gather the water via truck, which, you know, has a whole list of

problems.

Q. And can you -- can you tell me again why this particular well is so important to this pipeline system that you described?

A. Well, our plan is to gather the water and treat it and recycle it, and we've got to have the ability to dispose of water from time to time. There are times when the frac pump -- I mean that pond is full. There are times -- even when you recycle water, there is a fair amount of wastewater you have to dispose. So you have to have a disposal well on recycling --

Q. And can you tell me how this particular well -- what its role is and why it might be so important to the oil and gas industry in New Mexico?

A. It's really the same things. You know, I mean, from their perspective, we're able to reduce their cost because trucking is more expensive. It's a lot safer process. You know, when you put water on a truck, you're handling it. You have the human touch that causes problems. You have a truck, truck-driving, truck-driving on roads, environmental impact. There are a lot of negatives that you can avoid when you gather the water on pipe versus truck.

Q. Okay. And when you say "they," who do you mean?

A. The operators, you know, when we're not gathering the water, they're responsible for getting it disposed of. So they would typically call, you know, their trucking companies and get the water hauled off. So that's the other alternative.

Q. Okay. We saw a map earlier about where OWL is at in New Mexico. What can you tell me about the oil and gas industry in southeastern New Mexico?

A. It is, you know, ground zero. There are many, you know, recent articles that have come out that reference, you know, the Red Hills area, which is that southern Lea County, as the most valuable gas acreage in the lower 48. So based on our conversations with operators, we think that's true. It's ground zero.

Q. So can you tell me a little bit more about what specific industry needs OWL addresses with this pipeline?

A. Well, you know, disposal and gathering, recycling and re-use, but what's unique about this pipeline is the size of it. It's a 16-inch fiberglass line, which can transport a lot of water, which -- these operators, when they -- when they bring on fracs, sometimes they do multiple fracs, and they have huge surges of water. So just normal gathering pipelines can't handle 80-, 90-, 100,000 barrels at a time. They

may not be for, you know, extended periods, but the amount of flowbacks, you have to be able to handle surges, and this pipeline is uniquely designed for that.

Q. And, Mr. Johnson, can you tell us about what we're looking at here on this particular slide, number nine?

A. Yeah. This is just a schedule that sort of shows, you know, some other economics. You know, for example, this well -- if this well is disposing of 20,000 barrels a day, which is that fourth bar, you know, it shows, you know, the like kind production value, which is almost $400,000 a day in production, the associated royalty value and the associated severance tax value just for this well per day.

Q. And can you address the assumptions made to create this graph?

A. Yeah. The assumptions that generated this was oil at $45, which I think oil as of yesterday was at 49, the water cut being 70 percent, which is a fair assumption, in my opinion, the royalty rate at 12-and-a-half percent, which I think is a typical state royalty, and severance tax at 8.4 percent.

Q. Okay. So what are the other benefits of using OWL's pipeline to address these disposal needs as opposed to trucks?

A. The other benefits?

Q. Yeah.

A. Well, you know, cost, environmental footprint and mostly safety. The trucks that this -- that this water puts on the road and the amount of trucks -- we've seen it when we take this pipeline down for maintenance reasons -- it's like a war zone out there. I mean, the effect when this pipeline goes down is trucks in a part of the county where there are no paved roads running 24/7. Otherwise, these wells get shut in. We've seen that. When we're down for more than a day or two, operators start shutting in wells.

Q. And, Mr. Johnson, can you tell me, does this pipeline that we're discussing have its own name?

A. It's called Red Hills.

Q. The Red Hills?

A. Yeah.

Q. Okay. Can you tell me more about this Red Hills pipeline?

A. Well, we have a little over $40 million invested in it. It's about 30 miles long. It can move, at times, 150,000 barrels a day. It's uniquely designed to handle large volumes, surges, that I mentioned earlier. We've got, you know, roughly a dozen customers tied into it already, and it's a life-long asset. It's

built to last 20, 30, 40 years.

Q. And you mentioned the $40 million. Could you discuss a little bit more about the investment in this pipeline that OWL's made?

A. Well, you know, it's in excess of $40 million and growing. You know, this is a pipeline that's in high demand. We've got a lot more customers who -- currently, we're talking to a lot of customers. They're looking at their drilling schedules and trying to reserve capacity in this, because everybody anticipates disposal being a real problem in Lea County.

Q. Okay. And can you touch on what makes this Red Hills pipeline system so unique as opposed to others?

A. Its -- its design, its surgeability, its reliability. Really, it's designed to take water out of a very highly drilled part of the county and take it out of that area. So we're trying to get the water out of the production area.

Q. And can you tell me again the capability of this pipeline? How much water can it take?

A. It can take -- it can move up to 150,000 barrels a day.

Q. Okay. And how do injection wells fit into this pipeline system?

A. They're critical. I mean, you know, we are

currently, today, laying off water on this line to other customers for re-use. So the pipeline gathers the water, moves it to where it's needed, but all of it's not needed all the time. So there's got to be a place where you can dispose of it from time to time. That's the purpose of the SWDs.

Q. What are the safety benefits of using a pipeline in this area?

A. Well, moving water via pipeline is the safest way to do it. You know, you've got -- you know, you've got truck accidents, truck traffic, spills. You're able to avoid a lot of those things by moving water on a pipeline.

Q. Okay. Can you tell me more about what you know about the truck traffic in the Lea and Eddy Counties area?

A. Yeah. You know, Highway 128, going west from Jal, is a very highly traveled road. Other than Dialex [phonetic] Road, there's not really a road down there that's paved, and there is just a tremendous amount of truck traffic. If you drive that road, you quickly see that your wheels get in the ruts where these trucks have rutted up the road, where there is just a lot of heavy trucks in that traffic. They're 24/7 all the time.

Q. And without this particular injection site

we're discussing, would there be an increase of truck traffic in this area?

A. Absolutely. We've seen that when we take our pipeline off line.

Q. And I believe that you did some math on the truck traffic increase. Can you tell me about that?

A. Yeah. Just this one well taken off line will generate 400 truck trips a day that would not be there otherwise.

Q. Okay. Can you explain to me how you got that number?

A. Yeah. That's -- you know, a typical truck handles about 120 barrels of water. 25,000 barrels a day kicks up that number.

Q. And so we discussed the equivalent truck use required to move the same amount of produced water. Could you tell me what otherwise is the benefits of using this pipeline versus the trucks?

A. You know, as the slide shows, it's a small environmental footprint. I mean, when you drive these roads, you see -- you know, I've seen cows that have been hit by trucks. You see all sorts of animals that are killed. It's just an easier way to move the water. You have less human touch. The maintenance costs and operating costs are less. And, just, you know, all the

things that come with truck traffic, whether it's accidents or road repair or, you know, diesel, all those things you can avoid with a pipeline.

Q. Shifting gears a bit, Mr. Johnson, can you tell me about the safety of using saltwater disposal wells for disposal of produced water?

A. Saltwater disposal wells have been around for,I mean, almost 100 years. So I don't know how many SWDs there are, but there are quite a few. It's a well-known way of disposing of produced water in the oilfield.

Q. Is OWL interested in continuing to operate in New Mexico for a significant amount of time?

A. Yes. We're building long-life assets, and we plan on operating them for a long time.

Q. Are there any alternatives besides truck transportation to move this produced water?

A. Not really.

Q. And are there any other injections locations that could be used to accommodate what this well would accommodate?

A. You know, we've designed this system on purpose to get the water out of the field. You know, this field, this location, is, you know, where we plan to take the water.

Q. And you touched on some of this earlier, but

can you tell me a little bit more about the water reclamation opportunities?

A. Yeah. We're currently permitting two 500,000-barrel reclamation ponds, 500,000-barrel each, where we capture water. We're going to treat it and resell it. And that's -- you know, those have to be adjacent to an SWD. There is no way you can off-load that kind of water and not be able to dispose of what's not sellable. So those are an integral part of the reclamation process. So when you recycle water, you're forcing wastewater, so they are --

Q. Are there any other industry opportunities that you could discuss with regards to these reclamation opportunities?

A. You know, we're currently doing it. We've got a couple of customers that are taking water from us now. We're going to build these ponds and treat water ourself. There is a huge opportunity to, you know, recycle a larger and larger percent of the water we touch. This pipeline gathers water, so it allows us to be a gatekeeper for a large amount of water.

Q. Okay. And those are the -- are those the only reclamation efforts that OWL's involved in, the ones you've described?

A. We're doing a landfill. We'll do reclamation

of a landfill, too.

Q. Can you describe that for me?

A. Yeah. We just got a landfill permit a week or two ago, so we'll probably construct that here shortly and be open early next year. So that'll take solid waste. It'll take flowback water, and there will be a recycling effort with that material, too.

Q. Mr. Johnson, can 100 percent of produced water be recycled?

A. No.

Q. Can you tell me why not?

A. Well, you can't do it all the time. So even -- even when you're taking water -- when the ponds are full, you can't take it. When you treat it, there is wastewater left over, and you can't recycle all the time. We've seen it with a lot of our operators. There is a certain amount of water that they can recycle, and as their overall water production increases, they grow through that band to where at some point -- and the larger operators are already there -- they're always recycling what they can and laying off what they can't recycle.

Q. So would there still be a need for your pipeline and injection system?

A. Yes.

Q. Even with reclamation efforts in place?

A. Yes.

Q. So would OWL essentially be able to explore any of these reclamation and recycling opportunities without this injection site?

A. No.

Q. I'm sorry?

A. No.

Q. Would OWL suffer loss without this proposed injection site?

A. Yes, we would.

Q. And are there any options that you know of that OWL could partake in to make up those losses?

A. You know, it's -- the pipeline's been constructed. It's difficult to move the pipeline. It would be very difficult.

Q. And then you mentioned that you do have several producers that depend on you. Approximately how many clients does OWL serve with this injection system?

A. Well, just the system, there are a dozen customers.

Q. On just the Red Hills system?

A. Correct.

Q. What would happen to those producers who are dependent upon you if they couldn't use this?

A. You know, we've seen it, like I said, when we have maintenance. They immediately start trucking, but they cannot keep up with trucking. And if it goes on for more than a couple of days, they start shutting in wells.

Q. What are the benefits to OWL being granted its permit in this application?

A. Well, it's -- you know, it allows us to continue what we think is a safe, stable disposal, you know, taking the water out of the field with the best possible way to do it via pipeline, with the alternative being trucking or shutting in of wells.

Q. And those are the benefits to OWL?

A. Those are the benefits to OWL and the customer base. Customers appreciate the lower cost and the lower liability. And we're -- you know, we're compensated as well for something that's not -- that didn't exist before.

Q. Okay. And are there any other benefits to the industry that you could speak of?

A. You know, I think they appreciate that we're trying to recycle. A lot of these operators -- some of them are recycling, but a lot of these guys don't have acreage blocked up enough to do it in every location. We're able to move the water around to where they need

it, which is a big part of water cost transportation.

MS. CHAVEZ: Mr. Examiner, may I have one minute?

Q. (BY MS. CHAVEZ) Mr. Johnson, can you tell me -- we touched on what your corporate responsibility is. Can you tell me who your -- who OWL's investors are?

A. Sure. Our investors are comprised of NGP; since we're natural gas partners, the NGP Tech Fund, and then an entity called Palo Alto. NGP, which is sort of the mother ship of those two private equity firms. There is a Dallas-based private equity firm that its investors are, you know, insurance companies, pension funds, foundations. It's, you know -- it's very institutional investors, and they all require, you know, proper guidance to all the environmental regulations, safety personnel. You know, we have to report on our safety processes every board meeting. It's a big of what they expect us to report and accomplish.

Q. So you're independently monitored by these investors?

A. Correct.

MS. CHAVEZ: Mr. Hearing Examiner, I don't have any other questions.

EXAMINER JONES: Okay. Do you want to offer Mr. Johnson as a practical oilman, or do you want

to qualify him in some sort, some way? You don't have to if you don't want to.

MS. CHAVEZ: Mr. Hearing Examiner, Mr. Johnson is here as a fact witness.

EXAMINER JONES: Fact witness. Okay.

Mr. Brooks?

CROSS-EXAMINATION

BY MR. BROOKS:

Q. Where, Mr. Johnson, is your pipeline terminal located to the well?

A. Probably a half a mile due south, I would believe.

Q. Which direction?

A. The pipeline terminates into a large pad on the southern end of Mr. Fulfer's ranch, and then from that pad, it's connected to the Sholes well, which is roughly half a mile north -- northeast slightly, I think.

Q. Well, my witness assisted me to locate it. So I will --

MR. BROOKS: May I approach the witness, Mr. Hearing Examiner?

EXAMINER JONES: Sure. Sure.

MR. BROOKS: I will ask him to verify this so it's in the record.

MS. MOSS: For the record, could you tell

us what you're looking at?

MR. BROOKS: I'm looking at OCD Exhibit -- what's going to be OCD Exhibit Number 2, which is a map -- areal map of a several-section -- about six sections in the vicinity of the proposed well site.

Q. (BY MR. BROOKS) Mr. Johnson, I'll ask you to look at OCD Exhibit 2. I just put an arrow where my witness indicated it was. Is that a correct location?

A. Let me orient myself just for a second. This State 205, I don't recognize.

Q. Well, the well site is right here (indicating).

A. Okay.

I believe that's right. I believe that's right.

Q. Okay.

MR. BROOKS: I will present this exhibit at a later time when our witness identifies it, but I will note at that time that the arrow I put on there marks the pipe terminal that Mr. Johnson has identified.

Q. (BY MR. BROOKS) Okay. Mr. Johnson, in order to develop this facility, are you going to need more disposal wells in addition to the one that you're applying for right now?

A. Possibly.

Q. Okay. I note that there is one new disposal

well, identified as new, which I assume means it's not been drilled yet, in this vicinity, and that is the Kimberly SWD No. 1 in Section -- in Section 31 of 25 South, 37 East, and OWL is identified as the operator of that?

A. Right.

Q. Are you familiar with that well?

A. That's an approved permit.

Q. Okay. For both the -- permitted for both the drilling and for the injection?

A. I believe that's correct.

Q. Okay. I know it's permitted for the drilling because that's where I got the information, but I have not checked the permit for the injection.

Are there any other new wells in this vicinity that OWL has permitted or is in the process of permitting injection?

A. There is a recently completed well north -- generally north of this pad by Greg Fulfer. It's called the Jal North.

Q. Okay. That one does not appear on our list.

A. That's not in our name. That's in Mr. Fulfer's -- well, that's in Delaware Water Company's name.

Q. Any other disposal wells that you are in the

process of permitting?

A. No.

Q. Do you have any -- do you have any estimate of how many wells you will need in this vicinity?

A. Not at this time. It depends on the oil field's production.

Q. Okay. Now, this well is going to be injecting up to a maximum of 30,000 barrels per day of water; is that correct?

A. Yes, sir.

MR. MOELLENBERG: Could we clarify which well you're talking about?

MR. BROOKS: The Bobcat -- the proposed Bobcat well.

MR. MOELLENBERG: Okay. Thank you.

THE WITNESS: Yes.

Q. (BY MR. BROOKS) And are other wells of similar capacity or other wells of similar injection capacity anticipated?

A. Again, it depends on the oil field's production of water and the net effect of our recycling efforts going back out, because that's -- as we've seen with operators, recycling does dramatically affect the amount of water we can put down a hole.

Q. But do you consider it likely that there will

be additional development of wells necessary to continue the operation of this pipeline to operate efficiently?

A. Again, we're hopeful we can recycle up to 70 percent of the water we gather. That would be very dramatic and would greatly affect what the net downhole amount would be needed.

Q. So you cannot make an estimate at this time?

A. No, sir.

Q. Okay.

A. Because we're not recycling yet, but those are the figures that the industry talks about.

Q. Okay. Thank you.

Have you investigated other sites in this vicinity for a possible disposal? I mean other sites that are farther away from the city and from the existing producing wells.

A. We've looked in the general area, and, you know, the best option that we've found is the proposed location that we're looking at. You know, we permitted the Kimberly, which is another option, but, you know, given -- given the Jal North's results, we're hesitant that that's a viable option.

Q. Okay. That was the one I asked you about previously, the Kimberly SWD No. 1 in Section 31?

A. Correct. Yes, sir.

Q. Okay. I think that's all the questions I -- well, one minute.

MR. BROOKS: That's all the questions I have for this witness.

EXAMINER JONES: Ms. Moss?

CROSS-EXAMINATION

BY MS. MOSS:

Q. Just some follow-up here.

For the proposed disposal zone for the Kimberly, which I was not familiar with, do you know what the proposal zone is for that?

A. I believe it's the Devonian.

Q. Okay. And do you happen to know the zone for Mr. Fulfer's well?

A. I'm sorry?

Q. Do you happen to know the proposed disposal -- well, actually, he's already, I guess, using it.

A. Right.

Q. The disposal zone for Mr. Fulfer's well?

A. Fulfer. It's Devonian, and that's called the Jalmat.

Q. I just have three more questions.

Is it correct that OWL has corporate responsibility to properly dispose of Delaware Basin-produced groundwater for its oil company clients?

A. I'm sorry. Can you repeat that?

Q. Is it correct that OWL has a corporate responsibility to properly dispose of Delaware Basin-produced groundwater for its oil company clients?

A. I believe that's correct. Not in the Delaware, but Delaware region, not produced water. I just want to make sure I'm understanding the question properly.

Q. Yes.

A. Oh, yeah.

Q. And is it correct the new well, the Bobcat No. 1, will become the east end of the 30-mile pipeline system anchor disposal well?

A. Yes.

Q. Okay. So then is it correct that the Delaware Basin wells produce higher total dissolved solids than the groundwater in the area to which you're injecting?

A. Can you repeat the question?

Q. Is it correct -- and I can ask another witness as well. But is it correct, to your knowledge, that the Delaware Basin wells produce a higher total dissolved solid groundwater --

A. Than fresh water in the area?

Q. Well, greater than 10,000 milligrams TDS.

MR. MOELLENBERG: Object to the form.

I'm not sure what all the locations are

involved in that question, and I would say we have technical witnesses who are very familiar with the water-quality issues that would probably be suited for you.

MS. MOSS: Okay. And I can ask those questions, but I'm simply asking you your opinion, if you know the fact.

MS. CHAVEZ: Can you restate your opinion fact question?

Q. (BY MS. MOSS) Is it correct -- what I really think the question is: Is it correct the water you're bringing in from other areas has higher total dissolved solids than what is considered protectable water?

A. Any produced water has higher TDS than --

Q. Thank you.

EXAMINER JONES: Mr. Newell?

MR. NEWELL: Just a few.

CROSS-EXAMINATION

BY MR. NEWELL:

Q. I believe from your testimony, when you were equating the savings of the truck traffic, you used about 25,000 barrels a day.

A. (Indicating.)

Q. So if I use 20,000 barrels a day, that's a pretty conservative estimate of how much you're going to

inject, correct?

A. (Indicating.)

Q. Okay. And if we use 350 days -- I think we talked about the liability operating 350 days out of the year?

A. Yes.

Q. Okay. So if we just do that in math, that's, what, 7 million barrels of water a year?

A. Uh-huh.

Q. Okay. And then 40 years? So we're looking at that for 40 years.

And then as I understand it, the Seven Rivers and Yates, at the Tillman, flow into the Capitan Reef, which basically circles in a horseshoe manner the Delaware Basin. Is that your understanding?

A. That's not correct.

MR. MOELLENBERG: And I object to the question. It's beyond the scope of direct. It's really a technical question, and a technical witness should respond.

MR. NEWELL: I'll rephrase. I'll withdraw that question.

Q. (BY MR. NEWELL) Okay. But anyway, what you're saying is basically over this 40-year period, just from this one disposal well, conservatively, 280 million

barrels of water will be put in the Seven Rivers Formation; is that correct?

A. And I think you'll learn from the testimony that is a fraction of what has been taken out of the same field over the last 70 years.

Q. Okay. And in this particular location, is it adjacent to, as you understand it, the Capitan Reef Complex?

MR. MOELLENBERG: Again, same objection. This is not an expert witness on geology or hydrology of the area.

EXAMINER JONES: Can you save the question for the next witness?

MR. NEWELL: Certainly.

Q. (BY MR. NEWELL) And your testimony was the other wells in the area are Devonian wells?

A. There is -- there is one other example of a Devonian in the immediate area.

Q. And then one that's been permitted?

A. Correct.

Q. And what are the zones for the Devonian wells, as you understand it?

A. The depths?

Q. Yes.

A. I'm not prepared to answer that.

Q. All right. Do you have knowledge about whether it's above or below the Capitan Reef Complex?

A. I'm not prepared to answer that.

MR. NEWELL: Pass the witness.

EXAMINER JONES: Okay. Any further questions?

MS. CHAVEZ: Just a few, Mr. Hearing Examiner.

REDIRECT EXAMINATION

BY MS. CHAVEZ:

Q. Mr. Johnson, you are aware of the Jal North; is that correct?

A. Yes.

Q. And where did you say that -- what was the area that this Jal North was drilled?

A. That was a Devonian completion, as I understand it.

Q. Okay. Do you know -- do you know about what results with injection on that --

A. It was a poor well. We've worked with him to try and figure out if it could take more water. I believe it's been completed for something like 10 months, and he's had very poor results on and off, couple thousand barrels a day, "when it works" kind of results.

MS. CHAVEZ: Mr. Hearing Examiner, I have no more questions.

EXAMINER JONES: Thank you very much.

Thank you, Mr. Johnson.

And let's take a five-minute break.

