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 BLACK RIVER WATER MANAGEMENT COMPANY, LLC TO AMEND ADMINISTRATIVE ORDER SWD-1627 FOR A SALTWATER DISPOSAL WELL LOCATED IN EDDY COUNTY, NEW MEXICO.

CASE NO. 15720

REPORTER'S TRANSCRIPT OF PROCEEDINGS

EXAMINER HEARING

June 8, 2017

Santa Fe, New Mexico

BEFORE: WILLIAM V. JONES, CHIEF EXAMINER
MICHAEL McMILLAN, TECHNICAL EXAMINER
DAVID K. BROOKS, LEGAL EXAMINER

This matter came on for hearing before the New Mexico Oil Conservation Division, William V. Jones, Chief Examiner, Michael McMillan, Technical Examiner, and David K. Brooks, Legal Examiner, on Thursday, June 8, 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.

REPORTED BY: Mary C. Hankins, CCR, RPR
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APPEARANCES

FOR APPLICANT BLACK RIVER WATER MANAGEMENT COMPANY, LLC:

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EXHIBITS OFFERED AND ADMITTED

(2:28 p.m.)

EXAMINER JONES: Call Case Number 15720, application of Black River Water Management Company, LLC to amend Administrative Order SWD-1627 for a saltwater disposal well located in Eddy County, New Mexico.

Call for appearances.

MR. RANKIN: Mr. Examiner, Adam Rankin on behalf of the Applicant, Black River Water Management Company, LLC, and I have one witness today.

EXAMINER JONES: Any other appearances?

Will the witness please stand?

(Mr. Green sworn.)

TRENT W. GREEN,

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

DIRECT EXAMINATION

BY MR. RANKIN:

Q. Good afternoon, Mr. Green.

A. Good afternoon.

Q. Will you please state your full name for the record?

A. My name is Trent W. Green.

Q. And by whom are you employed?

A. Matador.

Q. Mr. Green, will you please explain for the

Examiner the relationship between Matador and Black River Water Management Company, LLC?

A. Black River Water Management is an affiliate of Matador Resources.

Q. And what is your job title with Matador?

A. I am the vice president of production and facilities for the company.

Q. And what do those duties entail?

A. A lot. I oversee the production and operations for Matador's wells in three states. I also oversee the facility construction. So outside of drilling and completions, my department handles everything for the next 25 years or so on a well.

Q. Have you previously testified before the Oil Conservation Division here in New Mexico?

A. I have not testified in front of this Commission.

Q. Will you please review for the Examiners your background and your educational background?

A. Sure. I received a bachelor of petroleum engineering from Montana Tech in 1989. I received my professional license in 2005. I'm registered in Colorado. My MBA is from the University of Denver, in '07. I've testified in front of other commissions in other states.

Q. Will you please review a little bit of your background work experience as a petroleum engineer?

A. Sure. I've dealt with water systems for almost my entire career, so a little over 20 years. I've worked with systems on six continents and around the country. Most recently, I was chief operating officer with HEYCO, Harvey E. Yates, down in Roswell, and put in a couple of wells for them. Prior to that, I was with BOPCO up in Colorado, put in disposal wells in Colorado and Wyoming. And I've worked on water management systems around the globe for various reasons, various sundry problems for about 20-plus years.

Q. So your job duties involve and your responsibilities involve both on the oil-production side and some saltwater disposal water management duties?

A. Yes. With Matador, I handle, essentially, both sides of the equation, the long-term strategic management of produced water and the disposal on both sides of that equation.

Q. Okay. Now, are you familiar with the application that was filed in this case, as well as the well?

A. Yes, I am.

MR. RANKIN: Mr. Examiner, I would tender Mr. Green as an expert in petroleum geology and saltwater disposal.

EXAMINER JONES: Yeah. I think I've seen him in SPE.

You're active in SPE.

THE WITNESS: I've been active for a long time in SPE, yes, as a chairman.

EXAMINER JONES: Denver or Farmington or --

THE WITNESS: Williston, Tulsa, Denver, Houston and Roswell, chairman of all those organizations at one time.

EXAMINER BROOKS: Okay. That's why -- you get around. I've seen your name.

THE WITNESS: I have, yes, sir.

EXAMINER JONES: Okay. He is so qualified.

MR. RANKIN: Thank you very much.

Q. (BY MR. RANKIN) Mr. Green, will you please explain for the Examiners what it is that you're seeking here today?

A. Today we're seeking to increase the tubing size in the Black River SWD well from 4-1/2 inch to 5 inch under Administrative Order SWD-1627.