(Recess, 10:04 a.m. to 10:10 a.m.)

EXAMINER JONES: Let's go back on the record and continue with the Applicant's case.

MR. MOELLENBERG: So, Mr. Hearing Examiner, if you're ready for our next witness, we'd call Chad Kronkosky.

Mr. Hearing Examiner, to start with, we haven't introduced the C-108 as an exhibit. You have copies of it with the pre-hearing statement. There is a copy on file with OCD. We'd be happy to put it in as a hearing exhibit. And we'll certainly ask it to be admitted as evidence, but I'm not sure if it's needed.

EXAMINER JONES: Was it part of the application, and has it changed any since the application?

MR. MOELLENBERG: It has not changed since it was originally filed with OCD or since it was filed with the original pre-hearing statement.

EXAMINER JONES: Yeah. Sometimes people --

MR. MOELLENBERG: I'm sorry. It was a

hearing notice, not statement.

EXAMINER JONES: Okay. Sometimes people do admit it later as a separate exhibit, but then they actually send it as part of the application, too. So I don't think you need to do that.

MR. MOELLENBERG: Okay. We may do that. I just wanted to make sure, if we didn't get to it, that we weren't missing out on that.

MR. BROOKS: Let me ask a question about that.

MR. MOELLENBERG: Yeah.

MR. BROOKS: Does the -- Mr. Goetze informed me that the copy filed with your exhibit folder did not have the area-of-review wells listed.

MR. MOELLENBERG: It may not have all the wells. The application as originally filed does.

MR. BROOKS: Has that list?

MR. MOELLENBERG: Has all the area-of-review wells. We'd certainly be happy to put in a copy here.

MR. BROOKS: That'll be part of the record. I don't know that it's necessary that it be filed --

MR. MOELLENBERG: If we use it for questions or anything, we'll be happy to do that. We just don't want to kill any more trees than we have to.

MR. BROOKS: Okay.

CHAD E. KRONKOSKY,

after having been previously sworn under oath, was questioned and testified as follows:

DIRECT EXAMINATION

BY MR. MOELLENBERG:

Q. So, Mr. Kronkosky, could you provide your full name and address and employer for the Hearing Examiner?

A. My name is Chad Ewert Kronkosky. My employer is CEK Engineering, LLC. The address of the corporation is 5301 69th Street, Lubbock, Texas 79424. I am the owner of the consulting company.

Q. So CEK's work, in essence, is your work? Is that fair to say?

A. That is correct. It's a single engineer company.

Q. Okay. Mr. Kronkosky, I'm going to hand you what's been marked as OWL Exhibit 3 and ask you if that's a full and complete copy of your current resume?

A. It is.

Q. Would you give the Hearing Examiners just a summary of your education qualifications and experience?

A. I have a bachelor's and master's degree in petroleum engineering from Texas Tech University. Currently, I'm in candidacy for a Ph.D. in petroleum

engineering at Texas Tech. I expect to complete the dissertation phase either sometime later this fall, with a possible official graduation in the spring of next year.

I've been active in the oil and gas industry prior to my consulting company since '06. I worked for several operators in Midland, Texas. My predominant technical focus has always been in the Permian Basin, though I have worked in areas all across the United States.

In 2011, I started CEK Engineering and have been providing consulting engineering services ever since to numerous clients throughout the state of Texas predominantly.

Q. And, Mr. Kronkosky, in that kind of work, have you acted as a reservoir engineer, or could you give us a little more specific information about the types of projects and things you've worked on?

A. Yeah. My technical focus has predominantly been reservoir and geological engineering throughout the Permian Basin in New Mexico and in Texas. My advanced technical focus is asset evaluation, which requires tremendous geological and production analysis. I have had experience in drilling and production engineering, but my predominant technical focus is reservoir

analysis.

Q. And has your experience with geology included experience with hydrology?

A. It has. Additionally, as part of my graduate education, I've taken numerous courses in geology beyond my bachelor's, which included numerous courses in geology. I continue to take courses in industry and geology and petrophysics and things of that nature. I've worked on saltwater disposal wells, saltwater disposal projects predominantly in the last five years extensively.

MR. MOELLENBERG: And we would offer, then, Mr. Kronkosky as an expert in petroleum and reservoir engineering, geology and hydrology.

EXAMINER JONES: Any objection?

MR. BROOKS: No objections.

EXAMINER JONES: Any objections, Ms. Moss?

MS. MOSS: No objections.

EXAMINER JONES: Mr. Newell?

MR. NEWELL: No objections.

Q. (BY MR. MOELLENBERG) So, Mr. Kronkosky, are you familiar with the C-108 application that OWL has filed in this case?

A. I am. I have reviewed it.

Q. Okay. And could you describe briefly, just so

we sort of start on a foundation here, what that application by OWL asks for?

A. That application asks for a disposal permit -- a saltwater disposal permit for the Bobcat No. 1 SWD to inject into the Lower Yates and Seven Rivers Formation approximately within 100 or so feet of the existing Maralo Sholes B No. 2 well.

Q. And can you tell us your understanding of OWL's intentions with regard to the new well with regard to existing Maralo Sholes well?

A. My understanding is that this will be basically a replacement well to the existing well.

Q. And do you know why OWL wants to replace the existing well with the new well?

A. My understanding is the Commission has a finding that there is inadequate wellbore protection across the Santa Rosa and Chinle Reservoirs, freshwater reservoirs in the area, and that they would like that wellbore to be plugged and abandoned or remediated in some way.

Q. And I think you said "Commission." You perhaps meant Division there?

A. I'm sorry. The Division.

Q. Did you prepare a written report for this proceeding?

A. I did.

Q. And are you aware whether that's been filed with OWL's pre-hearing statement in this proceeding?

A. I believe counsel has filed that with the Division.

Q. Okay. And did you prepare that report, or could you describe how it was prepared and anybody else who contributed to it?

A. That report was prepared solely by me.

Q. Are you aware of any corrections or changes that you'd like to make to that written report?

A. Maybe apart from some grammatical errors, I think it's fine technically.

Q. Had you prepared any previous technical reports relating to the existing Maralo Sholes well?

A. I believe I prepared two technical reports. One was a preliminary geological evaluation I prepared, I believe, sometime in October of last year, and another one that was prepared, I believe, in the very first part of this year, maybe in January.

Q. Are there any -- as you can recall, any substantive or technical differences in those reports compared to the reports you've provided for this presentation or any different conclusions that you reached?

A. I don't believe that there are any different conclusions between the previous two reports.

Q. So is it fair to say the current report on file in this proceeding represents a full and complete discussion of your work at this site?

A. It is. This report -- the current report is just a more current report to reflect the findings from, I believe, April-ish of this year.

Q. In the course of your work and the preparation of your report, did you also review a report and recommendations prepared by Mr. Phillip Goetze?

A. I did.

Q. So we may want to refer to that somewhere in this discussion, but for now, you've considered and in your current report responded to do the work that Mr. Goetze discusses in his report of 2017.

A. I believe our June 1st, 2017 report tries to address Mr. Goetze's comments as best as possible. I think we've addressed most, if not all of them.

Q. So let's start talking, I guess, about some of the specifics of the proposed Bobcat SWD No. 1 well that OWL is asking to be permitted and is the subject of this examination. Could you describe and explain the formations or strata where the proposed new well is intended to inject fluids?

A. The proposed well is intended to inject into the basal Yates and Upper Seven Rivers sands of the Artesia Group.

Q. And how does that injection zone relate to the injection zone of the existing Maralo Sholes wells?

A. We believe they will be at the exact same intervals.

Q. So with your report --

MR. MOELLENBERG: And if there is anybody that doesn't have this to follow -- I think everyone has one now.

Q. (BY MR. MOELLENBERG) You attached a number of exhibits to that report. Do you have a copy of that there in front of you?

A. I have a copy.

Q. Okay. So I would like you to, starting with what's labeled as -- and I'm going to refer to it as Tab A.

MR. MOELLENBERG: Just for the record, I think we've identified the -- Mr. Kronkosky's report as OWL Exhibit 1.

Q. (BY MR. MOELLENBERG) And I'm going to refer to what's labeled as exhibits in that report just to avoid confusion as tabs. So turning to Tab A of Exhibit 1, could you tell us what that represents?

A. This is a nine-township area centered around the proposed well and existing well, the Maralo Sholes B No. 2. What we're looking at here is a lithological interpretation of the Upper Seven Rivers reservoirs. Yellow would be predominantly sand reservoirs. And there is a very light blue that is kind of hard to interpret, and that would be a combination of sand and shelf dolomites. The darker blue -- and this is as you go to the left or to the west. The darker blue would be dolomites -- shelf dolomites. And as we continue further on, we get into -- closer to the Seven Rivers shelf margin, which becomes potentially limestones and dolomites. And then as we get further out, it would be predominantly probably limestone in the Capitan Reef.

Q. And, Mr. Kronkosky, sorry to interrupt you. You are talking now about, are you not, the primarily the plan view map in the bottom?

A. I am talking about the plan view map. And the well location is the red dot, and the boundary that you see in black is the township of Jal.

Q. And what's represented in the bottom left-hand side, the red line and the blue dot?

A. The red line is the Jal Basin, which is a Cenozoic water reef -- water reservoir that the City of Jal uses for its freshwater supply. That's the

boundaries of that basin -- freshwater basin. The blue dot is, I believe, the area where they have their wellbores, and there is a black-dashed line depicting what I believe to be their pipeline to the city.

Q. And could you talk a little bit about the two figures at the top of this Tab A labeled "Figure 6" and "Figure 7"?

A. These figures are a cross section going across the Guadalupian Series, the Artesian and Capitan Reef. These cross sections are identified in a blue line going from the -- I guess it would be in the top left of the plan view map, and it's going from the southwest to northeast. This is a well-known geologic cross section that Harris and Saller did I believe in the late '90s, and those cross sections are identified above to give the interpretation of the carbonate build-ups that they prorated down into the basin during the Seven Rivers and Yates time.

Q. And you mentioned one of the authors of these figures. Is that the same author for all the figures, or did you prepare some of these?

A. These figures were taken directly from the -- the two figures at the top of the two cross sections were taken from Harris and Saller. I think it's '99.

Q. Okay. So could you briefly tell us the

importance of this exhibit with respect to this proceeding?

A. These cross sections depict the vertical and lateral equivalence of the Seven Rivers sands as they come on and lap up against the Capitan Reef margin. We would like to point out that the far well in this cross section to the right, the Davidson Federal, has a very, very small amount of Capitan Reef, and that's identified in the gray zone in the cross section on the left.

We are injecting into the equivalent of where you see the Yates lines -- the line below the Yates, in that cross section. Additionally, the injection well, the Bobcat well, is probably two or three miles further to the east and further into the lagoonal facies of the Seven Rivers in the Federal Davidson well. So it's in a more back-water environment.

Q. Is there anything else of importance that you'd like to point out regarding Tab A?

A. Not that I can think of at this time.

Q. Okay. So let's move to Tab B, and please describe what we're seeing here on Tab B.

A. Again, this is the same cross section -- I mean -- sorry -- the same plan view. We've just taken the lithology off. And what this is representing -- and

it's a little bit hard, but in a larger map, you can see it. But the colored symbols that you see are Seven Rivers and Yates injection wells, and they've been identified. There are approximately 3- or 400 Yates-Seven Rivers injection wells in this immediate nine-township area injecting into the Jalmat and -- I'll probably butcher the name -- Langlie Mattix Field.

The cross section at the top is identified on the map as the blue line kind of going north to south, and those are through known saltwater disposal wells.

EXAMINER JONES: Excuse me. Which -- the southern part of the cross section is equivalent to what part --

THE WITNESS: The one on the right. I'm sorry.

EXAMINER JONES: On the right.

THE WITNESS: On the right. So the one on the right is the southern well, and the one on the left is the northern well.

Q. (BY MR. MOELLENBERG) And at the top of Tab A, it looks like there are some plots relating to, perhaps, some specific wells. Can you tell us about those and what they show?

A. Those are the wells identified in the plan view

map as saltwater disposal wells. And we've hung this on a stratigraphic cross section I believe on the top of the Tansill. And the colored lines are the identified sandstone reservoirs, and the blues are dolomites -- shelf dolomites. The pink squares that you see are the actual injection intervals for those saltwater disposal wells. And I believe the basal line that you see kind of going down -- the southern line going west to east identifies the top of the Seven Rivers. So these wells are predominantly injecting into the very, very top, if not the base of the Yates.

Q. So these are a series of wells that are shown on this blue line on the plan view, but I think you mentioned maybe -- did you say 3- or 400 injection wells?

A. There are an additional -- on this map, it's a little difficult to see, but the producing wells are in gray that have produced in the Jalmat Langlie Mattix Field, and the darker-colored wells are the injection wells. And so you might be able to see a little bit -- to the north side of Jal, City of Jal, there is a large waterflood that's producing, and it's injecting into the Yates and Seven Rivers.

Q. So this large number of wells, is that a combination of waterflood wells and saltwater injection

wells, or could you describe what -- what the various wells, to your knowledge, are doing?

A. Probably the predominance of those wells are waterflood wells, but there are a number of saltwater disposal wells.

Q. Okay. And the Examiners are obviously familiar with waterfloods and what those are, but could you talk a little bit about that for the record?

A. So these fields have been producing since the late 1920s. And by the early 1950s, the Yates' and Seven Rivers' primary production had been depleted, and starting in about the '60s, several large operators and small operators started installing water injection wells, saltwater disposal wells and waterflood injection wells to perform secondary recovery for the residual hydrocarbons that were not being produced through primary production.

Q. Are waterflood projects still going on, or can you tell us a little bit about that?

A. Yes. Waterflood projects are still active in the area.

Q. And do you have some idea of what kind of volumes might be injected for those waterflood projects?

A. Offhand, I don't, but the water volumes are significant. I don't have a physical number for you.

Q. Okay. Is there anything else that you would like to point out to the Hearing Examiner about Exhibit B?

A. Not at this time.

Q. Okay. Or I'm sorry. Tab B.

Let's move to Tab C, and I'll ask you again to describe what we're seeing there.

A. So this is a structure map on the top of the Yates that was prepared back in the -- oh, I believe in the mid-1950s, and this shows producing wells in the Jalmat Pool. This map came from the Roswell Geological Society. They've published a series of field study books, oh, since the 1950s all the way until to the 1990s. This is a scanned copy of that.

The yellow area is what we've kind of identified as the project area around the injection well, which is identified in the blue dot, the Bobcat well. This is a structural feature that produced a significant quantity of hydrocarbons. And the production of that project area is identified above in the rate-time plot. I believe a more detailed example of that plot is in Tab F.

And what we've also identified is the approximate regional oil-water contacts and gas-oil contacts in the Yates and Seven Rivers, and those are

identified with an oil-water contact line of green in the Yates, an oil-water contact in the dashed green line in the Seven Rivers -- top of the Seven Rivers and a regional gas-oil contact at the top of the Seven Rivers in red.

Q. So there are a couple of other features here. In the lower left, there is -- at the top, it says "Type Radioactivity Log." Can you tell us what that represents and what the source of that information is?

A. That's a type well identified for the Jalmat Pool, and the blue-hatched box that you see is the proposed interval. And what you may notice is that the Jalmat Pool actually encompasses sands and dolomites lower than the proposed interval.

Q. And let me jump up to the top. There is another figure there which says "Bobcat SWD No. 1" at the top. What does that represent?

A. That is the -- that is our analysis of the production data from the 1970s to the current date in the project area, in the yellow-hatched area. And there is a more detailed example of that in Tab F.

Q. Okay. Is it better to talk about that in Tab F then?

A. Yes, sir.

Q. Okay.

MR. MOELLENBERG: Let me -- just for the Hearing Examiners, I know these are pretty small. If there are any of these that you'd like us to reproduce in a little larger format and make them a little easier to read, please let me know and we'll be happy to try to do that.

EXAMINER JONES: You know, we probably would need that for our records, if nothing else.

MR. MOELLENBERG: Okay. Very good.

Q. (BY MR. MOELLENBERG) Mr. Kronkosky, that's something we can maybe do here at a break or perhaps do it after the hearing.

EXAMINER JONES: Or even -- you know, you don't have to do it today. You don't have to do it today.

THE WITNESS: I can get you that sometime this week, if that's okay.

EXAMINER JONES: That's okay. Sounds good.

Q. (BY MR. MOELLENBERG) Okay. So let's move to Tab D, and I'll ask you, again, to discuss what this exhibit represents.

A. This is a structural cross section going west to east, but basically across the middle part of -- I believe it's Section 25, the section that the proposed well is in. It starts in, basically, the middle part of

Section 26 and goes into Section 30 of the township adjacent to the permitted well.

EXAMINER JONES: Are you on D?

MR. MOELLENBERG: We're on D, yes.

Q. (BY MR. MOELLENBERG) So you were describing the larger figure at the top?

A. No. That's the -- that's the -- yeah. The figure at the top is describing location only. The figure at the top is the structural cross section depicting the Yates and Seven Rivers in the wellbores in those three sections, and it also shows the approximate oil-water contact and gas-oil contact in those zones.

Q. So would you -- and tell me if this is the right exhibit or if there is a better one. So on this exhibit, could you talk in a little more detail about the injection zone of the proposed new well and how it relates to these various formations?

A. The existing well, the Maralo Sholes B No. 2, is the fourth well from the -- from the left, and the existing interval is injecting right at the top of the green area. It's proximal to the gas-oil contact but in the oil-water portion of the reservoir. The offset well would be very, very similar to that wellbore.

Q. And is -- are -- are we looking at that little red area or something different?

A. The dark red area, which you most likely see, is the actual production from the Yates that this wellbore did. The area that we're injecting into is actually a very faint red area actually below the bottom of that well log. So the well log actually did not cover the Seven Rivers because this is an open-hole condition.

Q. And did you talk about the two figures on the bottom of this page, or do we need to cover those?

A. We can talk about them. The lower figure, the plan view map, the blue -- sorry, not the blue. The green circles depict the oil production that has been produced out of these wellbores in this area, and the red is the gas production that has been produced.

To give a sense of scale, the well that is in the very middle portion where you see the A to A prime -- there is a large green circle there? That well produced approximately 750,000 barrels of oil. And to give you a sense of the gas produced out of some of these wells, the larger blue circles produced upwards of ten bcf of gas.

And what the Examiners should note is that there is a strong gas-oil contact that can be observed from this production. So this is Yates and Seven Rivers production. And you can see at approximately the

western boundary of Section 25, that is approximately the gas-oil contact for the Yates and Seven Rivers.

Q. And I may be getting -- asking you to repeat yourself a little bit, but, again, how does that oil-gas contact relate to the proposed injection zone?

A. The proposed injection zone will be slightly below the gas-oil contact.

Q. Okay. Is there anything else that you'd like to point out about Tab D?

A. Just on the figure to the right, that is a structural map of the Yates, top of the Yates, and what we can see is that there is a pronounced structural feature. It's an anticlinal feature that encompasses Section 25 that is responsible for the large amount of hydrocarbons that were produced in that section.

Q. So I would ask you now to turn to Tab E, and it looks similar to Tab D. But can you tell us what's going on in Tab E?

A. Again, this is a stratigraphic cross section hung on the top of the Tansill, and what we're showing here is -- and it's a little difficult. But there is a B to B prime cross section that goes from the north to the south through a series of injection wells, and these are injection wells that are injecting into the Yates -- basal Yates and top of Seven Rivers. In the cross

section itself, there is a dark blue line. That is the top of the Yates -- top of Seven Rivers. And the pink squares that you see are the injection zones for these wells. So you can see that they're injecting into the top of the Seven Rivers Formation. And it's approximately on strike with the permitted zone.

Q. Does that conclude your description regarding Tab E?

A. It does.

Q. And would you now move to Tab F? I think we may have seen a smaller version of this in one of the other maps, but tell us what this figure represents.

A. So this is a rate-time plot of the production in that yellow area that you saw on -- I believe it was Tab -- Tab C. We've aggregated the production data. Digital production data that we've been able to find only exists through 1970. Production has -- hydrocarbons have been produced in this area since the late 1920s. And we've got historical cumulative numbers prior to 1970, and we've summarized those at the top in the worded text.

So prior to 1970, approximately 8 million barrels have been produced out of this project area, along with 40 billion cubic feet of gas and approximately 14 million barrels of water.

After 1970, approximately 2 million barrels were produced and 70 mcf of gas, which gives us -- I guess another thing to point out is that current production in this area is pretty much subcommercial. There are very few barrels a day being produced out of this wellbore, and that's identified basically since the mid-1990s. There's been very limited oil and gas produced out here. Most wells out here produce something less than half a barrel a day and maybe 5 or 10 mcf of gas a day.

Q. So, Mr. Kronkosky, is this some of the information you used to evaluate the reservoir characteristics and geology in the area?

A. It is.

Q. Anything else generally that you'd like to say you used -- you used this information for?

A. This information was used to study what type of reservoir was producing out here. It's a solution gas drive reservoir. As I said, it's been producing for a very, very long time, since the late 1920s, and it was depleted by about the 1950s.

Q. What is the relationship between the production history that you've talked about, and why is it important for this application and for the Hearing Examiners to consider?

A. I believe Mr. Goetze had made a comment about correlative rights impacts on an offset wellbore. And what we've studied is we've studied the offset production to see if the existing wellbore had potentially impacted the production in this immediate area, and we observed no impact to production. The gas has been on steady decline since, it looks like, the early 2000s. That trend has not changed. The oil production has not changed as well. There is a substantial amount of void space in this reservoir caused by the gas reservoir being depleted. The existing wellbore is basically just filling up that void.

Q. Aside from what you've already talked about, is there anything else you'd like to point out to the Hearing Examiners regarding the geology and reservoir characteristics and such of the project area?

A. Not that I can think of at this time.

The only thing I would point out on this plot is we have taken water production data that goes back into the 1970s, along with injection -- injection history. There are several injection wells that have been injecting since the late 1960s in this area. The injection is identified in the very dark blue line. The water production is identified in the dashed -- light

dashed blue line.

And what's interesting to note is that the injection and water production is almost exactly the same, which leads me to believe that there was no waterflood taking place, as makeup water would have to have been injected into this reservoir to replace the approximate 10 million barrels of hydrocarbons and 90 bcf of gas that had been produced. So the water was just cycled. So as soon as they produced the water, they injected it.

Southwest Royalties, if you'll note, in the mid-1990s, that big jump in water production and injection, they instituted either a pressure maintenance or some kind of waterflood and installed some submersible pumps into some offset wellbores. And they didn't have -- they had limited success. You can see that the oil jumped up and the gas jumped up, but there was not enough reservoir pressure to substantiate a waterflood.

Q. So you mentioned reservoir pressure. How does the reservoir pressure change over the history of -- you talked about?

A. So initially the reservoir pressure in the 1920s was approximately 1,400 psi, which is very close to the gas saturation pressure -- oil-gas saturation

pressure of the oil that was produced out here. And so initially there was a large gas cap that was out here that, over time, as they produced the oil, the gas evolved from the oil into the gas cap and provided pressure support, which led to these wells being highly productive. In the late 1940s, mid-1950s, operators blew down that gas cap, which caused the reservoir pressure to substantially decrease so that by the late 1950s, the bottom-hole pressure in the Yates and Seven Rivers in the permitted interval was down to only 1- or 200 psi. So it was extremely depleted.

Q. And why is that important with respect to OWL's application?

A. It's important because it explains the reason why these wells inject at particularly high volumes. The reservoirs themselves are highly permeable, and they're extremely depleted, which causes the fluid to enter the pore space very rapidly.

Q. You may have already covered this when we were talking about the exhibits, but -- and if you think you've covered it adequately, we can move on. But could you talk a little bit about the type of reservoir that was there in the Jalmat Field?

A. The type of reservoir is -- it's basically -- the productive interval is in the Yates and Seven Rivers

sands. They produce predominantly from the clean sands that are in those reservoirs. The carbonates in this area are tight. They have -- the dolomites themselves are predominantly anhydrite-filled, and so they are almost practically impermeable. And so most of the hydrocarbons and water are going into those reservoirs.

Q. And, again, why is that important to this application?

A. It shows that the fluids are entering into zones that are in, basically, isolation. The fluids are not migrating vertically. They're moving in a horizontal component.

Q. Did you look at the history of produced water production from the field in the project area?

A. I did.

Q. And what did you find out about the produced water production?

A. So the produced water out here -- initially, these wells did not produce water, which is to be expected because they're so high on the structure. They're 3- or 400 feet above the regional water contact, and so the water itself is near residual saturation.

As they produced the field and predominantly blew down the gas, the reservoir depleted rapidly, and there was some very minor water

encroachment from the oil-water contact into some of the wells on the extreme western edge. That produced water was then reinjected into the saltwater disposal wells that were permitted in the late 1960s. And it was predominantly just water recycling. As they produced water from the downdip wells, they reinjected it. There was no real waterflood taking place.

Q. So what would that tell you about water that has been present and water that might be currently present within the reservoir of the project area?

A. It tells me that there was really no producible water in the project area initially in the permitted interval, and any water that is being produced or that was produced was from slightly downdip. And it's just due to natural compressibility. It's just the -- as the relaxation and pressure happened further to the east, the water expanded just due to compressibility and just encroached into some oil downdip and -- water near the oil-water contact.

Q. Did you do a calculation of the reservoir pore space that was occupied by the oil and gas in the produced area?

A. I believe I did. And I think it's identified on page 4 of the report.

Q. Could you talk a little bit about those

calculations and the reasons you used to get there and what your result was?

A. We took the aggregate production that had been produced in the project area, and then we looked at the reservoir fluid properties that had been reported for this field through filings at the Division in their annual filings and came up with a formation -- gas formation factor that's identified as BG of .00174. That was then used to figure out how much pore space the gas that was produced in this area occupied originally, which was 74 million barrels of pore space -- hydrocarbon pore space.

The estimated pore space of the oil was, again, estimated from the oil formation volume factor that had been reported for the field, and that is estimated to be roughly 11.9 million barrels of pore space at reservoir conditions.

Q. And how do your calculations that we just talked about relate to the proposed injection of fluids into the zones as OWL has proposed?

A. Maybe can you rephrase that just a little bit? I think I kind of know where you're going with it.

Q. Well, tell us why your pore space calculations are important as it relates to this application?

A. This pore-space calculation gives an example of

the amount of makeup water that would be required in the project area to establish a waterflood. So the gas that was originally there would have -- would have to be compressed into a single-phase system before a waterflood would work, and that's the reason why a waterflood has never been effective in this area, is because the pore space was blown down; the gas was removed. And so that pore space would have to be filled in with some kind of makeup fluid, whether it be gas or water or what have you. And it would be roughly 85- to 90 million barrels of fluid that would have to be reinjected in the immediate project area to establish some kind of waterflood.

Q. Does the information that you just talked about regarding -- and I would say both previous efforts for waterflood and your calculation, how would that relate to the issue of impacts on correlative rights with respect to the proposed injection?

A. I don't believe that -- you know, given the amount of void space that currently exists in the reservoir, there are no correlative rights impacts to adjacent owners. There would have to be a substantial amount of fluid injected into this reservoir before any kind of hydrocarbon response would be -- would take place. And if the hydrocarbon response were to take

place, I believe it would be beneficial to all owners in the immediate area.

Q. So let me -- let's go ahead and do these in order. Would you turn to Tab G now of your report? And it looks like there is a Chart A and Chart B there, and tell us what -- what these figures represent.

A. These are figures that were prepared by Mr. Ben Stone that looked at the water production from 2009 until March of this year. And it was created to address Mr. Goetze's concern raised about correlative rights impacts to the -- I believe the Maralo Sholes B -- B No. 1 -- I'm sorry -- B 25 No. 1. Mr. Goetz had made a comment that this particular well had made a substantial spike in water production. And you can see that in September of 2015 -- September of 2015, the blue line spikes to approximately 10,000. And that's in Chart A.

And then I believe in Chart B, Mr. Stone is making comments about reporting errors. We have since reviewed the production filing for that particular well, and those spikes have been amended by the operator. They are no longer present. They must have been a reporting error.

Q. So the information in these charts, is it correct to say that they show both the original water -- produced water generated from these wells and then the

corrected figures?

A. I don't believe that these show the corrected figures. I believe the corrected figures are on the Division's Web site. I think what Mr. Stone was trying to address here was that they were reporting errors at the time. The amended filings, I believe, have just been filed.

Q. Is there anything else that would be important to talk about or that's presented in your report on historic injection into the reservoir within the project area?

A. I guess can you rephrase that a little bit better?

Q. Yeah. Let me just do this a little bit differently. Let me have you turn to Tab H and tell us what that represents.

A. Again, this is the Yates structure map that was prepared in the mid-1950s as a field study for the Jalmat Field at the Roswell Geological Society. And what we've identified here is a number of approved saltwater disposal wells that have been injecting from the mid to late 1960s. Those are identified with the blue dots and their associated filings and dates in the yellow with the black letters to them. The proposed well is identified in the red dot, along with its

proposed injection interval on the top well, identified in red.

Q. And, Mr. Kronkosky, we're talking about the single red dot toward the bottom of that figure --

A. That is correct.

Q. -- as opposed to the red ones above?

A. The pinkish-colored ones to the top are the Skelly Jal water supply that was Capitan water supply field that was used for industrial purposes to supply makeup water to oil and gas fields in the Jalmat Langlie Field, along with fields further on into the Central Basin Platform into Texas. Significant volumes of water were produced out of those, those wellbores starting in the 19- -- I believe 1960s.

Q. And are those -- is that field still producing water?

A. To my knowledge, it was formally and officially plugged out in, I want to say, the mid-2000s by Chevron, so I don't believe it's producing water anymore.

The green dot to the south is a -- is a Capitan water supply well for EOG, and it's identified in green. I don't know if it's producing, but I believe that they're using that as a --

EXAMINER JONES: Can you point that out?

THE WITNESS: It's on the north-south

compass roads (indicating), right in the middle part.

EXAMINER JONES: Thank you.

THE WITNESS: It offsets the Jal Southwest Capitan Reef observation well by the USGS. I believe it's approximately one mile to the west, and I believe it was just approved in the latter half of 2015. And I believe it's to be utilized for makeup water for their frac jobs going on in the Red Hills area in southeastern New Mexico.

Q. Did you take a look at the -- at the reported water quality for the waters in the systems that you were just talking about?

A. I did.

Q. And is that presented in your report?

A. It is. It's presented in my report. The water quality for the Skelly Jal water supply, the pink wells, is identified in Tab M and in Tab N, and the water quality for the EOG Capitan water supply is identified in Tab O.

Q. Could you give us just a quick summary of that water-quality information?

A. The water quality in the Capitan in those water supply wells is -- exceeds the drinking water standards. The total dissolved solids in the Skelly water supply are identified at 22,624. Additionally, the water

produces a significant quantity of hydrogen sulfite gas approaching the lethal threshold.

In Tab N, we've also identified the particular wellbores. And these are from filings with the Division, and we've identified items that the Division should take into consideration, namely that the operators identified this as basically black, salty, heavy oil-cut water. They've identified that they've corrosion problems with this water, and those are identified in the wellbore schematics. The submersible pumps that they installed into these wells had to be replaced quite regularly, almost on the order of every six months just due to corrosion.

Additionally, the operators made comments that they produced hydrocarbon gas with these -- out of the water, which led them to either dispose of that gas, or they had to figure out a way to sell the gas, as they did not own the rights to the gas.

Q. And, again, we're talking about the Skelly Jal Water System?

A. That is the Skelly Jal. So Tabs M and N relate to the Skelly Jal water supply, in pink.

Q. And just to -- I'm sorry. Just to clarify, this system was never used as a municipal water supply?

A. To the best of my knowledge, it was never

utilized as a drinking water source.

Q. Sounds like that would not have been a very good idea.

A. I don't believe it would.

Q. Is there anything else that we should cover regarding Tab H of your report?

A. I would just like to point out that Exhibit O is the EOG's letter that they received from the State Engineer's Office relating to the water quality from that wellbore. And, specifically, this is, to the best of my knowledge, the most recent water-quality analysis that's been done in the Capitan, in the immediate area, and the State Engineer's Office has agreed that the water quality has total dissolved solids in excess of 10,000 and made the comment that it's 13,298. And they've reviewed this water-quality report.

MR. MOELLENBERG: Mr. Hearing Officer, are we doing all right, or should we --

EXAMINER JONES: You're doing good.

MR. MOELLENBERG: Do you want to wait until lunch to take a break? I wanted to make sure everybody's doing all right.

EXAMINER JONES: Is everybody okay?

MR. BROOKS: Yes, sir.

MS. MOSS: When are you planning to take

lunch?

EXAMINER JONES: Well, I should have asked you originally, but 12:00, or a good break time between witnesses is what we usually kind of shoot at.

EXAMINER WADE: How much longer on this witness?

MR. MOELLENBERG: I would say we'll probably get fairly close to 12:00 with the direct.

EXAMINER JONES: If you're going to get close to 12:00 with him, we can take a five-minute break right now and then finish him up and go to lunch.

MR. MOELLENBERG: Okay.

(Recess, 11:12 a.m. to 11:24 a.m.)

EXAMINER JONES: (Indicating.)

MR. MOELLENBERG: Thank you, Mr. Hearing Examiner.

Q. (BY MR. MOELLENBERG) Mr. Kronkosky, we've been covering a lot of pretty technical stuff here. As we start our discussion, I thought maybe I would take a little bit of a step back and just have you kind of give a general description to your approach in terms of researching relevant information of the site and evaluating it and putting your report together.

A. So my approach to tackling any kind of, you know, technical project, especially in areas that I may

have not worked extensively, I always start with a very detailed literature review, try to spend a significant portion of time finding literature, geologic literature, reservoir literature, all of the societies, the APG, Society of Petroleum Engineers, things that are on the Internet, along with going to public libraries. I have access to the Texas Tech University Library to do a lot of detailed literature review.

We've tried to pull all of the available literature that we could find in this area on the Capitan Reef, on Seven Rivers, Yates. We've pulled the literature that Mr. Goetze has identified in his reports. We've reviewed it. We then assemble as much publicly available information as we possibly can get our hands on through online data vendors, drilling info, IHS, state filings with the Division. We try to do an exhaustive effort in all of our projects.

Q. Thank you.

So let's jump back into the nitty-gritty details again. Let's talk a little bit about your evaluation and calculations concerning the projected radius of influence of the proposed injection. Could you maybe turn to and identify where that's discussed in your report?

A. That is identified in Tab K, and it's

identified for the existing wellbore for the Maralo Sholes B No. 2. We performed a pressure transient uncertainty analysis for that wellbore I believe in our January filing, the final report for that particular well -- for the existing wellbore. And this does some Monte Carlo simulation regarding various reservoir parameters, permeability, reservoir thickness, porosity and things of that nature. It was all done through a programming language called R to do our statistical analysis. And it uses well-known pressure transient calculations, the Matthews and Russell 1967 calculation, and that's identified through that equation right there to calculate the pressure at radius and various times.

We've simulated the various reservoir parameters, and those are identified in histograms on page 2.

MR. BROOKS: Excuse me. Is this in your report, or what tab?

THE WITNESS: It's Tab K.

Q. (BY MR. MOELLENBERG) And is there a corresponding text that goes along with this, too?

A. I believe I may have addressed it in the text as far as maybe radial influences and things of that nature, but this is more of a detailed analysis that kind of stands on its own, that can be read through and

figured out how we came up with our analysis. And Mr. Goetze's comments in his March report address this.

EXAMINER JONES: We need to admit, at some point, Mr. Goetze's March report as maybe an additional exhibit.

MR. BROOKS: It's one of our exhibits.

MR. MOELLENBERG: I was going to say, we could do it now, but if it's one of your exhibits, unless I need to refer to it --

MR. BROOKS: Well, it's the Examiner's pleasure.

MR. MOELLENBERG: Right.

EXAMINER JONES: As long as it's somewhere in the evidence.

MR. MOELLENBERG: Right.

EXAMINER JONES: And if you refer to it -- if it's theirs, if you refer to it as Exhibit K of the Division's --

EXAMINER WADE: Is it currently an OCD record? Is it correspondence?

MR. MOELLENBERG: It is. I believe it's in the file on SWD-1127.

MR. BROOKS: I don't know where it is.

MR. GOETZE: May I?

EXAMINER JONES: (Indicating.)

MR. GOETZE: It's both in the well file and, in particular, an SWD order, so it is available publicly.

MR. BROOKS: There are also -- there is an issue with our exhibit, though, because our exhibit -- there are figures attached to the original document, which I have, but they're not in the exhibit book attached to that report.

MR. MOELLENBERG: Okay. So I'll tell you what, it may be duplication, but if we talk about it specifically, I'll introduce it and --

EXAMINER JONES: Thank you. That sounds good.

Q. (BY MR. MOELLENBERG) So let me have you talk a little bit about -- I think we were talking about Tab K and the --

A. Radius of influence.

Q. -- and the radius of influence. I was getting to that part of it.

I'll tell you what, why don't you walk us through Exhibit K? And I think that gets to the radius of influence calculations; is that right?

A. Sure. It does.

Q. Okay. And if you've already covered part of it, you don't need to repeat it. But let's just walk

through it?

A. So on page 2 are the histograms of the simulated parameters, permeability, formation thickness, porosity and total compressibility of the formation. Those parameters were then utilized in the Matthews and Russell calculations to calculate pressures at various radial extents with time.

In the bottom half of page 2, we do a calculation on the near wellbore reservoir pressure estimates at the time when the Maralo Sholes B No. 2's injection survey took place, I believe in the early part of December. And the near wellbore pressure during that survey -- when this survey took place was approximately 1,000 psi.

On page 3, we do a series of calculations to calculate the reservoir pressure caused by injection -- the historical injection on that existing wellbore at the half-mile area of review boundary, and then we have a median pressure increase of approximately 300 psi.

Now, remember, the reservoir pressure in this reservoir at the time this well started injection was extremely low. It was on the order of 1- or 200 psi, maybe even less.

Q. So these calculations, if I understand them,

are based on the existing Maralo Sholes?

A. They are. They are the existing, and they relate to the proposed well, as the parameters would be the same. So it would be -- the five-year estimate that we do in this, I believe, would be a similar calculation.

Q. Can you identify any potential differences in how you would do the calculation for the new well versus the existing well?

A. I don't believe that I could -- I would calculate the area of influence the exact same way for this particular permitted well.

Q. And did you use some specific information for the existing Maralo Sholes well to do this calculation?

A. We did a detailed literature review. And in that detailed literature review, we observed in Hiss' 1975 dissertation that a Seven Rivers well located approximately a half a mile from this particular well had a core analysis permeability of 350 millidarcies. And based upon the injectivity of the existing wellbore and the observed pressures, we believe that the existing permeability in the reservoir is easily 350 millidarcies, if not in excess.

Q. So have we covered everything we need to up to page 4 of Tab K?

A. I believe.

Q. Okay. So tell us what we're seeing on page 5, at Tab K, with the big blue dot.

A. The big blue dot is a simulated perturbed area of the injected fluid as of 12/2016. The small pink circle that you see is the half-mile area of review, and the larger pink circle is the two-mile radius that is centered on the existing well. And as you can see, the color feathers as it radiates away from the well. That takes into account the uncertainty of where that fluid may exist.

Q. And, again, this would represent, if I'm understanding it right, the history of injection into the Maralo Sholes well up to this December time period?

A. It takes into account the injection that took place from 2008 until the end of 2016.

Q. Is there anything else we need to talk about on page 6 of Tab K?

A. I believe that this is just an estimate of the reservoir pressures at various radial boundaries five years out into the future if the discussion of injection took place. So five years from the end of 2016, if the Maralo Sholes had been shut in, we would anticipate that the reservoir pressure approximately one mile from the wellbore would have been increased by 62 psi.

Q. So if we've covered everything up to there, let's turn to page 7, and tell us now what's the difference we're seeing here.

A. Page 7 is the area of influence, again taking into account uncertainty, five years into the future of the Maralo Sholes well and assuming that injection stayed constant at, I believe, 18,400 barrels a day, which I believe at that time was the average injection of OWL in, say, 2016. So that's a forward project.

Q. And, again, how would this relate then to a projection of the radius of influence as it relates to the Bobcat well if it's permitted?

A. I believe that the Bobcat well would have a similar radius-of-influence calculation. Again, we would utilize the similar technical analysis to determine that as well.

Q. Okay. Is there any other comments you'd like to make with respect to Exhibit K -- or Tab K?

A. Just that this was regarding the existing wellbore. I believe Mr. Blandford will provide a more detailed analysis regarding the permitted well. And I believe that Mr. Blandford has utilized a -- we've consulted back and forth about the utilization of reservoir properties and parameters, so we've come to an agreement as to their values.

Q. So what we've just been talking about with Exhibit K is largely a horizontal? Looks like the maps are, in the plan view, largely a horizontal radius of influence. What -- what do you know about potential vertical migration of the injected fluids in the existing well and then the new well?

A. OWL ran a series of -- they ran two production logs in the existing wellbore, I believe, in the early part of October of 2016 and in the early part of December of 2016. And those production logs looked at where the injected fluids were being injected into, the injected interval. And we've reviewed those injection profile surveys, and we observed that 100 percent of the fluid is entering -- or is exiting the wellbore in the approved permitted interval.

Q. And is there anything to add in that regard with respect to the new well?

A. We believe that the injection surveys that were performed on the existing wellbore would be very, very similar. We would observe that all of the fluid would be entering the approved permitted interval just given the fact that the reservoir is at a very low pressure compared to the reservoirs below them. And so the preferential flow is into the low perm- -- high permeability to the low pressure sandstone reservoirs.

Q. So just to clarify, then, the information in Exhibit K, particularly the future projections of the radius of influence would be applicable, in your view, to the proposed new well?

A. That is correct.

Q. And similarly, what your -- well, I guess I'll just ask you to summarize what you're projecting about vertical migration of fluids with respect to the new well.

A. I believe that the likelihood of vertical migration is extremely slim in the new permitted well.

Q. And, again, as I think as you mentioned, some of this is addressed in Mr. Blandford's analysis?

A. I believe it is.

Q. Let me jump back to Exhibit -- well, let's see. I think we have spoken about Exhibit I. Is there anything else in Exhibit I, which looks like an EOG Resources document, that you would like to mention? And I would specifically refer you to some highlighted language, if you'd like to talk about that.

A. This is a detailed reservoir study that was done by Worley & Parsons for EOG regarding the Capitan water supply well that we identified in previous exhibits. And we pulled information from this report and utilized it, along with supplementing other

literature, to look at reservoir properties, to look at their interpretation of the geology in this particular area. And I'm trying to see if there is anything -- they have a really good write-up on the water supply fields in the Capitan Reef on page 10 of their report. Again, they make note of the poor water quality in the Capitan Reef, and they also make note of the substantial volumes of water that were produced out of the Capitan Reef since the 1960s.