Q. So this -- this particular well is subject to approval and authorized to inject through an administrative order?

A. Yes, it is.

Q. And that's Order SWD-1627? Is that what you said?

A. That's correct.

Q. And is the only thing you're seeking to change is the diameter of the tubing?

A. That's correct.

Q. Now, is a -- let's see. Let's get ourselves located here. Is Exhibit Number 1 a copy of that order that approved authorization to inject?

A. Yes, it is.

Q. And what did the order provide generally?

A. It generally provides for a surface-injection pressure limit, 2,740 psi, with 4-1/2-inch tubing or smaller, and the injection zone from 13,700 feet to 14,700 feet.

Q. Is Black River currently injecting into this well?

A. Yes.

Q. And when did it start injecting?

A. Towards the end of December 2016, when we initiated injection.

Q. And is this well equipped as it was proposed and as it was permitted?

A. Yes, it is.

Q. And is it cased and cemented according to the

Division's regulation requirement?

A. Yes, it is.

Q. And so you're not seeking to change any of the well construction -- any aspect of well construction or any other aspect of the well other than the tubing size?

A. That's correct.

Q. Now, after the Division first approved this order administratively -- that's Order SWD-1627 -- did Black River ask the Division to increase the tubing size, administratively, from 4-1/2 inches to 5-1/2 inches?

A. Yes.

Q. And Black River now has modified this application to request to seek a 5-inch tubing size, not a 5-1/2-inch tubing size; is that correct?

A. That is correct.

Q. And is a 5-inch tubing size adequately sufficient for purposes of this well?

A. We would prefer 5-1/2-inch, but for this well and the casing design that is in this well, 5-inch will work for us.

Q. Okay. So based on the existing well construction and design, 5-inch tubing is the appropriate size for the existing well construction?

A. That is correct.

Q. Now, let's talk a little bit more about where the well is located. Is Exhibit Number 2 a well locator map of where the well is?

A. Yes. Exhibit Number 2 is a locator map for the Black River SWD #1 well. You can see on the map that it is located in southern -- southeastern Eddy County in the -- located in the Delaware Basin, and it's west, plus or minus three miles, of Loving, New Mexico.

Q. Do you also have a well log that gives a little background on the particular location of the geology of the well?

A. Yes. So I direct you to Exhibit 3, which is a well log, not the entire log, the lower portion of the well, the Black River SWD #1 well log. This shows the zone that we're injecting into, the top of the injection zone, 31, below the Woodford zone. The 31 is a lower Devonian carbonate. We drilled into this zone plus or minus about 800 feet and completed open hole.

This log shows you, in track one, the gamma ray. As you can see, it's pretty straight through there. Moving to the right, you have the depth track and TVD, total vertical depth. The photoelectric curve is the orange curve with the gray spacing in there. Moving to the right, again, you have the resistivity degree. The subsea TVD depth track is next. The track is the blue and the black curves of the density -- or the porosity curves, black being the density porosity, blue being the neutron porosity. The curve on the far right, in yellow, is the sonic curve.

Q.   Just while we're on this particular exhibit, a portion of this wellbore that's completed open hole, that injection zone, is that -- from what depth track?

A.   Approximately 13,7 to 14,7.

Q.   And what are -- if you could summarize the reasons that you're seeking to increase the tubing here from 4-inch to 5-inch. Is that -- are those laid out in Exhibit 4?

A.   Exhibit 4, is the answer to that. Exhibit 4 states the reasons that we are trying to upsize the tubing. First and foremost, bullet point one, 85 percent of the measured surface pressure is due to friction in a 4-1/2-inch tubing. And we have measured that, and we'll talk about that in subsequent exhibits.

The increase in tubing size will mitigate or decrease this friction and increase our ability to dispose of or inject greater volumes in this well. The larger tubing and subsequent lower friction allows for more water to be disposed of in fewer wells, which then takes me to the fourth bullet point, yielding reduced surface impact with fewer disposal wells.

Q. So the chief issue you're seeking to address here with this application for the increase to 5-inch tubing is to mitigate that 85 percent injection pressure due to friction?

A. That is correct. Friction is not our friend.

Q. And friction reduces the total volume that can be injected through that well?

A. That's correct.

Q. Okay. So have you conducted a study, then, to determine -- and how is it that you know that you've got 85 percent of your injection pressure due to friction? Did you conduct a study to determine that?

A. Of course.

Q. And that's indicated in Exhibit 6 -- 5, rather?

A. 5. Exhibit 5.

So to analyze and fully ascertain what we have and how we move forward, first Matador and Black River Water Management conducted a separate injection falloff test. The primary objection of this test was to measure friction in the tubing, and then follow up with some reservoir properties.

So this particular plot you see on Exhibit 5 shows the results of our test. On the y-axis, we have the vertical axis, pressure, the psi. On the horizontal axis, or the x-axis, we have the injection rate in barrels per day. What you see in the main part of the graph, the first red line, if you will, horizontal red line, is the approved surface pressure limit. And I've drawn that on there for reference. That's the .2 psi per foot times the depth and the 2,740 psi.

Corresponding to that, because I work in bottom-hole pressure, you see the top red line, which is essentially just adding hydrostatic, .45 psi per foot or 1.04 specific gravity times the density, giving me roughly 9,000 psi -- pressure limit, per the permit.

In the center is the blue line, and that represents the bottom-hole pressure measured in the gauge that we had in the bottom hole during this test. We gauge the surface, and we gauge at the bottom hole. The difference between the two, basically, is friction.

In gold, towards the bottom, in the gold-dashed line, is the measured surface treating pressure, or injection pressure, while we were conducting our step-rate test. You can see that we did -- we could have -- it's dashed because we didn't actually do that. It's dashed because we could have crossed the surface treating pressure limit had we kept going, but we, essentially, pressured out with friction. The gold bars are the calculated measured friction. The blue triangle below that is the entry friction into the formation, which is about 15 percent. You can think of that as reservoir entry fiction or some level of small amount of skin. But the calculation shows that 85 percent of the surface-injection pressure is friction in the tubing.

Q. So in addition to identifying and determining what the -- calculating what the friction is that accounts for this injection pressure, you took other measurements of the reservoir at the time; is that right?

A. We did a falloff test following this to ascertain reservoir properties.

Q. Okay. And then in your exhibit here, you've indicated that you conducted some additional studies based on the data that you obtained?

A. Yes, we did.

Q. One was a nodal analysis?

A. We then move into nodal analysis.

Q. And the other -- I think you said you did a study to indicate the potential response to the pore pressure in any injection.

A. That's correct.

Q. So let's talk about the nodal analysis first. What is a nodal analysis?

A. A nodal analysis, which we'll look at on

Exhibit 6, is a methodology that engineers use to optimize the completion design. It essentially matches that design -- that completion design to the reservoir deliverability. It allows engineers like myself to identify restrictions or limitations or variations of different configurations and tubular sizes on the impact of the well productivity.

Q. Will you review for the Examiners what Exhibit 6 actually shows here?

A. Exhibit 6 is an output of a nodal analysis that I did. And on this plot, we have, on the x-axis, the horizontal axis, the liquid rate. In this case, it's an injection rate in barrels per day. On the y-axis is the bottom-hole pressure. I balance my well at the bottom hole, hence, the bottom-hole pressure from the previous analysis as well. That's in psig. You match the inflow performance, or in this case the tubing performance, and that's the blue curve that you see labeled "4-1/2-inch tubing."

The two yellow dots indicate measured actual data. We got that from our step-rate test previously. So we anchored those points. I felt comfortable with that correlation on a 4-1/2-inch tubing. That matches, roughly, 15 barrels a minute or 21.7 or 22,000 barrels a day current injection rate.

From this, we then evaluate the different tubing sizes that we could use. In this case I looked at 5-inch tubing. That's the red-dashed line. You can see that curve to the right. The difference between the 4-1/2 and 5-1/2-inch curve is, essentially, the fiction difference, which is represented by the black-dashed line.

What I was able to come up with was a very minor increase, small, maybe less than 100 psi, of injection pressure. We could go to 20 -- 30,000 barrels a day with the 5-inch tubing. That's what I'm showing here.

Q. Now, on this exhibit, you also indicate what the approved bottom-hole pressure is --

A. I do.

Q. -- based on your calculation --

A. And that's the top red line with the approved bottom-hole pressure limit, which is 2,740, plus hydrostatic.

Q. So that line indicates --

A. And we do not approach that with this injection. That's correct.

Q. Now, based on this analysis, have you come to any conclusions about the propriety or the appropriateness of using a 5-inch tube in this

particular well?
A. I think it's appropriate.
Q. And is it based on your determination that it won't approach the permitted injection pressures?
A. Well, we will not approach surface- and bottom-hole pressure limitations. We'll enhance the deliver -- or the injectivity, the deliverability of the well and improve the economics. So yes.
Q. With only a marginal increase in injection pressures?
A. "Marginal" being the key word.
Q. Yeah.
Now, you also indicated in a previous exhibit an additional study to look at pore pressure response. And is that something that you also have an exhibit to present?
A. Yes.
Q. Is that Exhibit 7?
A. Exhibit 7 describes the evaluation I made to look at the impact that a pore pressure increase might have. We wanted to make sure that putting these volumes in wasn't going to have any other impacts we may not want.
So on Exhibit 7, I'm showing a graph here that we used a model to calculate. On the graph, I show

three different injection rates. Again, on the y-axis, I have a calculated pore pressure. That would be above and beyond virgin pressures. The pressure here is measured at 6204. This would be above and beyond that based on however long we inject it.