Q. Does that conclude what you'd like to say about Tab I?

A. I believe it does.

Q. So let's move to Tab J. And I suspect this may relate to something we've already talked about, but tell me what we're seeing in Tab J.

A. In Tab J, we're showing a cross section of the two production surveys that were performed on the existing Maralo Sholes B No. 2. The production survey on the left was the survey that was done September 2nd of 2016, and the one on the right was the December 2nd survey. In the survey on the left, the tools set down approximately 50 feet high to the base of the permitted interval, and that's denoted as fill.

The Division requested that OWL clean the wellbore out and rerun another production log, and that

is what was run. And that is depicted on the right survey. And what we observed is that all fluids are entering the approved permitted interval.

And we see that there is a strong vertical boundary at the base of the wellbore that is depicted in the red line that goes down the cross section. That is the temperature survey. And what we observed is that the temperature is pretty consistent across the permitted interval and rapidly increases as it goes to the base of the cleaned-out portion of the wellbore. That is a strong indication that there are no injected fluids entering the formations below the base of that survey.

Q. So I think we might have talked about this a little bit a minute ago, but is there anything you would have to add regarding the reports of this information as it relates to the application for the new well?

A. I believe that the -- that this survey shows that there are several thick Seven Rivers sands that are lateral extensive. We observed these in the well logs. We've reviewed well over 100 well logs in this immediate area, and these sands are extremely correlatable across extensive areas. And we observed that the fluid is predominantly entering those sands. The dolomitic carbonate reservoirs, you can see them identified in the

green where the percent of fluid is very low, less than 10 percent. Those are extremely tight carbonates. And those carbonates are lateral extensive as well, and they serve to provide vertical migration barriers throughout this portion of the Yates and Seven Rivers.

Q. So, again, this is about the testing of the existing well; is that correct?

A. That is correct.

Q. Okay. Does your exhibit show the full report on that testing?

A. No. The well log goes further up. We've just cropped it to the zone of interest, if that's what you're asking.

Q. Okay.

MR. MOELLENBERG: Let me go ahead and introduce Mr. Goetze's report of March 15th, because I think it contains a little additional information on the testing that's not in Mr. Kronkosky's report.

And do you have that available to you, or should we get you some copies of that?

EXAMINER JONES: Right here (indicating)? Is that it?

MR. MOELLENBERG: It's the March 15th report.

EXAMINER DAWSON: Yes. That's the -- no.

It's June 1st.

MR. MOELLENBERG: June 1st. Okay. That's the -- that's Mr. Kronkosky's report. I'm jumping back to Mr. Goetze's report that we talked about earlier.

EXAMINER JONES: Yeah. So you're going --

MR. MOELLENBERG: I'm going to go ahead and have Mr. Kronkosky talk a little bit about that.

Rikki, do you have copies of this?

MS. CHAVEZ: Yeah. It'll be Number 4 -- Exhibit Number 4.

Q. (BY MR. MOELLENBERG) So, Mr. Kronkosky, I've given you a copy of what's been marked as Exhibit 4, so OWL Exhibit 4. And it's -- well, tell us -- tell us what that is.

A. This is an analysis by Mr. Goetze and his summary opinion of the Maralo Sholes well. Mr. Goetze made a series of comments in this report, and we addressed those comments in our June 1st report.

Q. So, Mr. Kronkosky, does Mr. Goetze's report contain a more complete set of results regarding the testing that OWL did on the Maralo Sholes well?

A. I believe he had reviewed the production logs that were run in September and in December.

Q. Okay. Are those over to your right there?

A. The September log is, and the December log is

here as well.

Q. Okay. We talked about this information in Tab J of your report, right?

A. No. We talk about -- is this regarding his opinions?

Q. No. I'm really just working on document stuff right now --

A. Oh, okay. Sure.

Q. -- getting us all on the same page.

A. Correct. These are just -- the exhibits in J are just snippets from the full complete logs. We're just looking at the basal portion of the -- the interval of interest. The log goes way up high, and we're not concerned with that because there is nothing being injected uphole.

Q. So is there anything really of interest in the complete set of production logs that -- that we ought to talk about, that you'd like to point out to the Hearing Examiners?

A. Nothing of particular interest. I think it's pretty much addressed in Tab J.

Q. Very good.

Okay. Now, we've been talking -- we've bounced around a little bit, but we were talking earlier regarding your assessment of the radius of influence of

the Maralo Sholes well, as well as the proposed new well. Do you recall that?

A. Yes, sir.

Q. And in Mr. Goetze's report that's now in as Exhibit -- or now is marked as Exhibit 4, does he provide some comments on your assessment?

A. Mr. Goetze makes a series of comments regarding the assumptions that we utilized in determining the area of influence.

Q. Did he make a comment as it relates to preferential flow direction with regard to the injected fluids?

A. I believe he did. Yes, sir.

Q. And have you done some additional work after reviewing that comment and given some additional thought and assessment to that issue?

A. We've taken Mr. Goetze's opinion into consideration, and while we agree that there likely exists preferential flow directions in all of these reservoirs, given the volume that's injected, though it may sound like a substantial amount, it is adequate to assume that the parameters remain constant over this small area. We're talking about areas that are a mile or two mile in radius. There just doesn't exist any publicly available data to create reservoir simulation

models to quantify how this fluid would migrate due to directional permeabilities and things of that nature. So we've modeled this as a homogeneous and isotropic reservoir.

Q. Now, did Mr. Goetze also raise some comments that you looked at regarding changes in Capitan Reef water levels?

A. Mr. Goetze did make a comment regarding his understanding from, I believe, a Lewis Land report that Class 2 injection in the immediate vicinity was responsible for the rise in Capitan Reef Aquifer throughout time.

Q. Are you in agreement with that, or do you have a different assessment of that issue?

A. I believe -- I have a different opinion than Mr. Goetze regarding the rebound and water levels regarding the Capitan Reef. I believe that the rebound and water levels can be appropriately described by just the cessation of production. So initially there were water supply fields to the north of our area and water supply fields south of our area, and these fields produce significant quantities of water throughout that same -- upwards of 70-, 80,000 acre-feet a year. And that drew the aquifer water levels down several hundred feet.

When we look at what the water level would be when those fields stopped pumping, we find that the water levels are approximately what we would expect and observed in the Jal Southwest No. 1 observation well. And we've made calculations to that effect in our report, and I believe they are on page 8.

There is a section titled "Volumetric Capitan Aquifer Recovery Estimate." And we look at the water that was produced out of the reservoir and estimate what the water level would be once these fields stop producing produced water, and they align very closely with the observation well. And I believe Mr. Blandford has made a more detailed calculation than ours, and he may provide testimony to that.

Q. Is there anything else you'd like to discuss on that topic?

A. Namely being?

Q. I don't have anything in mind. Just wondering if we've missed anything.

A. Just that from what we've observed in the filings and in the production histories of some of the secondary recovery projects that are taking place along the Jalmat trend, we observed that there was not a lot of makeup water injected into these fields, and so they were kind of like a water-recycling project. And in

order to provide a rebound in the aquifer, which Mr. Goetze contends, there would have to be makeup water. So there would actually have to be water put into the reservoir, and we just don't observe in the record where this makeup water would come from. The fresh water that's out here is in limited supply and limited rates. And so it just doesn't make sense for the water to be makeup water.

Q. Did you perform a statistic PTA regarding the proposed well injection?

A. Not the proposed well, the existing well.

Q. The existing well.

A. Yes, sir.

Q. Would you tell us what that is and why it's important to the application?

A. I believe that in any kind of analysis like this, it's really good to take an uncertainty into account, and what we've done is assumed how the radius of influence and pressure would behave given a series of assumed values for these reservoir parameters. So we've modeled those in a Monte Carlo simulation -- analytical simulation. And that's just to give a better understanding of where this fluid may be and at what pressures they may be.

Q. Could you give us your overall assessment of

your view regarding the potential for saltwater from the proposed injection to impact the Capitan Reef Aquifer?

A. In our opinion, the likelihood of saltwater disposal impacting the Capitan Reef is very limited. The reason we make this judgment is we've observed that throughout time, the aquifer has remained at substantially higher head levels than the reservoir itself that's been produced. And if there was communication or even strong communication or even weak communication, that head would be transmitted into the productive zone. We do not observe that. Therefore, we say that the likelihood of Capitan Reef communication is not likely.

Q. Have you also looked at water qualities regarding the Capitan Reef in the vicinity of the project area?

A. We have. We've reviewed the best available literature that we could find on water quality in the Capitan and in the Yates and Seven Rivers, those zones.

Q. Okay. Could you turn to Tab L of your report and tell us what that represents?

A. Tab L is our summary analysis of total dissolved concentrations for, on this particular page, all formations combined in the Artesia Group series, along with a -- there are various percentiles, so you've

got total dissolveds in the various percentiles of those fluids, along with the sections that they're in. That's the average total dissolved concentration by section for all formations.

The next two pages delineate it with regards to the various formations. This information comes from the USGS Open-file Report, 1975-579. That's a Hiss 1975 report. And, additionally, we provided scanned copies of this report, and we believe this to be the most accurate and available information on this.

Q. So the scanned copies of the Hiss report that you refer to, those are the rest of this tab?

A. Yes. We've tried to identify all the samples that we included, and these samples are from the nine-township area. So it's one township north of our proposed location and one township south, and then a township to the east and a township to the west. So it creates a nine-township area. So all of the samples are identified in the orange highlighting, and we've included those in a spreadsheet and did our statistical analysis from that.

Q. Would you turn to Tab M and tell us what this represents?

A. That is the Skelly Jal water supply well No. 2 water-quality sample report. It identifies the various

concentrations and the total dissolved solids of the Capitan Reef water, along with the hydrogen-sulfite content that we've identified.

Q. And why is that important?

A. It shows that the waters coming out of the Capitan Reef are mineralized to a degree that is about 10,000 parts per million.

Q. And given all of this data, how did you assess that and reach the conclusion that you just stated?

A. We reviewed, like I said, what we believe to be the most accurate and available information. We looked at the statistical analysis, and we find that the waters in the Seven Rivers and Yates are mineralized to a degree that's well above 10,000.

Q. Would you turn to Tab N, N, as in Nancy, and tell me what that represents?

A. Again, these are filings that were with the Division in their well files. And we've identified the particular well and the page that it came from for the Skelly Jal water supply. And we're calling to attention comments raised regarding water qualities. And on the first particular page, it regards comments on salty, sulfur water, oil-laden. On the next several pages, there are comments in the well files that show submersible pump failures on the order of every six

months in these wells, which leads me to the conclusion that the water is highly corrosive in nature. There are also maybe some comments on chlorides. Additionally, towards the back of this particular exhibit, there are comments regarding hydrocarbons that were being produced out of the Capitan Reef water.

Skelly did not own the mineral rights to this water, and, therefore, they had to dispose of these hydrocarbons. They either sold them through -- I guess the corporation either owned them, or they just flared them. But there were hydrocarbons that were produced with this water.

Q. I'd like you now to turn to Tab O and tell us what is in that tab.

A. This is a letter from the New Mexico State Engineer's Office regarding EOG's Capitan water supply well permit, approving it. In that letter, the State Engineer makes note that they have reviewed the water sample provided by EOG and found that the total dissolved concentrations of their water was in excess of 10,000, and their water was a total dissolved concentration of 13,298.

Q. And finally Tab P, tell us what we're seeing there.

A. May I make another comment on Tab O?

Q. Absolutely.

A. In the back of that, there was an email that we found in the files that we would like to call attention to, that EOG made a comment to the State Engineer's Office that they would be moving their submersible pump due to water quality. So in our opinion, that email provides further evidence of the corrosive nature of this water.

Q. Anything else to offer on Tab O?

A. No.

Q. So let's move to Tab P.

A. Tab P is an Open-file Report prepared by Lewis Land titled the "Overview of Fresh and Brackish Water Quality in New Mexico." This report was released in June of 2016. I believe it's the most recent analysis of fresh and brackish water quality in the state of New Mexico. This is just a small excerpt of that report. We've only pulled out the pages regarding the Capitan Reef water, and we have highlighted specific comments that Mr. Land provided regarding the Capitan Reef water. And those are identified in the yellow highlighting.

Q. Is there anything of note that you'd like to specifically call out in the highlighted portions to the Hearing Examiner?

A. We'd just like to specifically note that

Mr. Land specifically mentions and notes that the water quality in the Capitan Reef is not a brackish water reservoir. It is a brine reservoir and has total dissolved concentrations in excess of 10,000. He also makes comments that the average total dissolved concentration is 54,000 parts per million.

Additionally, he makes comment that the water is not a potable water source even under conventional desalination water technologies and that its real purpose is predominantly industrial purposes, either used in the potash mining industry or in the oil and gas industry as a makeup water for enhanced oil recovery projects.

Q. And do you have any comments from your own investigation as it relates to those excerpts from Mr. Land's report?

A. I believe the data that we've looked at, all of the literature that we've reviewed supports the conclusions that Mr. Land has made in this report.

Q. Okay. Mr. Kronkosky, have you also considered some comments made by Mr. Goetze in his report as it relates to the City of Jal's investigation of future potential water supplies?

A. I believe Mr. Goetze made a comment regarding the fact that the existing well may impact the future

water, I guess, supply for Jal regarding the Capitan Reef, and we've attempted to address that with the city's own engineer's report that they prepared. And that's in Exhibit Q -- or Tab B, and that's the Hydrologic Investigation Report that was prepared by Souder, Miller & Associates. And we've excerpted from that report and highlighted specific comments that they made, and they make comments that the water quality is poor, that it's not a potable water source. They say it's in excess of 3,000, and they say that the city -- it's not a viable source in the foreseeable future for the City of Jal.

Q. Do you have any thoughts or comments regarding the conclusions that you just mentioned from Jal's engineer?

A. While I'm not a civil engineer and can't speak to the potable water quality and things of that nature for a municipality, just due to my education as an engineer, I agree with the findings supported in this report that the water quality is extremely poor and the likelihood of it being utilized as a municipal drinking source is remote.

Q. So this is an expert -- I'm sorry -- an excerpt from that report. Have you reviewed the whole report?

A. I have.

Q. Okay. Does it indicate anything about the City of Jal looking to Yates-Seven Rivers-Tansill or any of those formations for a future water supply?

A. It did not.

Q. Do you have any views regarding that? I know Mr. Blandford may.

A. Mr. Blandford may make a more detailed opinion on that.

But based upon the water quality that we observe in the Yates and Seven Rivers and the permeabilities and the amount of water that is there, especially in the permitted wells' area -- there is actually very little water there. The only water that's really there is the injected fluid, because the permitted interval is well above the oil-water contact. So this is a hydrocarbon reservoir. This is not a water aquifer in our permitted interval. So there is -- the likelihood of any kind of potable water being in this particular project area is remote as well.

Q. So, Mr. Kronkosky, to wrap up here, let me refer you back to the text of your report dated June 1st that is -- again, we're talking about Exhibit 2, and we've gone through the various letters in Exhibit 2. Does that written report contain the results of your overall assessments and evaluation of the suitability of

the project area and the injection interval and the appropriateness of OWL's application for the Bobcat well?

A. The report was specifically prepared to address the existing well, but I believe the conclusions that come from this report are 100 percent for the proposed wellbore, but due to the nature of -- the proposed wellbore is a direct offset to the existing wellbore. And so we've tried to address, to the best of our ability, Mr. Goetze's comments throughout this report, and those had to do with the existing wellbore. But I believe if the Commission takes into consideration the text that's in this report, that it is fully suitable for the proposed well.

Q. Anything specific that you'd like to say about the particular suitability of the reservoir that -- where the injection interval is for this intended purpose, or maybe just provide a quick summary of your overall conclusions in that regard?

A. I believe, based upon my work in saltwater disposal in southeast New Mexico regarding various formations in the Delaware Basin, the Delaware zone and in the Devonian, the shallow reservoirs in the Yates Artesia Group, in particular along the vacuum trend, are the most viable candidates for large volumes of water to

be placed in southeast New Mexico given the fact that they are high permeability. They're low pressure because they've been produced extensively for a number of years.

The basin reservoirs, the Delaware Group, those reservoirs, are (A) pressured up at normal pressure gradients, and they're extremely tight in most instances. And so the volumes that can be injected into those reservoirs are very small, which would require a substantial amount of investment.

What OWL is basically doing is they're taking a reservoir that has been depleted and they're restoring it to the initial state that was there back in the 1920s. And I believe that that's a beneficial thing for the state of New Mexico.

The only concern that I would raise is there are old wellbores in this area. There are extremely old wellbores and that any future operators wanting to inject into the shallow zones need to do a very detailed analysis of the existing wellbores and how they're applied to make sure that there is no out-of-zone injection taking place.

Q. Okay. Is there anything you would have to add to the discussion and opinions stated in your written report or anything else you'd like to tell the Hearing

Officer at this time?

A. I think -- I think our opinions are adequately addressed in our report.

Q. Okay.

MR. MOELLENBERG: So we would at this time offer Exhibit 1, which is the June 1st report from Mr. Kronkosky. And just for the record, I may have, in error, referred to that as Exhibit 2 a little bit ago. So we would offer Exhibit 1, including all of the tabs, A through Q, into evidence.

We would offer Exhibit 3, which is Mr. Kronkosky's resume into evidence.

And then Exhibit 4, I guess, I'll -- we might as well go ahead and put that one in, too. That will be Mr. Goetze's March 15th report and its attachments.

EXAMINER JONES: Any objections?

MR. BROOKS: No objection.

MS. MOSS: No objection.

MR. NEWELL: One slight objection. With respect to the City of Jal's water study, I'd object as to both hearsay and it's incomplete in the sense that there was material cherry-picked out. And what we would propose is that the entire report be presented and made as evidence so that can be considered in its entirety,

not one singular page, with one portion of it cherry-picked out, because I believe it was presented for the truth of the matter asserted, which was the parts per million dissolved solids in the water, is what it was presented for. And the record will reflect that, I believe. So that would be the nature of our objection, that the entire document should be presented so that the Commission could consider it in context.

EXAMINER JONES: Does the Applicant have a copy of the entire --

THE WITNESS: I have.

MR. MOELLENBERG: Mr. Hearing Examiner, we have the entire one, and I have no issue in providing the entire report. In fact, we may do that through Mr. Blandford, if that's all right.

MR. NEWELL: Yeah.

EXAMINER JONES: Okay.

MR. MOELLENBERG: Or we have a full copy. But if not, we'll --

EXAMINER JONES: Give it to the court reporter.

Exhibits 1 through 4 are admitted and as described --

MR. MOELLENBERG: Just for clarification, I haven't offered 2 yet, which is Mr. Blandford's report.

So it's 1, 3 and 4, I think, at this point.

EXAMINER JONES: 1, 3 and 4 are admitted.

And we're waiting -- you're going to talk about that later.

MR. MOELLENBERG: Yeah. Later, we'll put that one in.

(OWL SWD Operating, LLC Exhibit Numbers 1, 3 and 4 are offered and admitted into evidence.)

MR. MOELLENBERG: So other than that, we'll reserve the right to recall Mr. Kronkosky on rebuttal. And assuming we're probably going to take a lunch break now, I guess we can resume with --

EXAMINER JONES: Yeah. Yeah. Let's take a lunch break and come back at 1:45.

(Recess, 12:19 p.m. 1:49 p.m.)

MR. MOELLENBERG: Pass the witness.

EXAMINER JONES: Mr. Brooks?

MR. BROOKS: Thank you.

CROSS-EXAMINATION

BY MR. BROOKS:

Q. Good afternoon, Mr. Kronkosky.

A. Good afternoon, Mr. Brooks.

Q. My cross-examination is going to be much briefer than direct examination.

Because it's on my mind, I first want to ask you a couple of things about Exhibit J to Exhibit 1. First of all, what is the -- what is the permitted depth? I just remembered I can find it somewhere in one of these exhibits. But what is the base of the permitted depth?

A. I believe it was 3,050 or 3,060.

Q. Okay. Well, I was thinking it was 3,005 or 3,055, but that's because those two figures appear at the left-hand margin of this exhibit. But it's somewhere around there?

A. Yes, sir.

Q. And the two survey tests that are shown here indicate that -- the one on the right, anyway, indicates that 100 percent of the injected fluid is entering the formation or leaving the wellbore, you said -- exiting the wellbore was the word you said, I believe --

A. Yes, sir.

Q. -- within the permitted interval -- permitted interval?

A. Yes, sir.

Q. Okay. Now, that is actually -- exiting the wellbore is actually what you're looking at because this is an open-hole completion, right?

A. That is correct.

Q. So it's not going out through perforations?

A. My understanding is it's not.

Q. Okay. How far does that test indicate that it will remain within the permitted interval, just that test alone, without regard to the other work that's been done on the subject?

A. This test only confirms that it is leaving the wellbore. It does not confirm a radial extent away from the wellbore.

Q. It doesn't confirm that there won't be upward or downward movement after it, of course, gets out of the wellbore?

A. The test does not confirm at a radial extent up or down. The geologic interpretation does.

Q. Yeah. And you told us about the, as I understand it, dolomite barrier underneath the permitted interval?

A. There are a series of dolomitic and anhydritic dolomitic reservoirs throughout the Seven Rivers that are extremely low porosity and low permeability.

Q. And you believe that those will inhibit downward movement of the injected water, because otherwise it would go down because of gravity if there is no water in the formation?

A. That is correct. I believe it would act as a

barrier.

Q. Okay. But it's going to go down somewhat, is it not, because -- if it gets far enough, because the strata dips downward from the west; isn't that correct?

A. I believe that's factually incorrect.

Q. Okay. And if you pursue that dip -- I know the number -- the distance in miles. But if you pursue that dip -- dip for a series-- first of all, this is what's called the back reef area?

A. It is, sir.

Q. So not only is -- well, you're above the reef, but you're also east of the reef?

A. Yes, sir.

Q. And if you follow the strata at the well site westward, they eventually intersect the reef even though the footage elevation of the well, I take it, is above the top of the reef; is that correct?

A. I believe the Seven Rivers sands would lap up above the reef margin. That's correct.

Q. Yeah. But would they not -- as they dip to the west, would they not intersect the reef at some point?

A. They would terminate up against the reef. Yes, sir.

Q. Okay. Now, if I can find my green exhibit here -- Mr. Goetze's green exhibit, which I'm not sure

which exhibit it is. It's the -- the green map. Oh, here we are. Okay.

Well, I can't tell anything from that because this is -- this just shows the reef in plain, and it's above the reef, so -- but it doesn't show you where it would intersect. Do you know how many miles that is from the well site?

A. Off the top of my head, I would say it's well over five to six miles further to the west.

Q. Well over five or six miles?

A. I would imag- -- I think so. I think that's where Hiss has it delineated. I think it's five or six miles to the west.

Q. Thank you.

So on the basis of the things you've talked about -- we've talked about now survey tests and the impervious strata below it. You cannot rule out that the water will eventually -- would eventually, if it flowed far enough, come in contact with the reef?

A. Based upon our analysis, the dip of the reservoir does not play that much into the direction of flow. The direction of flow is based upon the gradient of the head in the reservoirs themselves. Water will flow uphill if the preferential gradient is higher on one side and lower on the other.

Q. Correct.

A. So the water preferentially wants to move to the east. Because that's where all the production took place in these reservoirs, the head in those reservoirs is extremely low. The head in the reef is extremely high. If the water did want to flow out of the reef, it would flow to the east.

Q. So if it wanted -- if the water in the reef -- if the water in the reef could cross the barrier, it would do so, in your opinion, right, and the water outside the reef would not enter the reef?

A. Could you state that one or time? I just don't want to --

Q. The water in the -- what you're saying is if there is communication between the two zones, it would be from the reef to the -- to the -- let's see. What's this? The Guadalupe series?

A. The Artesian series.

Q. The Artesian series. I'm sorry.

It would be from the reef to the Artesian series rather than the Artesian series to the reef?

A. Yes. But I don't believe that the reef water communicates to those reservoirs.

Q. Okay. Thank you.

The other question I have to ask you -- and

it's probably about the only one, although I may run into a series -- is about water quality. Now, first I want to ask you about something that is in our notebook that I believe is also in your -- well, I'm not sure. Well, it's also in your C-108 application, Exhibit Number 6. You don't have it because that's our Exhibit Number 6. But this is a report from Mitchell Analytical Laboratory, and it has been represented to me that it is something that was filed with the C-108 application, and we'll get Mr. Goetze to authenticate it if necessary. But it shows total dissolved solids in the water to be estimated [sic] -- I'm sure it's total dissolved solids in water to be injected -- as 140,543? Does that sound correct?

A. I believe you're referring to a water sample that, if I have reviewed, as the water to be injected or currently being injected into the approved well.

Q. Okay. Well, it would be -- currently, it would be injected into the existing well --

A. Yes, sir.

Q. -- because the -- yeah. You said approved well.

A. I'm sorry.

Q. Okay. There are numerous water samples in here from the vicinity -- there are no water samples really

close, right? Closest being the EOG well?

A. In the Capitan Reef?

Q. Yeah. I think that's where the water samples were taken, actually.

A. In the Capitan Reef, the -- I believe the closest water sample that I've observed is the EOG. That's the most current. And there is a water sample that the USGS did on the Jal Southwest No. 1, which is, I believe, about a mile east of the EOG well. That's in the Capitan Reef observation network that the USGS has. And there's another observation well to the north called the Federal Davidson No. 1, and then the Skelly wells. I believe those are the nearby reef water samples.

Q. Okay. Now, you have some data here in your Exhibit O, and your Exhibit O indicates that -- on page 2, it says, Water from the Capitan Reef was sampled from the well, having an average total dissolved solids content of 13,298. Am I reading that correctly?

A. Yes, sir.

Q. And where was that sample taken from?

A. That was sampled from the EOG water supply well.

Q. Okay. Now, let's see. I was looking at it this morning during your testimony, but where are your samples from the Skelly -- what you were calling the

Skelly?

A. I believe it is Exhibits M and N.

Q. Well, looking at Exhibit N, we see -- that figure that says "Total" that is highlighted in yellow, is that total dissolved solids?

A. The 22,6- --

Q. Yes.

A. Yes, sir. That is the total dissolved solids that was recorded.

Q. Where is that from?

A. That is from the Jal Water Supply Well No. 2, dated April 14th, 1969.

Q. What formation?

A. That is in the Capitan Reef.

Q. Okay. And in Exhibit N, you have some figures that refer to chlorides, and that's different from total dissolved solids, right?

A. That is correct.

Q. Somebody told me one time -- and I don't know anything about these things, but they said it's kind of a rule of thumb that total dissolved solids tends to double the chloride level?

A. I think that might be a general rule of thumb.

Q. Okay. Well, if you look at -- you have what you call Jal Water System #3, on the second page of

Exhibit N. You have a series of chloride levels, all a long time ago, but they show a tremendous variance. What does that indicate? I mean, they go all the way from 3,871 milligrams of chloride to 165,474.

A. Well, I think -- do you want an opinion?

Q. Well, I guess that's what I asked you for.

A. I believe a reasonable opinion could be that the high permeability reservoirs may have higher-quality water initially, and as those were depleted, the lower-quality, lower-permeability reservoirs were starting to contribute, and those have extremely high chloride concentrations.

Q. Now, is this also in the Capitan Reef?

A. These -- all of these wells in Exhibit N are from the Capitan Reef.

Q. Okay. Okay. Now, the first three figures in that table from June '69, September '69 and January '75 are less than 10,000. In fact, they're less than 5,000, indicating possibly that the total dissolved solids might be less than 10,000, right?

A. That may be possible. There is no data to support whether they're below or above.

Q. There is no TDS calculation for this well -- for these wells?

A. Not that I know of with those dates.

Q. Okay. And, similarly, on the third page, you have figures below 5,000 for all of the readings from the Jal Water System #4, correct?

A. Yes, sir.

Q. Thank you.

Now, in Exhibit L to your Exhibit 1, looking at the third page of Exhibit L, these are TDS calculations in a fairly large area surrounding the well. I think you said -- did you say -- how many townships did you say are represented here?

A. There are nine townships that are included in this. Really, three townships are the ones that are predominantly in these calculations, and they're on the eastern side of the nine-township area.

Q. Okay. Now, these numbers are total dissolved solids, right?

A. That is correct.

Q. And they refer specifically to the Seven Rivers Formation, the top table, and the Queen Formation, which we're not -- we're not concerned with the Queen, right? We're concerned with the Seven Rivers?

A. The permitted well would be in the top of the Yates and Seven Rivers, top of Seven Rivers -- base of the Yates and top of the Seven Rivers.

Q. The numbers for the Seven Rivers, in a number

of wells, appear to be less than 10,000. Is that a correct observation just looking at this table?

A. There are several wells that have reported total dissolved concentrations less than 10,000.

Q. And the ones that are above 10,000, we have one exception, it looks like, in this table and not very much above 10,000, right?

A. No. I believe that the average concentration depicted here is 40,000 parts per million.

Q. Well, in this table, there is one at 32,000 -- no. That's 327,000. Well, that would -- I realize I was misreading that. But the one at 327,000 and the one at 110,000 bring the average way up as compared to a number of other points that are much lower, right?

A. It would. You could look at this way. Based upon the total dissolved percentiles, that 75 percent of the samples are above 10,000, and that's based upon the TDS percentiles table.

Q. Yeah. But many of them are very close, like 12,500, 14,000, 11,000, 14,000, 12,000, 12,000. So I don't know where the median would be, but it would be much lower than the median; would it not?

A. The median is 14,650, roughly.

Q. Okay. And there are a number of situations -- there are a number of wells where you have samples

indicating less than 10,000 within this area?

A. There are some samples. Yes, sir.

Q. Do you have any samples from the Seven Rivers that are in close proximity to the proposed well. The closest I see is 24 -- Section 24, 25-36. Would that be correct?

A. That would be correct. That appears to be the closest.

Q. And that's not very -- that's not all that close, but it's the closest on this table; is it not?

A. It's within a mile. It's the adjacent section to the north.

Q. Yeah. And that is 20,470, right?

A. The average concentration is 24,7 or --

Q. So that's above the level -- now, you've got one in 31, 25-37. That's fairly close also; is it not?

A. I have to look on a map. I can't remember where the sections line up, but it may be close.

Q. Yeah. I'm thinking it is fairly close because the section numbers increase as you go from west to east. So you're going to go back. When you get to 30, you're going to go back to 25, and 31 is just to the south of 30. Well, that one in 31-25-37 looks like it's 7,755.

A. Yes, sir.

Q. Okay. So would it be -- would it be fair to conclude from this exhibit there is wide variability in TDS levels within this area in both the Seven Rivers and the reef?

A. I believe that the variability from one section to the next is based upon this data. Now, this data is extremely old.

Q. It's really, basically, all we have. We don't have a lot of current data, correct?

A. I believe that this is maybe the most complete data.

Q. Okay. Go ahead and answer the question I asked you before.

A. The variability?

Q. Yes.

A. Yes. There is variability within the water quality of these reservoirs.

Q. And there have not been any studies -- or have there been any studies that delineate the water quality and show patterns in this area?

A. To my knowledge, the only study that may have delineated water quality was Hiss' work that he did based off of this data.

Q. And that was a long time ago, also, wasn't it?

A. That was in 1975. Yes, sir.

Q. Okay. I think that really is all -- let me confer with my colleague here.

MR. BROOKS: I think that's all I have to ask you.

I pass the witness.

EXAMINER JONES: Does the State Land Office have questions?

MS. MOSS: Yeah. We'd like to ask questions.

CROSS-EXAMINATION

BY MS. MOSS:

Q. Good afternoon, Mr. Kronkosky.

A. Good afternoon.

Q. I have a couple of questions about the barrier and the dolomite.

A. Uh-huh.

Q. Dolomite can be porous; is that not correct?

A. Yes, ma'am. It can be porous.

Q. And what led you to conclude this is not porous?

A. We reviewed approximately 100 well logs in the project area. We looked at neutron density logs, and those neutron density logs that went through the Seven Rivers section showed that the porosity was extremely low in the dolomites. Additionally, the resistivity

logs indicate extremely high resistivities, which is another indication of extremely tight and impermeable formations.

Q. And are there any studies on the impact of fluids that are being pumped into this area on dolomite that you know of?

A. Chemical alterations or something? Is that what you're asking?

Q. Anything about the quality of what's being injected and perhaps its acidity, how that might impact the dolomite?

A. I don't believe, to the best of my knowledge, that there have been studies in the immediate vicinity about dolomite and its, I guess, acid effects due to the water that's being injected.

Q. Would there be any studies -- are you familiar with any studies anywhere in the exhibits of these -- on dolomite?

A. Not that I'm aware of. Injected fluid --

Q. Yeah.

A. -- on -- I guess like an acid. Is that what you're asking?

Q. Yeah.

A. The injected fluids have corrosive natures well less than the acid that's typically used to enhance the

porosity and permeability of tight dolomites. Typically, we pump 15 to 20 percent hydrochloric acid to enhance near wellbore permeability. The water that we're injecting has nowhere near acidity near the hydrochloric acid of those concentrations.

Q. So it is your opinion that it would not affect --

A. I don't believe it would affect.

Q. I think for some of the things that are a little less clear to me, it would be easier if I could ask my witness questions when I call him. Are you going to be here?

A. Yes, ma'am. I'll be here today and tomorrow. If you have additional questions, I'll be here.

Q. Thank you.

EXAMINER JONES: Mr. Newell?

MR. NEWELL: Yes. Thank you.

CROSS-EXAMINATION

BY MR. NEWELL:

Q. You've stated a lot of opinions here today. What are some of the things you assumed in formulating some of your opinions? I mean, you've assumed, I take it, the trajectory or the flow of the water from the proposed injection well, correct?

A. We've utilized available reservoir pressure

data to arrive at the preferential flow direction.

Q. Okay. And you modeled it, correct? I think you modeled some projections on the capacity in and around the wellbore to absorb the produced water that's being injected; is that correct?

A. We didn't model the trajectories per se. We modeled the rates. Mr. Blandford, I believe, will provide testimony as to trajectories and which way the fluids will migrate with time.

Q. So you projected the rates?

A. Yes, sir.

Q. Okay. Did you project the rates being uniform over the entire 40 years that this project is anticipated to be in use?

A. No. I did not project the rates in any part of our analysis. Our analysis was predominantly -- had to do with the Maralo Sholes, the #2 well, which is a good proxy for this permitted well. Mr. Blandford has actually modeled the fluids of that time period.

Q. Okay. So the model you're using is a model where the completion and integrity of the well has been placed into question; is that correct?

A. (No response.)

Q. The Maralo Sholes wells has integrity issues that have been raised. Would you agree with that?

A. I believe that the Maralo Sholes well has had wellbore integrity questions raised.

Q. Okay. What you're saying is the model you used is a well that has at least -- the question has been raised -- the question has been raised of wellbore-integrity issues, correct?

A. Correct. But we didn't model wellbore integrity. We modeled reservoir integrity.

Q. I understand.

If there is wellbore integrity issues, that suggests that there could be fluids escaping into other zones, correct?

A. If there is a wellbore-integrity problem, fluids can potentially migrate out of zone.

Q. In all of your projections, you assumed that all the fluids were going into the targeted zone in the Maralo Sholes, correct?

A. That is correct.

Q. Okay. So to the extent there's wellbore integrity issues in the Maralo Sholes, that impacts your modeling for this particular well here; does it not?

A. I don't believe that there is wellbore-integrity issues with the Maralo Sholes well.

Q. Now, let me ask you this. You've discounted the quality of groundwater that's available in the

Capitan Reef, correct?

A. By discounting, I don't --

Q. Well, you've suggested and you've cited a number of sources that suggest that at least at current times, it's not a potable water source. Would you agree with that?

A. We've cited sources that suggest that the quality is not a viable candidate for desalination technologies.

Q. Okay. Now, would you also agree with me that there are portions of the Capitan Reef Aquifer that are being used as potable water sources and are planned to be used as potable water sources in the future for communities in West Texas?

A. I'm not really, you know, versed on that per se. I believe Fort Stockton may be what you're referring to, and that's about the only place that I may be considering. And that's near the outcrop of this formation, which is, I believe, 60 to 80 miles south of our project area. I believe you may be citing that Carlsbad fits into their water, which is approximately 60 or 70 miles away, and, again, that's in the outcrop, in the very, very shallow portions of this reef.

Q. It does indicate that the water quality in the reef aquifer is variable; does it not?

A. I believe that's a correct statement.

Q. Okay. Now, when you look out in your horizons and look at the existing technologies, how far in the future are you projecting out desalination and other cleanup technologies that would be available?

A. I'm not averse to answer a statement like that. I'm not a petroleum and reservoir engineer. That's a civil engineering question.

Q. Fair enough.

So you don't know the horizon for technology that might be able to take even the most -- the highest concentration of Capitan Reef Aquifer water and make it potable, do you?

A. No. I believe Mr. Blandford would be better versed at answering that question.

Q. All right. Now, I think you indicated that -- and let me make sure I understand. Although acidic water can create caverns in dolomite formations, you believe that the acidity of the water in the injection water will not reach that level, where it's going to impact the dolomite barrier that you've identified here today, correct?

A. The acidity of the waters being injected, to the best of my knowledge, are not of the nature that would create substantial dissolution of carbonate

material. Dolomites have very, very low solubility as compared to limestone. Limestone -- it's actually a test that we do when we're in college. You put hydrochloric acid on limestone and it fizzes, and you put it on a dolomite, and it makes a bubble. So it's not very reactive.

Q. Okay. I want to read you a statement. See if you disagree with this or agree with this. And this is from the Texas Water Development Bureau of the state of Texas. And in describing the Capitan Reef Complex Aquifer, it states it's a minor aquifer, and it identifies the Texas counties in which it's in. And it states: The aquifer is composed of as much as 2,360 feet of massive cavernous dolomite and limestone. Do you agree with that?

A. I would have to read the report. It would also probably be a context. If it's talking about caverns, it would most likely be extremely close to the outcrops, but I'd have to read the report.

Q. Okay. Do you -- do you know whether there is any cavernous areas on the -- how do you describe just the eastern portion of the horseshoe that seems to be the way the Capitan Reef Aquifer is identified? How do you -- if you were describing it, what nomenclature would you use.

A. I guess you would call it the eastern portion of the Capitan. The productive portions is typically known as the vacuum trend in the Artesia Group. I believe that's pretty widely used terminology.

Q. Okay. Let me now go on here and let me ask you this. And this is in same report that I was -- and this is from a summary in the report. But it states that water-bearing formations in this aquifer include Capitan limestone, seep [sic] dolomite and most of the Carlsbad facies of the Artesia Group, including the Grayburg, Queen, Seven Rivers, Yates and Tansill Formations. Do you agree with that?

A. I believe some researchers lump all of it together in the Capitan Reef Complex or something like that.

Q. Okay. Is there any communication between those zones?

A. I believe that the data that we've looked at in our project area indicates that there is no communication between the Capitan Reef and the Artesia Group, the Seven Rivers and Yates.

Q. Now, let me ask you this: Water is contained in solution, cavities and fractures that are unevenly distributed within these formations. Would you agree with that statement?

A. I'd have to read the report, sir.

Q. Okay. Do you think -- do you find anything particularly wrong about that statement with regard to the uneven distribution of caverns and other things within the Capitan Reef Aquifer?

A. Maybe can you state that a little bit better?

Q. Sure. I mean, do you have any reason to believe that their description of the Capitan Reef Aquifer and those very zones that comprise it, do you believe that the description of that having diffuse and -- diffuse and different areas that are cavernous that contain these water formations, do you find that to be fairly consistent with what your research has uncovered?

MR. MOELLENBERG: Object to the form.

EXAMINER JONES: Can you restate it?

MR. NEWELL: Sure.

Q. (BY MR. NEWELL) Do you believe that there are uneven cavernous formations within the Capitan Reef Aquifer Complex?

A. Carlsbad Caverns is a cave that is in the Capitan Reef Formation. Is there cavernous porosity engaged [sic] in the Jal area through the Yates and Seven Rivers? We see no indication of that.

Q. All right. What about through the other

formations that were identified? Going on down to -- and, again, understand -- again, I'm not picking on you. This is important because this is an issue of high public -- this is a community.

Let me just ask you this so you'll understand. What other differential water resources have you identified for the City of Jal in southeast New Mexico?

A. I'm a petroleum engineer. I don't look at fresh water.

Q. Sure. Fair enough.

You've been down there, right?

MR. MOELLENBERG: Just to clarify, Mr. Blandford probably could address that question.

MR. NEWELL: Fair enough.

But certainly he's talked about some of these issues, but I'll defer to the next witness on that.

If I might just check my notes?

THE WITNESS: Sure.

Q. (BY MR. NEWELL) Okay. So this morning, we identified, conservatively, there could be 280 million barrels of fluid injected into this one well. You were here for that, correct?

A. Yes, sir.

Q. Okay. Now, has any of your modeling looked at the ability of this area of the Seven Rivers Formation and Yates Formation to accept or take in 280 million barrels of fluids?

A. Our analysis indicates that approximately 90 million barrels of hydrocarbons were produced out of this 2,000-acre area. That would be readily replaced with the injected fluid.

Q. Okay. You said 90 million or billion?

A. 90 million.

Q. 90 million.

And so let's go - we're going to replace 90 million with 280 million over a 40-year time span. I mean, am I -- am I hearing the numbers correctly that you're identifying? I want to make sure I understand.

MR. MOELLENBERG: And I'd just object. Misstates the testimony.

MR. NEWELL: I'm trying to clarify. I think he just said 90 million barrels were --

Q. (BY MR. NEWELL) Or 90 million barrels were -- were produced out of that formation, correct?

A. That is correct.

Q. Okay. And then this morning, I believe we talked about that if we take 20,000 barrels a day over 350 days, over 40 years, it comes up to 280 million

barrels. And so what I want to understand is you're saying that the space created by removing 90 barrels of production will be sufficient when you're talking about injecting 280 barrels of new fluids -- 280 million barrels of new fluids?

A. We did not model that. Mr. Blandford modeled that, and I think his testimony will address your question.

Q. You indicated the old wellbore needed to be investigated. Did you do any investigation of those old wellbores?

A. As far as like a wellbore-integrity analysis?

Q. Yes. Yes.

A. No, sir. That was all done by Lonquist, that prepared --

Q. Okay. But it was done?

A. Yes, sir. I've reviewed the permit, but I didn't prepare any of that material.

Q. Sure.

This aquifer is about 10 to 14 miles wide, correct?

MR. MOELLENBERG: Object. Which aquifer are we talking about?

MR. NEWELL: The Capitan Reef. I'm sorry. Thank you.