Along the x-axis, or the horizontal axis, is distance from the wellbore in kilometers. I love switching up units to mess with people. So we're in kilometers. The injection rate is the three curves. I have a blue curve, which is 40,000 barrels per day. The orange curve represents a rate of 30,000 barrels a day, and the green curve represents an injection rate of 20,000 barrels a day. This analysis was done for a 20-year period. In other words, taking a look at the orange curve, if we were to inject 30,000 barrels a day for 20 years, at the wellbore, we would only increase the pore pressure 165 psi, maybe, which is less than 3 percent of the initial reservoir pressure.

Q. Just for our own -- for context, what approximate tubing size would be -- would permit you to inject 40,000 barrels per day?

A. 5-1/2-inch tubing.

Q. Okay. 5-1/2-inch tubing.

All right. So you're kind of in the middle there with the 5?

A. Yes. 30,000 barrels a day is the 5-inch, and 20,000 is where we're at with the 4-1/2.

Q. And based on this study and based on your analysis of the pore pressure response, what are your conclusions about switching to the 5-inch tubing in this particular reservoir?

A. The reservoir would see a relatively insignificant impact by having a larger volume injected.

Q. And so in your view, the appropriateness of switching to the 5-inch tubing, the benefit would be that you get to inject additional volumes --

A. That's correct.

Q. -- without weighing any concerns to impacts to the reservoir?

A. Correct.

Q. Now, just so the Examiners understand, you used a particular model to conduct the study?

A. We used a model developed by Stanford University, and in that model, it is used -- it is used to evaluate pore pressure impacts, if you will, due to oil and gas injection and to look for potential effects of that.

Q. And that model was developed at a university or --

A. Stanford University.

Q. Is that an industry-accepted model that is used for this type of work?

A. Yes, I believe so.

Q. Now, overall, Mr. Green, does the result of your analysis indicate that there is little risk to impact to the formation based on the proposed injection rate?

A. Restate the question.

Q. Yeah. Based on your analysis with this model, is it your conclusion that there is little impact to the reservoir based on the proposed injection rate?

A. That is correct.

Q. Okay. Now, this model that you ran, that you conducted, did it account for any other injection other than the subject well?

A. No. This is the only well.

Q. Okay. Now, are you aware of any other injectors in the area that are injecting into the Devonian?

A. There is another well approximately a mile away, or using scale, my two kilometers away. Yes.

Q. And do you have any information about that well? Do you understand what it's --

A. A little bit. A little bit. It's not in New Mexico, and I'll probably pronounce it incorrect, Cigarillo. Cigarillo. I'm from Montana. Cigarillo, we'll say. Yeah. It's about a mile away. It's injecting into the Devonian. For its life, the average injection rate has been less than 5,000 barrels a day, and for 2017, it has averaged about 2,300 barrels a day.

Q. So you said it's approximately -- roughly two kilometers away from the Black River --

A. Yes.

Q. -- injector?

A. Yes.

Q. So is there any way that you can anticipate or project what the potential impact would be between those two wells?

A. Yeah. You could take my plot and go to the two-kilometer curve -- or line, horizontal line, and kind of imagine a 5,000 barrel-a-day curve. And you can see that that would have an impact, at two kilometers, of 1020 psi over 20 years of injection. This has been on injection for not very many years, so it's probably going to have a negligible impact to the reservoir in this area.

EXAMINER BROOKS: Excuse me. I'm going to have to leave to go to my meeting, and I will leave it to the Examiner's discretion if he wishes to continue -- if he wishes to go on with the hearing or postpone it until I'm able to return.

EXAMINER JONES: I thought you had to leave at 3:30.

EXAMINER BROOKS: 3:00.

EXAMINER JONES: No. Let's keep going.

Thanks for being here today.

EXAMINER BROOKS: Thank you.

(Examiner Brooks exits the hearing.)

Q. (BY MR. RANKIN) Let's pick up where you were just describing how you can estimate the rough impact -- the approximate impact of this other well that is approximately two kilometers of the Black River injection well.

A. Yes. This analysis could do that, evaluate the pore pressure effect.

Q. And based on its lifetime injection rate of about less than 5,000 barrels per day, you came to the conclusion that its impact on the pore pressure would be insignificant?