Q. (BY MR. NEWELL) The Capitan Reef Aquifer is about 10 to 14 miles wide in this area, correct?

A. I don't believe the reef itself is 10 to 14 miles wide. The complex, when you include the Artesia Group reservoirs, may be 10 to 14 miles wide, but those are the back reef lagoonal reservoirs. The reef proper is much narrower than that, and in the outcrops, it's probably less than a mile wide.

Q. So why this location? Why not move it either farther east or farther west where we don't have this potential to even communicate with the Capitan Reef Aquifer?

A. I'm not an employee of OWL. I didn't pick the location.

MR. NEWELL: Pass the witness.

EXAMINER WADE: Would you like the opportunity to redirect?

EXAMINER JONES: Do you want to redirect now, and we'll ask questions later?

MR. MOELLENBERG: I don't believe I have any redirect at this time.

EXAMINER WADE: I don't have any questions.

EXAMINER DAWSON: I have a couple of questions.

CROSS-EXAMINATION

BY EXAMINER DAWSON:

Q. Good afternoon, Mr. Kronkosky.

A. Good afternoon.

Q. Looking at your exhibits, Exhibit J, page 8, with the solid blue circle, and that's your best estimate of the future situation of injected fluid. Did you say that was based on a rate of 18,000 barrels a day?

A. I don't believe it's J. Let's see. Exhibit J, page 8 -- in my book, J has one page. I think it's K.

Q. K. I'm sorry. Page 8.

A. And your question again -- I'm sorry -- was 18,000 barrels a day?

Q. On your estimate, that was based on a rate of 18,000 barrels a day?

A. Yes, sir, Maralo Sholes. So what we did was we took the existing well. And the 18,000 barrels a day was an average, I think, of the last two years of OWL, and we projected that five years into the future.

Q. Okay.

A. So this is for the existing wellbore.

Q. So you would anticipate that five years into the future, the proposed Bobcat well would have basically the same radius as this Maralo Sholes well?

A. That's probably an accurate statement.

Q. And the proposed Bobcat well, that's about six miles from the Jal Oilfield; is that correct?

A. In the Jal Oilfield, you're talking the water --

Q. The municipal water supply.

A. The municipal water supply?

Q. Yes.

A. Six, seven miles.

Q. Okay. So this is a five-year projection. Did you -- did you go any -- did you project in any greater yearly estimates more than five years, like 15 years, 20 years, to see how far out that radial -- the plume may be radial?

A. No. But Mr. Blandford, I believe, will provide a modeling that shows the radial estimates.

Q. And you're injecting -- when you're injecting into -- this will be an open-hole completion, which will be similar to the Maralo Sholes B No. 2 well?

A. I believe it is. Yes, sir.

Q. And so when you inject those grease [sic] waters into the proposed Bobcat well, as in the Maralo Sholes well, then you're basically saying that they're going to follow those sand stringers --

A. Yes.

Q. -- and they will not --

A. Sorry.

Q. Anhydrite, carbonates, dolomites, they won't really -- it won't really affect those zones within those sand sequences or sand lenses?

A. I believe that that's accurate.

Q. Okay. And in the -- when you -- you looked over at the well field -- the Jal well field, those wells over there. Did you look at each individual well within that well field as to what aquifer those are producing from? Are they all producing from the Capitan? There's Santa Rosa, correct?

A. No, no, no. They're Cenozoic. They're freshwater wells in the Cenozoic fields.

Q. Shallow.

A. So they're maybe 300 feet deep. Yeah, very shallow.

Q. And the Capitan Reef waters roughly about -- beneath the proposed saltwater disposal well, the TDS in the Capitan is about 22,000? Is that what --

A. In the Skelly Jal water analysis that was from the Capitan Reef, they reported -- I believe it was like 22,600, something like that.

Q. And then when I'm looking at the -- you had one slide in there with the -- where you had the temperature survey --

A. Uh-huh.

Q. -- and about 3,055 feet, the temperature went way up?

A. Yes, sir.

Q. That's indicating you're into the anhydrite or dolomite section there?

A. Yes, sir. That's an indication of a reservoir that's not taking fluids, and it hasn't cooled off due to the injected fluids. So that indicates a vertical barrier.

Q. And the porosity in those anhydrite lenses is roughly about 1 to 3 percent?

A. They're very -- yes, sir.

Q. And in the sandstones, it's about 17 to 23 percent?

A. Yes, sir. They're very high.

Q. Okay. And when you assessed this location, you also -- I guess you also looked at the Devonian in the area. And there is possibility for Devonian disposal in the immediate area?

A. I have knowledge of the Devonian, but I didn't -- I was specifically tasked to look at the Artesia Group of this well. I wasn't tasked to look at the Devonian.

Q. So you didn't -- your company -- or OWL did not

anticipate drilling a Devonian well in this Section 25?

A. My knowledge is that they may have a permit, but I wasn't tasked to look at that data.

Q. Okay. And so I heard some talk earlier -- Mr. Johnson talking about a well, the Kimberly well.

A. Yes, sir.

Q. Do you know about that well?

A. That's the permit that I'm aware of.

Q. That's the Devonian permit, right?

A. I believe it is.

Q. How far is that from this well?

A. If I had to guess, maybe three or four miles to the southeast.

Q. Okay. You did show some graphs on some offsetting wells that had some spikes in water production --

A. Uh-huh.

Q. -- for an offsetting -- couple of offsetting wells, those EOG wells, that had some spikes in water production? I believe they were EOG.

A. No. They were Mr. Fulfer's, I believe.

Q. Oh, Fulfer.

A. That was -- I think the question was raised due to correlative rights from Mr. Goetze.

Q. Did you assess the water production in the area

of review? Did you assess the wells and their water production since you've been injecting in the Maralo Sholes B No. 2?

A. Yes, sir. I looked at the water production that is in the project area that was delineated in yellow, and it was summarized, aggregated. And I believe that is in Exhibit -- Exhibit F. And that shows the water and injection with time.

I'd also like to call to your attention that the water production on the offset well -- I believe it's the Maralo Sholes Number 25 B No. 1. The water production that showed those spikes has been amended, and the water production is very low. It's, I believe, less than 1,000 barrels a month. So it's maybe 30 barrels a day or less. I think that was the highest month I observed. Those spikes have been removed.

Q. Is there -- I'm doubtful, but I'm just going to ask you. Has there been any horizontal drilling in the Yates-Seven Rivers? Have they attempted that any or -- probably not, huh, with not much success?

A. You know, they may have done it in some of the waterfloods on the northern part, but I know in the San Andres, that's an active play going on in some of these old waterfloods, to drill horizontal wells, to get the remaining unswept hydrocarbons. But I'd be stretching

and lying to you if I told you I knew there were horizontals in the Yates and Seven Rivers in this area.

Q. So you're pretty much saying that you wouldn't anticipate there would be any horizontal development in the disposal zone?

A. In the project area? No. There is a waterflood a little bit north of Jal that's been ongoing for a long time, and that might be a viable candidate for that waterflood, but I'd be speculating.

Q. But most of those wells in the project area produce maybe three to ten barrels, and they're really low product- --

A. I think the wells are currently producing less than half a barrel of oil a day and maybe five or six mcf on average. I mean, it's very small production.

Q. So you don't feel that there would be any impact whatsoever on offset producing Yates-Seven Rivers well?

A. No. I don't believe that there would be any impacts with any -- impacts that would actually be able to show to those wells by providing some form of pressure support for the operator.

Q. Okay. Do you know how much -- when you bought -- when you guys took over -- you took over the Maralo Sholes B No. 2 well, right --

A. I believe --

Q. -- or they did?

A. -- OWL bought the well from Mr. Fulfer and took over the well. I'm not an employee of OWL. I'm sorry.

Q. Okay. So it was -- you think it was uneconomic when they approached Mr. Fulfer about taking that well over?

A. Mr. Johnson could probably address that question a little better than I could, as far as the business case for that.

Q. That's all the questions I have. Thank you.

CROSS-EXAMINATION

BY EXAMINER JONES:

Q. Congratulations on your Ph.D.

A. I haven't gotten it yet, so -- I've got six more months of hard work.

Q. Sounds like you're well on the way.

And I apologize I'm not as prepared as I should be. They'll be treating me like one of the White House people that's on the outs.

You said the reef was five or six miles to the west, the peak of the reef of the actual Capitan?

A. Yeah. I believe that the reef and the reef margin is approximately five to six miles further to the west.

Q. And how about vertically to the reef from the proposed disposal zone?

A. I believe that we would have to go several thousand feet to get into what we would call a reef, and that would be well into the Queen.

In our area, when we look at the cross section that was done by Harris and Saller on Exhibit A, they identified the Capitan in the Federal Davidson No. 1, in gray, and it's, you know, several hundred feet down below the top of the Seven Rivers, which is where we're injecting, and that well is actually further to the west, closer to the reef itself.

Q. Is the slope of the reef 45 degrees coming from, like, five miles west and sloping east?

A. I believe that as you approach the reef margin, there is a steep -- steep drop-off into the basin. I believe there is -- at some point in time when the reef was growing, I think they say it may have been 5- or 600 feet, maybe even more, to the floor of the basin when dune debris flows came off.

Q. So debris flows, is that what created all this porosity and permeability in the back reef facies?

A. The porosity and the permeability in the sands -- they are sands, not carbonate reef growth. Those are from aeolian facies sand dunes that came

across the Midland Basin. So they're not marine at all. They're back reef evaporite-type environment, and that's why the dolomite is extremely tight. There is a lot of anhydrite. As the water came up, the shelf dolomites were deposited, and then the sands and then alternating sequences of, you know, back reef and --

Q. Our geologist in Hobbs always told me that the Seven Rivers and -- the actual Capitan and the Seven Rivers could be considered all one massive carbonate, and he either implied or told me that it was a limestone also. So are you convinced that it's a dolomite? Have you -- do your neutron density logs separate, or do they go together?

A. No. There is positive separation. They're most definitely a dolomite. The PD log confirms that it's a dolomite. We haven't seen reports of limestone. In this area, I haven't seen any reports. It's all either dolomites or sands, and they're muddied dolomites, stuff like that.

Q. But the sands are really high porosity and -- I'm jumping around here, but you -- I should jump straight to the pressure transient simulation that you did. I kind of understood in general that you had assumed a distribution of thickness, porosity, permeability, maybe even -- even

maybe SWI and then threw them all into the -- and a -- maybe a shape --

A. Uh-huh.

Q. -- a radial shape.

A. We -- we modeled the permeability with the formation thickness, the formation that is going to take fluids.

Q. You modeled the distribution?

A. The distribution.

Q. From different logs that you had?

A. No, no. Just -- it was a -- it was based upon intuition. There's really not a whole lot of data to substantiate these distributions, so what we did was we took the known Seven Rivers permeability that is approximately a half mile away that was reported by Hiss in 1975. I think that was 350. And we kind of centered the permeability distribution of assumed values around that, assuming normal distributions, just to give us a general idea of what the uncertainty would look like. So a lot of it is engineering judgment.

Q. 350 for sandstones is kind of -- even sandstone? That's high, isn't it? Was he talking about general system permeability, or is he talking about actual core measure?

A. That was an actual reported core measurement,

and I believe that there's -- there are very high permeabilities there. I mean, 100 is not unrealistic. I believe that when we look at the rates that this well has taken and the assumed reservoir pressures -- not assumed by low pressures but by what we've actually seen reported, the rates and permeabilities that we utilize in our Monte Carlo simulation all jibe with the rates that we're seeing injected into this well.

Q. So it has to be extremely high --

A. Yes.

Q. -- to take this much fluid?

And what's the thickness that you're injecting?

A. I believe we centered it around 100, 120 feet.

Q. So that was -- the tracer log showed that, confirmed that?

A. Yes, sir.

Q. Okay. So your horizontal versus your vertical perm in your -- in your sandstones, is it a ratio of one to ten or something or --

A. In the sandstones, most people typically, you know, use a ratio of 1 to 100. If it's a default, most reservoir simulators do a vertical permeability to horizontal.

Q. Okay. So that means that this much disposal is

going out a long ways. If it's -- it's not going up or down and it's -- it's pretty -- it's layered -- you say it's aeolian sands, though. So there's no telling how long this will last, and we might pressure up sometime out there.

A. I believe that there is a likelihood at some point in time that this reservoir in the project area will begin to pressure up, and the rates will come way down.

Q. Okay. How far out -- before we leave that subject, how far out would you -- is your radius that you would look at? Like, most of these wells are not lasting five or ten years, these horizontal wells. So let's say ten years. How long would you -- would you go out, you think?

A. How far would it go?

Q. Yeah.

A. I'd have to look and do a calculation, but I believe, based on the five-year projection, the area of influence was --

Q. Certain pressures you were talking about, right, with so many years out?

A. I believe it was something on the order of -- assuming the historical injection had taken place from 2008 to 2012, plus a five-year projection at 18,000

barrels a day, we got something on the order of around 800 acres of perturbed area.

Q. Oh, okay.

A. It's not a massive area, but it is a fairly good extent.

Q. So 1,400 pounds initial pressures. Where did you get that number?

A. That number came from the original -- the filings with the NMOCD, in their annual filings, but the production reports, I'm trying to think of the actual title of that document. But --

Q. Okay. The Roswell Geological Society?

A. Yes, sir. They were in Roswell, and there's the stuff that you-all have, the production data, the log books that go back way into the 1930s.

Q. Okay. Yeah. So that's a little bit less than normally pressured at these depths.

A. It's slightly.

Q. Slightly less.

And the current pressure that you're estimating?

A. The pressure that was -- that we last observed where they had bottom-hole pressures in the '70s, I believe, was on the order of like 100 pounds of pressure. So --

Q. Okay. So that is kind of a general-area study, but how does that relate to this particular area where you're at? Did you have wells in this area that were -- would have drawn down the pressure, or is this area a bit out of this Jalmat Field? Is it inside the Jalmat?

A. It is. It is actually in between the two discovery wells of the Jalmat and Langlie Mattix Fields.

Q. Okay.

A. The Skelly Joyner No. 1 was a mile to the west, and I believe -- and that was for the Jalmat. And I believe the discovery for -- and that was in 1929. And I believe the discovery for the Langlie Mattix Field was maybe a mile to the north, northeast.

Q. Okay. So this general area had to be pressured. And you say it had an initial gas cap?

A. Initially, the saturation pressure of the hydrocarbons was right around 14-, 1,450, so there was an original gas cap that was in place.

Q. And it was enhanced as a production, went below the bubble point?

A. So as the production took place in this area, the gas evolved and basically replenished the gas cap, which is the reason why some of these wells produced significant quantities of hydrocarbons. Most of these wells in this particular section, Section 25, produced

in excess of half a million barrels of oil, and some of these wells have produced several bcf of gas as they blew down the gas cap in the late 1940s and '50s.

Q. Okay. So we're kind of talking about taking an old oil and gas reservoir -- basically, a solution gas drive oil reservoir that's depleted and turning it into a disposal reservoir; is that correct?

A. I believe that is correct.

Q. Have you seen that in other places? We? don't -- we haven't done that very much in New Mexico so -- at least not without classifying it as some sort of a, you know, pressure maintenance project or something, you know. Have you seen it in Texas, that they've taken these depleted reservoirs and turned them into disposal?

A. Yeah. I believe in, like, South Texas, there are a lot of Wilcox gas fields that have been reinjected into, and they've made good candidates for saltwater disposal.

Q. Okay.

A. That's to the extent of my knowledge on saltwater disposal in extremely depleted zones.

Q. Okay. So -- and I know you've already answered this. The effect on producers that are still out here maybe a mile or so away, is it -- it's going to sweep a

bunch of gas to those wells, first of all, correct? They're going to -- they're going to gas lock right quick. They're going to have to change their pumps.

A. If there is significant quantities of gas, it would be -- it would be pretty slight. These wells, they just -- they don't produce very much. It may help them, but -- I don't know if they would gas lock them because they don't just pump.

Q. Yeah. They go up the casing anyway.

A. Yeah. Yeah. It would go up the casing. I just don't think they turn them on very often to produce the fluids.

Q. So it's totally depleted?

A. Yes, sir.

Q. And none of the minerals owners care that this had happened -- that this would happen?

A. To the best of my knowledge, no.

Q. You're not the right person to ask about that, I guess?

A. May have to get one of them in here.

Q. You weren't involved in the C-108?

A. The C-108 was prepared by Lonquist. They're a consulting group out of Austin, Texas and Houston.

Q. Before you were involved in the project?

A. I think when I was involved. I've reviewed the

permit for it, but we don't specialize in preparing permits and the regulatory aspect of that.

Q. Have you had talks with other professionals and other oil companies while you were preparing this valuation or other hydrologists?

A. Mr. Blandford and I have worked together quite extensively on this project.

Q. Okay. But any comments from other oil companies? Have you talked to any professionals in other oil companies about this?

A. I've talked to a professional at Texas Tech University --

Q. Oh.

A. -- one of the faculty there that's in the petroleum department, but no -- we have not brought on any outside consultants for our work.

Q. Okay. So basically even with vast quantities of disposal, your reservoir pressure is going to stay pretty low for a long time; is that correct?

A. I believe that there is a substantial amount of pore space in this reservoir that can readily accept produced water for quite some time.

Q. So far? At least --

A. Sure.

Q. -- what you're seeing so far?

A. This well, essentially, takes it on vacuum.

Q. It takes it on vacuum, but because it's an aeolian reservoir, it might, all of a sudden, hit a limit one of these days?

A. It may.

Q. It may?

A. Yes, sir.

Q. And how deep are the producing wells out here?

A. I believe they're -- they're all in the equivalent reservoirs at around 3,000 feet.

Q. No more than -- so that's Yates production?

A. Yates -- I believe that as you go further to the east, the reservoir becomes a gas reservoir, and they do produce Seven Rivers gas further to the east, as you go further up structure. Predominantly, anything that has oil -- anything below -- anything above minus 300 feet subsea going to the east is predominantly hydrocarbon productive if it has porosity --

Q. How far away is that from here?

A. I believe the lateral extents to the west go six to eight miles further to the west. I mean to the east. I'm sorry. I'm lying to you.

Q. But the proposed well is -- is that -- will that be in the currently productive hydrocarbon zone? In other words, is it down in the -- it's not in the

water leg? It's still in the depleted oil and gas zone; is that correct?

A. Yes, sir. I believe it is in the upper portion of the oil zone.

Q. Upper portion?

A. Upper portion.

Q. So how much further down to the water -- to the water?

A. I believe that you would need to go about a mile and a mile and a half to the east to get to the oil-water contact in these particular reservoirs.

Q. Okay. So there are still old wellbores around here that were producing in this zone?

A. To my knowledge, there may be a few.

Q. Okay. But how far down to the oil-water contact in this well?

A. I believe it's 2- or 300 feet.

Q. Okay. So it's just a little -- sands come and go in this?

A. No. The sands are laterally extensive. You can follow these sands across Section 25.

Q. Okay. So they're pretty predictable?

A. The sands that we're injecting into are laterally extensive. Yes, sir.

Q. So why would you want to complete your well

open hole or not case it and stimulate the sands?

A. That's a question that would have to be addressed by OWL. I think an open-hole completion is a good completion.

Q. As long as it works. If it doesn't work, you don't have any options.

A. Sure. And as far as fracture stimulation, there is such high permeability and low porosity that I don't believe that they need to be stimulated. Stimulation really wouldn't -- a fracture stimulation just doesn't really help you at all.

Q. Okay. And what about the testing and the logs on this well? Is another witness going to talk about that on this proposed well?

A. As far as -- this well hasn't been drilled, so it doesn't have --

Q. The proposed testing and logs on it. Another witness will talk about that, I'm sure.

A. Or I can maybe be called back about that.

Q. Okay. Some of the -- it seems some of the concern here is the impact on the -- on the reef -- the reef aquifer, I guess, the Capitan Aquifer, not just the reef rock itself, but the aquifer. So as a petroleum engineer, what kind of -- what kind of -- besides your testimony already, what kind of testing in the future

or -- on this well or other wells could you propose to allay any fears of impact??

A. I guess for the reef itself, it would have to be some kind of pressure observation wells that would have to be drilled to monitor changes in pressure, effects on the reef. But aside from that, I don't really see any kind of viable alternative besides drilling a whole bunch of observation wells.

Q. And if you drilled your wells at the wrong spot and didn't have a connection but right next to it did, you'd be wasting your well, wouldn't you??

A. (Indicating.)

Q. What about periodic follow-up tests to see -- to track your reservoir pressure?

A. I think that that would be a good management practice to look at, especially for the existing wellbore. Right now the reservoir pressures are so low that there is just no way to build up a head to get into any shallower zones. But with, you know, falloff testing, we could monitor the build-up of pressure to see if the reservoir pressure is building up, and we should notice it as rates decrease over time if the reservoir is building up pressure.

Q. Didn't you testify that the reef itself -- reef aquifer itself was higher pressure than the reservoir

that you're proposing to -- that OWL is proposing to dispose into?

A. Yes, sir. The Southwest Jal No. 1, I believe, shows that the pressure in the reef is substantially higher than the pressure in the proposed injected interval.

Q. Okay. So is the conclusion that you make that disposed waters will not -- that gravity will not overcome the difference in the lower -- pressure in the aquifer to cause migration of the disposed waters?

A. Yes, sir. I believe the hydraulic grade line is going to the east. So the low pressure is further to the east, and the higher pressure would be further to the west. So the grade line would close with preferential flows.

Q. So the water in the aquifer itself is flowing to the east?

A. If it was flowing to the -- it would flow, potentially, to the east if there was a connection, but we don't believe that there is a connection.

Q. What about the water in the aquifer? You talked about some -- is the aquifer -- the reef aquifer, is there a preferential flow direction at this point? Is it flowing south? The water flowing south?

A. I believe that due to the pressure observation

well that was the Southwest Jal, that well showed that the head had decreased over time due to the Skelly Jal and the, I think, El Capitan water supply fields north and south. So I believe that the communication is north and south and not in an east-west direction.

Q. Okay. So there was some fluence on the flow because of those withdrawal wells?

A. Yes, from the -- from the -- from those fields. Those fields withdrew, you know, 60-, 70,000 acre-feet a year -- a day. They were large fields.

Q. Okay. Okay. Thanks very much.

A. Yes, sir.

EXAMINER JONES: Let's take -- do you want to redirect?

MR. MOELLENBERG: I don't have anything. And, Mr. Hearing Officer, if you have some questions you'd like to ask about the logging and monitoring for the new well, we do have someone who could address those. Maybe we could put somebody on tomorrow to do that, if that would work for you.

EXAMINER JONES: Okay. Looks like we are going into tomorrow.

MR. MOELLENBERG: I think so.

EXAMINER JONES: Okay. We'll have a ten-minute break.

(Recess, 3:06 p.m. to 3:23 p.m.)
MR. MOELLENBERG: Mr. Hearing Examiner --
EXAMINER JONES: You got a full C-108?
MR. MOELLENBERG: Yup. We've marked that as Exhibit 5 and distributed it here.
EXAMINER JONES: Is there any objection to admitting Exhibit 5?
MR. MOELLENBERG: This one is a complete copy with -- with the other well.
MR. GOETZE: Does it have the wellbore diagram? Because they did apply -- the original application did have the AOR well diagrams in them. The exhibit that was submitted later for the application to hearing was missing it. So they have done the work. We've got to make sure it's on the record.
EXAMINER JONES: Okay.
MR. GOETZE: Thank you.
EXAMINER JONES: Exhibit 5 is admitted.
(OWL SWD Operating, LLC Exhibit Number 5 is offered and admitted into evidence.)
MR. MOELLENBERG: And I believe we're ready to call Mr. Blandford.

THOMAS NEIL BLANDFORD,

after having been previously sworn under oath, was questioned and testified as follows:

DIRECT EXAMINATION

BY MR. MOELLENBERG:

Q. So, Mr. Blandford, as with the other witnesses, you've been sworn.

So would you please state your name and address and employer for the record?

A. Thomas Neil Blanford. I'm employed by Daniel B. Stephens & Associates. It's at 6020 Academy, Northeast, Suite 100, Albuquerque, New Mexico.

Q. And have you provided a resume with your professional qualifications and discussion of your experience for this hearing?

A. Yes.

MS. CHAVEZ: It is in the binders already, and yours is right there (indicating).

Q. (BY MR. MOELLENBERG) Okay. And we've marked this as Exhibit 6.

Would you give us a brief summary, then, of your qualifications, and then we'll talk a little bit about your experience as well?

A. My qualifications, I have a Bachelor of Arts degree from the University of Virginia in environmental science. That course of study was primarily geology and hydrology. And I have Master of Science degree in hydrology from New Mexico Tech.

Q. And any professional licenses?

A. I'm a professional geologist in the state of Texas, Number 1034.

Q. And I guess New Mexico doesn't issue those licenses or numbers?

A. They do not.

Q. Would you talk a little bit about your experience, then, and the type of projects that you have been a part of?

A. I've been a consulting hydrogeologist for 30 years. I've worked on all types of projects across the Southwest, a lot of water supply projects, water rights evaluations, water right transfers, appropriations.

I've worked in the environmental field. I've supported a lot of environmental permitting for Freeport-McMoRan, formerly Phelps Dodge, and various other clients. I do a lot of -- in my work, a lot of quantitative hydrogeology. I was trained as a numeric modeler. That's kind of what I started doing in the -- and I've worked in all types of aquifers and all types of environments from fresh water to seawater intrusion to brackish aquifers.

MR. MOELLENBERG: So at this time, I would like to qualify Mr. Blandford as an expert in geology, hydrology, hydrogeology, if there is a difference, and

also as an expert in water supply issues.

EXAMINER JONES: Objection?

MR. BROOKS: No objection.

MS. MOSS: No objection.

EXAMINER JONES: He's so qualified.

Q. (BY MR. MOELLENBERG) So, Mr. Blandford, have you prepared a written report for this proceeding?

A. I did, yes.

Q. And is that something you prepared yourself or with other folks in your firm or others possibly?

A. I prepared it myself with some assistance from others in my firm, working under -- at my direction.

Q. And did you consult with Mr. Kronkosky regarding this project in the preparation of your report?

A. I did, yes.

Q. What kind of information did you receive and review to prepare your report?

A. I received the information that Mr. Kronkosky has summarized in his exhibits, in his report. I reviewed the application for the saltwater disposal, and I looked at a number of references that have already been referred to in this proceeding, the work by Hiss, his Ph.D. dissertation in 1975, and there are a whole number of derivative publications. There is a series of

maps that are published by the New Mexico Bureau of Geology, for example. There are some papers that he published on ground flow in the Capitan Reef Aquifer. And certainly on the geology and the hydrogeology, I also relied on my prior experience working in these same aquifer units and these same geologic settings across southeast New Mexico and West Texas for other clients.

Q. Is it your understanding that one of the issues that was raised early on this or related proceedings was the need for the City of Jal to ensure that its water supplies are safe and that it has access to future water supplies?

A. Yes.

Q. What did you look at and consider in your evaluation concerning the City of Jal's water supplies?

A. I looked -- there is a -- I don't know how you characterize it -- I guess a letter expressing concern on behalf of the City of Jal, and I read that letter. I looked at several reports from the City of Jal's hydrogeology consultants, Souder, Miller. In particular, there is a report where they looked at aquifers in the region to try to, you know, give Jal a recommendation on where they might find additional supplies in the future. So I reviewed that. I reviewed the saltwater disposal well application for the Bobcat

well, the new well, and then I would also lump into that all the historical documents that I've already mentioned.

Q. Okay. There are a couple of reports relating to Jal prepared by Souder, Miller & Associates. I think there has been some confusion in our office as to which one is most pertinent. But looking at your references -- it looks like probably on page 18 of your report -- is that the report that you just referenced a moment ago?

A. Yes. That is the report which is most pertinent.

Q. Tell us a little bit about that report and the investigation that Souder, Miller & Associates did for the City of Jal. I guess to start with, what was the purpose of that investigation?

A. I believe the purpose was to make a recommendation to the City on, you know, where they should go or consider going with regard to groundwater resources in the future or additional supplies that they may need.

Q. Go ahead.

A. I would just characterize it as kind of a paper study, a literature study of resources in the region where they list the different groundwater sources that

are available, and then they kind of go through a process of coming up with a recommendation that they made to the City.

Q. Okay. What is -- where and if you could describe Jal's existing water supply sources.

A. Jal's current supplies come from the Pecos Alluvium, the shallowest aquifer in the region, and it's -- the region's noted on Figure 1 of my report. And there is, on the lower -- well, to the southwest of Jal, there is a blue box and it's labeled "Jal Westfield Boundary." And that's the -- those wells completed in that region, they're in the Jal Underground Water Basin, as defined by the State Engineer. That's the current water supply for Jal.

Just so there is no confusion, I would also note, on the same figure, in the vicinity of the City of Jal itself, there are some magenta dots that are plotted there, and those are applications made to the State Engineer for Santa Rosa supply wells. Those wells are in the Capitan Underground Water Basin, as defined by the State Engineer, but the source of water would be Santa Rosa water, not Capitan Aquifer water. So those are applications. To my knowledge, those wells have not been drilled yet.

Q. What is the approximate depth of the existing

water supply wells, the new wells?

A. I believe they'd be on the order of 6- to 700 feet.

Q. And could you tell us how those well locations relate both horizontally and vertically from the proposed Bobcat SWD well?

A. So in all of my figures, the Bobcat SWD well as proposed is the green triangle. And there is a scale on all the figures. So those wells are about six miles or so to the southwest of the proposed Bobcat well.

Q. And do you recall the depth of the injection zone of the Bobcat well?

A. It's slightly over 3,000 feet, as I recall. I think 3,060, something like that.

Q. Okay. So let's talk for a moment about the magenta wells and in the Santa Rosa Formation. Do you know the approximate depths that they might be targeting for those wells if they drill them?

A. I believe those well were targeted for about 800 feet. Actually -- excuse me -- 700 feet. I have the application here. So 700 feet is what they put in the notice.

Q. Okay. And I think you said those are within the Capitan Underground Water Basin; is that right?

A. That's correct.

Q. What's the difference between the Capitan Underground Water Basin and the Capitan Reef Aquifer?

A. The Capitan Underground Water Basin is a -- it's a geologic region defined by the State Engineer for the administration of water rights within that specific region. The extent of it approximately follows the extent of the Capitan Reef Aquifer, and that's why it's named such. But administration of water in the Basin includes all aquifers you would find from land surface all the way down to the Capitan Reef Aquifer itself. So just because there is a water supply or a water right within the Capitan Basin, as defined by the State Engineer, that does not mean that it's a well that's drawing water from the Capitan Reef Aquifer. Those can be two very different things.

Q. Now, on your Figure 1, there are a couple of yellow lines in the legend that indicates that's the Capitan Reef Aquifer extent; is that right?

A. That's correct.

Q. Could you identify an approximate depth of the top of the Capitan Reef Aquifer there in the vicinity of Jal and those magenta-colored dots?

A. Yes. The next figure -- I'm sorry -- two figures down, Figure 3 is a cross section. And the location of the cross section is marked on Figure 1.

It's just -- it goes -- transfers to the -- to the reef aquifer, and it crosses just north of the proposed Bobcat well location. And this is a cross section that's taken from Hiss, 1975, D, D prime, and you can see there the different formations from the land surface downward. And you can see that to get to the Capitan Reef Complex or the Capitan Reef Aquifer, you have to go, you know, below sea level at least. And, you know, land surface is about 3,000 feet, maybe a little bit more. So you're going to go 3,000 to maybe 3,500 feet to get to the top of the Capitan Reef Aquifer.

Q. So on this cross section that you were just referring to, which I believe is Figure 3 -- is that right?

A. That's correct.

Q. -- where would the Santa Rosa Formation be if you were plotting it on that cross section?

A. It would be up in the unit that's labeled "Rocks Younger Than Rustler Formation." And so on top of the Rustler Formation, it's not shown, but you'd have about 500 feet of Dewey Lake confining bed, doing a siltstone shale, and then -- going up in the section. And then on top of Dewey Lake, you would run into the Santa Rosa Formation.

Q. And, again, this is sort of a generalized cross

section, kind of a regional cross section? Is that how you would describe it, or would you describe it differently?

A. It's regional but relatively detailed for the location it's at. The actual well logs are plotted on the location from Hiss, so he based this on five geophysical well logs, as shown.

Q. So what does the Rustler Formation consist of?

A. There are dolomites in the Rustler Formation, which are primarily -- the primary producing zones. The Rustler can be an aquifer. And then there are a lot of anhydrite and evaporite layers in the Rustler Formation as well.

Q. And then how would you characterize the Salado Formation?

A. It's essentially a salt, predominantly anhydrite. Hydrologically, it's virtually impermeable.

Q. How thick is the Salado Formation?

A. At the Bobcat well location, I believe it's listed as 1,250 feet thick. The thickness is substantial across this entire area that we're discussing today.

Q. So you have, to summarize there, about a 1,200-foot thick pretty much impermeable formation sitting below the Rustler and obviously the formations

on top of the Rustler?

A. That's correct.

Q. Okay. And then below that, it looks like the Artesia Group, which has been talked about a fair amount today. Any thoughts or comments on the Artesia Group as it relates to your study?

A. Not other than what's already been discussed. I think you can see, you know, visually here kind of how we've been talking about it. It sits on top of the Capitan Reef Complex, and moving to the west, it eventually grades into the reef.

Q. And this is the Capitan Reef Complex. Could you describe sort of what that label means? Is it kind of a homogeneous thing or different components? What can you tell us about that?

A. Yeah. The Complex, it's -- it's a geologic unit where you hit dominant limestone and dolomites, and it's very easy to pick out on the well logs. You do not have evaporites or siliciclastics, sand units in it. It's very -- so it's all of those carbonate units lumped together.

Q. And within that somewhere, not really shown here, is the Capitan Reef Aquifer, or would that -- would that take up the whole Capitan Reef Complex?

A. The blue, the Capitan Reef Complex, that would

be equivalent to the Capitan Reef Aquifer.

Q. Okay. Jumping back -- and I think we've actually covered this, but on Figure 2, you've got a table here that talks a little bit about these various formations that you've just gone over. Based on this figure, are there any additional comments or thoughts that you would add that would be important for the Examiners today?

A. I don't think so.

I put this together, kind of matched the -- you know, the hydrogeology to the geology, if you will, with the aquifer or confining nature of the unit being on the right, geology on the left. I only listed Dockum Group Lower. There's probably an Upper Dockum Group, but -- they call it Chinle Formation in New Mexico. There's probably some of that as well underneath the Pecos Valley Alluvium.

And there is not -- the alluvium, where Jal has their current supply wells, it's -- they are over west of the city by about seven, eight miles or so because that's where there is a significant thickness of alluvium that has water in it. You're in the Monument Draw trough. And once you move over towards the city, that alluvium becomes a lot thinner. It's not water-bearing. And that's why at the city itself, you

would have wells, and the Santa Rosa would be the first real aquifer rather than the alluvium beneath the city limits.

Q. So we started to talk a little bit about the Souder, Miller & Associates investigation for Jal, and I take it -- is it fair to say that that investigation led to Jal's applications to appropriate water for these magenta wells?

A. Yes. That's my understanding. When you read the study, it goes through -- considers some different options. It makes a recommendation that Jal pursue Santa Rosa water rights, and they have done that because there are applications for appropriation before the State Engineer for Santa Rosa wells.

Q. Okay. And if it's helpful to refer back to Figures 2 and 3, I take it Souder, Miller didn't just look at the Santa Rosa Aquifer. They did a little bit wider search of that?

A. That's correct. They list the different aquifers in the region, including the Capitan, and they also considered -- one of the recommendations is additional exploitation of the Pecos Alluvium Aquifer, the region that Jal is already utilizing. So they talk about expansion of that well field also.

Q. Based on your discussion so far, I take it the

Salado Formation really doesn't -- isn't an aquifer, or you couldn't get anything out of there?

A. No.

Q. Did the Souder, Miller investigation look at any potential water sources below the Salado Formation?

A. The only one that they looked at was the Capitan Reef Aquifer below the Salado Formation.

Q. Okay. And what was -- what were the results of Souder, Miller's investigation with respect to the Capitan Reef Aquifer?

A. They said it wouldn't be a very good supply for Jal because of the depth and the water quality. So it had significant limitations as a municipal water supply.

Q. Would you have any different assessment or what would your assessment be if you were looking on behalf of Jal or any city for the Capitan Reef as a water supply?

A. I would have the same assessment. The quality is very difficult to deal with. We have looked at it as a water supply for other clients, for example, Colorado River Municipal Water District is one. I know the City of Odessa looked at it in the Ward County area. They passed on it as well. There are a lot of problems with using that water in this area that we're talking about, the eastern limb of the Capitan Reef Aquifer. If you go

60, 80 miles away to Carlsbad or Fort Stockton or something like that, it's a different story. But that's not where we're at. We're at Jal.

Q. So what does the water quality look like based on the information you've reviewed from the Capitan Reef Aquifer and the City of Jal?

A. It's certainly variable, but it's high TDS. I have listed on Figure 4 some of the information that was also provided in Mr. Kronkosky's report. But there is some additional information here. And also provided in -- let me just go through this for a moment.

If we start looking in the southwest of Jal, we have the CP 14 46 Pod 1. That's the EOG Resources well that's already been discussed, with a TDS in excess of 13,000 milligrams per liter. The southwest Jal unit one is a USGS monitor well, so it's not a production well. But that would have had a TDS greater than 82,000, and the dates of the measurement are shown here. This was in 1966, from Hiss. The reason I have the "greater than" is because that's a chloride measurement, so TDS would have been, you know, much higher than the chloride.

Moving to the north, there is another observation well from the USGS, the Federal Davidson 1, and that's about 140,000 TDS. I put "recent." It's my

understanding that Dr. Land, from the Bureau of Geology, has made a quality estimate on that well, and that's what it is. There are the Skelly Jal Water System wells that Mr. Kronkosky already discussed. I won't go through all those.

But there are two new wells -- relatively new wells as of 2012 up in the far left-hand corner, and those are CP 1057 and 1056. And those were installed as part of the Ochoa Mine project for a water supply. And so those are, in addition to the EOG well, probably the newest Capitan Reef Aquifer wells that have been drilled. They had an extensive aquifer test, a seven-day test. At the end of that test, the total dissolved solids was nearly 70,000 milligrams per liter.

And so one thing I would -- I think is important about this figure, if we don't consider the monitor wells -- the other -- all the other wells on here are producing water wells. They're open to a significant thickness of Capitan Reef Aquifer, you know, hundreds, if not 1,000 feet or so. And so this, I think, gives a really good picture of the water quality you might expect from this aquifer if somebody was going to use it for industrial or municipal purposes.

A lot of information in Hiss, that he had, was from drill-stem tests, so you're grabbing a 20-foot

interval that, you know, in the process of drilling a well or after you've just drilled a well. This information, I think, is better because it's been a completed well that's been used for a substantial period of time or tested for a substantial period of time for a substantial thickness of aquifer.

MR. BROOKS: Excuse me. Be sure we're on the same page. You're looking at Figure 4?

THE WITNESS: Yes, sir.

MR. BROOKS: That's what I thought. Thank you.

Q. (BY MR. MOELLENBERG) So in comparison to the water-quality information you were just talking about, if you're looking for, say, a municipal water supply, what kind of water quality are you trying to get to in terms of TDS and chlorides?

A. It's variable based on location, but most people looking today for brackish water sources are looking for something between 2- and 3,000 milligrams per liter total dissolved solids, maybe 4-. That's kind of the target level.

Q. And for TDS in that range, would you put that straight into your water supply system?

A. No. That -- you'd have to treat it. Yeah. You would definitely have to treat that and anything

else that came out of the -- I mean, there are other things that I didn't mention here but are in my report. There is also -- you can have hydrogen sulfite problems, barium sulfate, other issues that are going to be very expensive to treat. So it's not just the salinity. It's other things that comprise that salinity that will, you know, be difficult to deal with for a municipal system or industrial users, for that matter.

Q. And, again, that would be looking at the water quality in the Capitan Reef Aquifer in this vicinity?

A. That's correct.

Q. Any other comments or thoughts that you would have -- you might have regarding the potential use of the Capitan Reef Aquifer for a Jal water supply?

A. I don't think so, other than it's -- I mean, it's clearly not a good option for Jal or their consultant would have recommended it.

Q. Did Jal's consultant look at the Artesia Group as a potential water supply source?

A. Not to my knowledge. I don't know that anyone would look at the Artesia Group as a potential aquifer. I don't view it as a potential aquifer, and I've never seen it in this area viewed as a potential aquifer or in West Texas where it also -- it also occurs.

Q. And when you're using the term "aquifer" there,

what are you -- what sort of considerations or factors are you sort of wrapping into the term "aquifer," as you're talking about it here?

A. Can you obtain the quantity -- you know, a usable quantity of water from wells. And I don't think the -- the Artesia Group does not fit into that category. It's too deep and the permeability is too low, and any interval that might have some production is too thin. So -- and the water quality is not very good either. So it's just -- they didn't -- Souder, Miller didn't look at it, and no one else would either as far as a potential water supply.

Q. So I take it you wouldn't really consider the Artesia Group or any of its components such as the Seven Rivers as a viable water supply source?

A. No. Certainly not in this area.

Q. Based on your experience, would you see any reasonably -- reasonable foreseeable future development of any of the formations within the Artesia Group in this area as a water supply?

A. No. There would be no reason to use those formations. If you were going to go that deep, you would go to the Capitan. And it wouldn't produce an industrial or a municipal-level supply regardless even if you tried to get water from it.

Q. And that's back to the Artesia Group -- the Capitan?

A. That's correct. That's correct.

Q. So walking back through your report, I think we've covered a lot of information here. I do note, on the top of page 5 of your report, you talk a little bit about your review of the application for the Bobcat SWD well. In what context did you look at that application and the proposed construction of that well?

A. It was in the context of the potential for the Bobcat well to impact shallow water supplies, and the only -- you know, with the Salado Group there and the other low-permeability formations, the only way that could happen is if there were some type of leakage up the wellbore. And so I just note the way that the well is proposed to be completed, with two casings cemented to surface.

Q. Just below that on page 5, you referred to a comment from Mr. Goetze about the Capitan Reef Aquifer as a potential groundwater source for Jal. What is your understanding of his comments and your assessment of it?

A. My understanding of Mr. Goetze's comment is that he was saying that you should not allow saltwater disposal into the Artesia Group because it could affect -- adversely affect the Capitan Reef Aquifer, and

if it was affected, then Jal may want to use it at some later time and wouldn't have that opportunity. That's my understanding of what he was saying.

MR. BROOKS: What page are you on?

MR. GOETZE: Page 5.

MR. MOELLENBERG: We're on, yeah, page 5, just under the heading.

MR. BROOKS: Oh, page 5 of Mr. Blandford's report.

Q. (BY MR. MOELLENBERG) So let's talk a little bit about the relation of the proposed well to the Capitan Reef Aquifer. Did you assess the potential for the saltwater fluids proposed for injection in the Bobcat well to communicate with and impact the Capitan Reef Aquifer?

A. I did, yes.

Q. Could you describe what information you looked at there for that assessment?

A. Well, we looked at a number of things. We looked at the hydraulic head and the Capitan Reef Aquifer, the hydraulic head within the Artesia Group, the geology and hydrology that we've been talking about and kind of the geologic relationship in terms of structure on the top of the Capitan and the -- and the top of the Artesia Group. And we used all that. We put

it into -- into a numerical model to simulate the injection, is what we ended up doing.

Q. So I'll get -- I'll get to the modeling in a moment. But what are the main factors that, in your view, would affect potential communication of injected fluids with the Capitan Reef? Maybe you should start with what your general conclusions are and then why?

A. Well, the main factors are the head -- the hydraulic head or the pressure in the Capitan Reef, the hydraulic head or the pressure in the Artesia Group under the injection scenario, the hydraulic properties of the rocks of the Artesia Group, and potentially the density, the nature of the injected water. And so those were the things that we -- things that we considered.

From Mr. Kronkosky's work, as well the Hiss work, it's clear that in this area, the hydraulic head or the reservoir pressures that would be injected into are very low compared to what is known to exist in the Capitan Reef Aquifer. And the recent water levels in the Capitan Reef are about 2,600 feet. They had a low of about 2,100 in the mid-1970s, and we're at a head of -- you know, pretty close to sea level in the injections zone.

So for many decades now there's been a head differential upward from the Capitan Reef to the Artesia

Group of over 2,000 feet, but yet this head differential has been maintained for decades.

So that's just a physical observational line of reasoning that -- you know, it certainly forms my opinion that there is extremely limited connectivity in this region between the Capitan Reef Aquifer and the proposed injection zone at the base of the Yates and top of Seven Rivers.

Q. At the bottom of page 7 on your report, you talk a little bit about changes in water levels in the Capitan Reef Aquifer. Could you talk about that and your observations are and how that may affect your conclusions?

A. There's been -- at these monitor wells that I mentioned, the USGS monitor wells that are shown in my figures and they're in Mr. Goetze's report, there's been a rise in water levels since about the mid-'70s. It's different at each well. The Southwest Jal well, it's been several hundred feet, I think on the order of 4- or 500 feet.

And my understanding, if I have it correct, of what Mr. Goetze is saying is that -- and I think he quotes Lewis Land's work as part of this, is that one of the reasons or the reason -- I'm not sure -- for this rise is because there is water coming into the Capitan

Reef Aquifer from adjacent units, you know, specifically the Artesia Group. And my opinion on that is that you do not need to have water coming into the Capitan Reef Aquifer to have this rise in water levels. The water levels will rise just because the pumping stops and that cone of depression is filling in. And they have not risen -- even where they are today, they have not risen to nearly the pre-pumping level where they would have been back in the '40s, early '50s.

Q. So let's go ahead and then move to your model. Let's talk a little bit about some of the information you've already talked about and other factors that went into the construction of your model. And I'm kind of on page 8, carrying over to 9.

A. Okay. So we constructed the model because Mr. Kronkosky had the calculations that you've already discussed earlier today. And as I understood Mr. Goetze's testimony, he said, Well, those calculations are fine, but they don't account for certain things that are important such as the structure of the Capitan Reef, and then, you know, it's sloping, it has a variable top surface and then the density of the fluid -- the injected fluid. So we constructed the model to specifically address those two concerns.

So the model is constructed of the Artesia

Group, excluding the Tansill. We assumed the Tansill at the top was impermeable, has a lot of evaporites. So we start with top of Yates and model domain vertically, and it goes down to the base of the Artesia Group, same as top of Capitan. And then we take it over to the west, to the margin of the shelf units, which changes by formation, and we take it to the east far enough away that it's not going to matter in terms of having any boundary effects.

The extent of the model is shown on several of these figures. It's Figure 6, for example. And so there is a rectangle there centered around the Bobcat SWD well. And I can see that some of these figures are black and white instead of color. But that gives you the areal extent of the model domain. The model cells are 250-feet-by-250-feet across the -- across the whole area, and the coloring beneath the grid is the top of Yates Formation. And so that represents the top surface of the model.

Moving over one page to Figure 7, this gives you the configuration of the base of the model, which is the top of the Capitan Reef Aquifer. These contours come from the Hiss study. So you can see that the top of aquifer here varies from, you know, minus 500 below sea level to, you know, minus 1,000.

We did change one contour based on a study that -- information from a study my company had done for the Texas Water Development Board where they looked -- took an updated look at the geologic structure of the Capitan Reef. And we had a data point in this region from that study. That's shown in blue, kind of just southeast of the Bobcat well at minus 634. And that data point kind of indicated to us that the minus 250 contour probably -- there is no -- Hiss didn't have any data points in that region, so he just interpolated it. So we removed that contour because we didn't think that that was an accurate representation of the top of aquifer.

But with that one change, this figure demonstrates the base of the model domain. So we're essentially modeling the Artesia Group across the extent of the Capitan Reef Aquifer.

Q. Let me jump backwards a little bit. I don't think we talked about Figure 5, unless I'm forgetting. But can you tell me how that factored into your model or perhaps something else?

A. This Figure 5 is not so much related to the model as it is to demonstrate a topic that has already been discussed, and that is these -- the crosshatched black zone here kind of shows the extent of oil and gas

fields. And this was taken from a figure in Hiss. And so this is to kind of show that the oil and gas fields are extensive along this eastern side of the Capitan Reef Aquifer and drawing predominantly from the Artesia Group. And so as was already discussed, the proposed injection would be into a depleted oil and gas field. And that's just what I was trying to show here.

Q. Okay. So before I go on to the code you used for the model and so forth, are there any other points you'd like to make about the geologic factors and other information that kind of went into the model?

A. Well, geologic factors, we -- there is a table in the back. It's the only table in my report, Table 1, and this lists the hydraulic properties that we assumed by unit. And we have the Artesia Group divided up into six model layers, and I list the hydraulic properties for each layer in that table.

We did not follow the Artesia Group members in the model layering because the injection zone splits across the Yates and the Seven Rivers Formation. So what we did was we split the entire group into the six layers. Layer two is the injection layer, and that's -- and the thickness is given in the third column. So we have an injection interval of 50 feet. That's a little bit smaller than what's in the application, but we took

that from the injection zone test. It looked like the majority of fluid was entering about a 50-foot interval, so that's why we did a 50-foot model layer for the injection zone. And we start from top of Yates and work down to the injection zone, and we work down with different thicknesses until we get to the -- until we get to the top of the aquifer.

Q. Anything else before we talk about the code you used for the model and the source of that?

A. I don't think so.

Q. Okay. So go ahead. And we're now on page 9, under the heading 3.2. So what kind of code did you use for this model and where does that come from?

A. So we used a code called -- it's an update of MODFLOW, USGS. It's a relatively new version of the MODFLOW code that's been released by USGS. This MFUSG version is even newer. What they have done to add to it is the capability to simulate variable density groundwater flow and solute transport. And it was done for the Texas Water Development Board. They had a brackish aquifer case with seawater intrusion that they wanted the work done.

So that's the version of the MODFLOW code that we used, and it simulates pool groundwater flow accounting for variable densities of the groundwater.

And it also accounts for full transport of constituents. So it's not just a flow code. It's also a transport code. And we did that because we have injection fluids which are higher density, greater TDS than the zone that, you know, they're going to be injected into. And, again, as I mentioned earlier, it was one of Mr. Goetze's observation that well, maybe this high-density water, if you account for that, maybe there is greater transport. So that's why we did this.

Q. Moving to page 10 of your report, I think we've already pretty much covered everything in 3.2.1; is that right?

A. Yes.

There is -- I would point out, I guess, figures -- Figure 8 may be useful to look at. And a lot of the modeling figures will show what's going on for every layer. But Figure 8 shows the thickness of the model layer at each location. So just so we're clear in looking at these figures, I'll just take the one on the upper left.

There are two thick green lines. That's the extent of the Capitan Reef Aquifer. There's an orange zone. It's primarily orange. It's showing 200 to 250 feet thick. That's the thickness of layer one in the model. And this is really the upper portion of the

Yates Formation.

And that orange goes over to the west, and it stops at a purple line, and that's where we have the shelf margin. And so the extent of the Yates Formation to the west is shown by that purple line, and then once you go across the purple line to the west, you would have -- you would essentially be in the Capitan Reef Aquifer on an equivalent horizontal level.

And each figure shows going down, so model layer one is the shallowest layer. Model layer six is the deepest layer, representing the Artesia Group. And you can see by the colors, at layer six, there is a lot of black to the west, and that means as you go down through the Artesia Group, you become laterally contiguous with the Capitan Reef Aquifer, closer -- farther east, closer to the disposal well location.

So we're taking into account in this modeling a full three-dimensional picture of what the geology and the hydrogeology looks like.

Q. So you present in your report a discussion of the boundary and initial conditions. What are the key things for the Hearing Examiners to be aware of and consider in that regard?

A. The initial conditions, we have -- we took the injection zone -- at the proposed injection zone at the

Bobcat well, and we have just a little bit of saturation at the bottom. We have 13 feet of head there just to start that layer being saturated, and we use that head throughout the entire model domain. That's probably low. I'm sure it's low as you go down through the remainder of the Artesia Group. But being low, it's probably going to allow more migration of the fluids downward as we do the simulation. So it's a conservative assumption in terms of allowing greater migration.

The boundary conditions around the entire edge of the model, top, bottom, left, right, we have to assign a condition on each boundary, and the approach to doing that is illustrated in Figure 9. And Figure 9 is a conceptual cross section of the -- of the model domain. It's not to scale in terms of layer thicknesses and things, but it kind of shows you what's going on.

So the very top surface of the model is a no-flow boundary. That's the bottom of the Tansill Formation, and then you get into the Salado. So we're assuming zero permeability.

And wherever -- this model grid, you can see from the blue hashers or the red, wherever a model cell is adjacent to the Capitan Reef Aquifer, we're allowing exchange of water between the Capitan Reef

Aquifer and the Artesia Group. And the model computes that according to a head that's prescribed in the Capitan Reef Aquifer. We know that from the observation well, the USGS observation well. And then the model will tell us what the head is in the Artesia Group because that's what the model is simulating.

We have a lower flux term, if you will, in the vertical dimension because that's scaled off of the vertical hydraulic connectivity. But as you get over to the left, you see the red boxes, and there we have a higher conductance term because that would be scaled off of the horizontal permeability. And so these red boxes on the left side, that's where you can have potentially horizontal exchange of water. And the blue boxes are where you can have vertical exchange of water between -- in any water in the Artesia Group and water in the Capitan Reef.

Q. What does Figure 10 show?

A. Figure 10 shows the schematic I was just discussing. It shows how that actually plays out in the model with the geometry that's in the model.

So, again, for each layer, 1 through 6, where that layer interacts with the Capitan Reef Aquifer either horizontally or vertically is different as you go down through the Artesia Group. So wherever there is

kind of a red cell on the -- on the left-hand side -- they are small, but there would be like a blue shading and then a red cell -- those are the red cells where you have horizontal -- potentially horizontal exchange of water. And where you have the blue shading is where you have the vertical conductance term. So you potentially have vertical exchange of water between those cells and that layer and the Capitan Reef.

And then where it's green, that's just an active model cell, and if water went down, it would just go down to the next model layer.

Again, going from top to bottom, 1 to 6, you can see how the geometry of these layers changes due to the actual geologic structure of the Artesia Group and the reef surface.

Q. So is there anything else you'd like to point out to the Hearing Examiners before you talk about the simulations you've conducted and the results?

A. No. I think that -- I think that covers it.

Q. So talk first about the particular simulations that you ran, and then we'll talk about the results of those simulations.

A. So we ran our simulations for 40 years. It was 20 years of active injection, and then we turn off the injection at 20 years and just go another 20 years past

that. We used an injection rate of the average rate in the application, the 25,000 barrels per day, and we inject that into layer two at the Bobcat well location.

We did several sensitivity runs. I'll just say what our boundary condition was for the first one. We can begin with that maybe. We assigned a Capitan hydraulic head of 2,610 feet above mean sea level, and that's equivalent to the measured value in that Southwest Jal monitoring well, and that's a recent measured value.

Q. So I think we're probably ready to move on to the results of your simulations. And are those presented starting in Figure 11A?

A. That's correct.

So the 11 series of figures show the results of the simulation that I've just described. Concentrations, again, in each of the six layers is shown in Figure 11A. The assumed total dissolved solids of the injection water was from a laboratory report supplied by OWL. It's in the appendix of my report. It's one page. But that value is 125,367. So we're assuming the injection water is TDS of 125,000. And you can see by the -- on 11A the color differentiation, the different concentration levels.

We assume that the TDS, total dissolved

solids, of the ambient Artesia Group water was 20,000, and so the first differential here on the concentration of 20.1 to 30, where you start seeing the dark blue, that is injection water. Now, I'll note that the TDS concentration on these figures is in grams per liter, not milligrams per liter. So there's why it's the 20.1 instead of 20,100.

And the injection well location, again, is the green triangle. And so this figure gives you an extent of the migration of injected water. Again, there is a scale on the bottom. And obviously water is in layer two. That's where we're injecting. We also have injected water come up into layer one, and we have a little bit into layer three. We don't have any water reaching layers four, five or six. And you really don't see the lateral extent of the Capitan Reef Aquifer at this scale of figure until you get down into layers four, five and six, and that's shown by the white. So where it's white in that lower row, that would be Capitan Reef Aquifer material.

Q. So what, then, would you conclude from this simulation about the effect of the injection on the Capitan Reef Aquifer?

A. There is going to be no effect, according to these simulations.

The other thing I would mention is if you look at the extent of the injected water volume relative to the Bobcat well location, it tends to move to the east. And the reason it does that is because we're prescribing this Capitan Aquifer head 2,610 feet. And as I already noted, that is far higher than what's in the injection zone.

So what's actually going on in there is we have Capitan water making its way into the Artesia Group because the heads are that much higher, and the permeabilities that we prescribed allows that movement of Capitan water to come in. Now, that's not what we've seen happen over the decades, but that's what's shown in this simulation.

Q. Now, remind me. You're not simulating above layer one. What's going on above layer one?

A. Nothing. That's a no-flow boundary. So there is Tansill Formation and Salado, and so there is no water moving above layer one anywhere.

Q. So it can't move because of the impermeable nature of those formations?

A. That's correct.

Q. So let's move to Figure 11B, and tell us what's different about 11B?

A. So 11B -- 11A was at 20 years, so inject for 20

years and look at the results. And that's in Figure 11A.

11B, we're looking at 40 years. So this is after 20 years of injection. The subsequent 20 years of non-injection, this is what the injected water plume looks like. Other than that, it's the same as what I already described.

Q. And what does figure 11C tell us?

A. Figure 11C is the simulated hydraulic head in each model layer, and you can see that -- in layer two, for example, you can see the injection well location with the buildup of head at that point. And at that model cell, the simulated head -- and this is at 20 years, so maximum -- is 2,855 feet. That's listed on the bottom part of the figure.

And the only reason we see these higher heads -- remember, we're starting about sea level throughout the entire domain. So the only reason you can see the higher heads in the lower layers -- for example, we see 1,400 feet and, you know, all the values there, that's Capitan water inflowing to the Artesia Group rocks in the simulation.

And, you know, I say in the report we could have stopped that by making the permeability a lot lower, but there didn't seem to be much purpose of doing

a run where the permeability was so low that there was -- really what's happening in reality is there is no connection.

Q. So what -- what are we seeing in Figure 12A, and why did you run that simulation?

A. So I ran figure -- the next -- there's one simulation in between I didn't show the figures. The other one we did was we -- instead of a Capitan Reef hydraulic head of 2,610, we used a hydraulic head -- it was about 500 feet lower. I think it was 2,109, if I recall, and that was the minimum value observed historically, and so I ran that run. There was really no difference from what I showed you in the first figures, so I didn't show those, but it is discussed in the report.

The final simulation shown in Figures 12A and 12B, we did not put in that the actual Capitan Aquifer hydraulic head that's observed in the field. We assume that the Capitan Aquifer head was very low just like it is -- just like the head is in the Artesia Group. So we wouldn't have the effect of this high head beneath the model and to the side of the model affecting our simulation. So we kind of allowed the water to move out radially without the influence of that higher head. And the results, you can see, are shown in Figure 12A.

Because of that, we do get a little bit of water down in layer four that we didn't have before.

And then in Figure 12B, you can kind of see the hydraulic heads that are simulated by layer. And this simulation gives you a better picture of how the hydraulic head will transmit through the layers vertically just due to the injection itself. It kind of pulls out that effect only. And we have about 25 feet of head increased down to the bottom of the Artesia Group from the injection.

But, again, I'll stress this is not really a reasonable simulation because for ignoring over 2,000 feet of Capitan head that we know is there.

Q. Is there anything else you'd like to point out to the Hearing Examiners about these simulations?

A. I think that pretty much covers it.

Q. So based on -- well, let me ask, first of all, is there anything about these model simulations that seems odd or something -- something you wouldn't expect based on your knowledge of the geology and hydrology and the nature of these formations and systems?

A. Well, the only thing that seemed a little odd to me, I already mentioned, was kind of the injected water being pushed to the east, and that was because of the higher Capitan heads. And the only way to get rid

of that is to make the connections between the Artesia Group, the permeabilities between the Artesia Group and the Capitan Aquifer lower than they already -- than they already are. So -- but other than that, I didn't -- no. I thought they looked reasonable.

Q. Okay. So based on your work and your modeling, what are your conclusions regarding the potential for the fluids proposed for injection in this well to impact the Capitan Reef Aquifer?

A. I don't think they're going to impact the Capitan Reef Aquifer at all. I think we have good physical evidence to tell us that, and then we have followed up with simulations that account for the types of things that one might be concerned about such as density and geology. And I think we've looked at it, and I don't think there is going to be any effect.

Q. Okay. What are your conclusions regarding the proposed injection as it relates to Jal's existing water supply sources and water rights?

A. There will be no effect on Jal's existing water sources or water rights or the new wells they've put in for appropriation.

Q. And, essentially, then, the simulations show that the injected water would remain within the Artesia Group; is that right?

A. That is correct.

Q. And more specifically, in particular, formations within the Artesia Group?

A. You can see it by layer, and most of it's going to be in the Yates and the injection zone and a little bit in the bottom part of the Seven Rivers.

Q. So looking at this from a water-supply perspective, are those water-quality changes that are predicted by the simulation of any concern to you?

A. No.

Q. And why not?

A. Because nobody would ever get water from those units. It's not going to affect anyone adversely.

Q. Okay.

MR. MOELLENBERG: I think I am finished with my direct then, so I want to pass the witness.

I guess I will before -- maybe before we finish, we offer Exhibit 2 for admission into evidence.

EXAMINER JONES: Any objection, Mr. Brooks?

MR. BROOKS: No objection.

EXAMINER JONES: Ms. Moss, Mr. Newell?

MR. NEWELL: No objection.

EXAMINER JONES: Exhibit 2 is finally admitted.

(OWL SWD Operating, LLC Exhibit Number 2 is

offered and admitted into evidence.)

EXAMINER JONES: Is there any objection to wait until tomorrow morning to start your questions?

MR. BROOKS: I would have no objection.

EXAMINER WADE: How long do you think?

MR. BROOKS: Not very long. I do not anticipate many questions.

MS. MOSS: It might be helpful in the morning so my witness could get his train.

EXAMINER JONES: Yeah. We're within 20 minutes of 5:00 anyway. So can we start tomorrow morning at 8:30? We've already advertised for 9:00 a.m., and I assume nobody else can --

MR. BROOKS: Well, I don't think we'll start with the case that's advertised for tomorrow. As long as we don't start with Case 15753 before 9:00, we'll be okay.

EXAMINER JONES: We'll be okay. Okay.

MR. BROOKS: I don't think there's much chance of that happening.

EXAMINER JONES: So 8:30 tomorrow morning.

EXAMINER WADE: Mr. Moellenberg, were all the exhibits you want to enter into the record entered? I think there is a question about Exhibit 6.

EXAMINER JONES: He's got another witness

also. Correct?

MR. MOELLENBERG: No. Actually, we're done for this hearing -- well, let me back up, I guess. We can present a witness to talk about the questions that you raised concerning the logging and monitoring and such with respect to the new well.

EXAMINER JONES: What about the notice that was provided?

MR. MOELLENBERG: Yeah. We can introduce that.

EXAMINER JONES: Okay. Maybe tomorrow.

MR. MOELLENBERG: Okay. We'll do that. We'll catch up and do a little housecleaning early in the morning.

(Recess, 4:37 p.m.)

STATE OF NEW MEXICO

COUNTY OF BERNALILLO

CERTIFICATE OF COURT REPORTER

I, MARY C. HANKINS, Certified Court Reporter, New Mexico Certified Court Reporter No. 20, and Registered Professional Reporter, do hereby certify that I reported the foregoing proceedings in stenographic shorthand and that the foregoing pages are a true and correct transcript of those proceedings that were reduced to printed form by me to the best of my ability.

I FURTHER CERTIFY that the Reporter's Record of the proceedings truly and accurately reflects the exhibits, if any, offered by the respective parties.

I FURTHER CERTIFY that I am neither employed by nor related to any of the parties or attorneys in this case and that I have no interest in the final disposition of this case.

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