A. Correct.

Q. And together, these two wells could have a very slight impact or result in a very slight response to the pore pressure within this area?

A. That's correct.

Q. Now, in your opinion, Mr. Green, does this

analysis and your experience with the Devonian and injection in this area suggest that there is still capacity for injection within the Devonian for the life of this Black River well at the proposed injection rate of 3,000 barrels per day with that 5-inch tubing?

A. At the injection rate of 30,000 barrels a day, yes, there is additional capacity.

Q. What did I just say?

A. 3. You said 3.

Q. 3? Sorry.

A. Yes. There is additional capacity for injection at this interval, at these rates.

Q. Okay. Now, again, just to recap what your earlier slide was -- depicted and the reasons for this application, what was the -- what is the -- again, recap. What is the practical benefit of increasing the tubing size from 4-1/2 inches to 5 inches?

A. The practical impact is reducing friction pressure, increasing injectivity and fewer disposal wells.

Q. Okay. Now, let's talk a little bit more about the particular wellbore here and the risk to the wellbore by increasing the tubing size from 4-1/2 inches to 5 inches. Did you evaluate that issue in preparation for this hearing?

A. Yes. We looked at the construction of the well, how it's built, what kind of casing we have, what we can work with. So Exhibit 8 shows a cross section, if you will, a bird's-eye view, of, on the left, the as-built 4-1/2 tubing by 7-inch casing and its clearances, and on the right, 5-inch tubing in that same wellbore as proposed, 7-inch casing, and its clearances.

The 5-inch-tubing scenario yields adequate annular clearance and one -- the BLM recommends a minimum clearance of .42 inches, which this adequately addresses. And we believe this has a -- meets the expectations for prudent operation of an SWD well.

Q. And why, generally, does clearance within the annular space matter?

A. Not that we do it on a regular basis and not that I want to, but occasionally we have to fish tubing out of the hole when something occurs, and you need to have appropriate clearances so you can get your tools in and do that.

Q. And you need to fish if there were a situation where the tubing were to get stuck or somehow this is inaccessible?

A. That is correct.

Q. Now, are there -- based on the proposed tubing, the 5-inch tubing, within this existing casing, are

there standard readily available tools that will allow you to access and fish any tubing that should ever get -- be required?

A. Yes. The reason I did the evaluation was to make sure that the essential stock equipment is available to fish these kind of tubulars out of this well.

Q. Now, this well's already been drilled --

A. Yes.

Q. -- or it's being injected into?

A. Yes.

Q. So have you -- do you have a well deviation study or report?

A. I do. That would be Exhibit 9. Exhibit 9 shows the wellbore as drilled, and you can see the casing designs. So what we see here is the true vertical depth on the y-axis and -- excuse me -- across the top, which is our northering [sic] x and y-axis. You can see the well is drilled. It's relatively vertical, and so we exit the casing -- open hole section. It's essentially a vertical hole. Yes, sir.

Q. So based on this amount of deviation, will regular, standard fishing tools be able to access any part of the tubing within this casing?

A. That is correct.

Q. In your opinion, is there an unreasonable enhanced risk to the wellbore as a result of the increased tubing size from 4-1/2 inches to 5 inches in this casing?

A. No.

Q. All right. So let's talk a little bit about notice. Is -- Exhibit Number 10, is that a copy of the Notice of Publication that was published in the "Carlsbad Current-Argus" giving notice of today's hearing and your application?

A. Yes, it is.

Q. And is the next exhibit, Exhibit Number 11, is this a copy of the affidavit that was prepared by me indicating that we provided notice to all the parties of interest according to Division rules?

A. Yes, it is.

Q. And behind that affidavit, is there a copy of the letter that we sent out providing that notice?

A. Yes.

Q. And on the subsequent pages, is there a list of all the entities who were required to be provided notice according to the Division rules?

A. Yes.

Q. And following that list, is there also a copy of the green cards and green card receipts indicating

that those individuals for which we had correct records received notice?

A. Yes.

Q. In your opinion, Mr. Green, would a prudent operator switch its tubing from 4-1/2 to 5-inch tubing given the facts and the increased friction that this well is experiencing with the injection that's been occurring?

A. Yes.

Q. Okay. And in your opinion, would approving this application impair any correlative rights?

A. No.

Q. Would it be in the best interest of conservation?

A. Yes.

Q. And in your opinion, would it protect against waste?

A. Yes.

Q. Let's see. I think that would be all my questions. That's usually what I end on.

MR. RANKIN: Mr. Examiner, with that, I would like to tender -- move to admit Exhibits 2 through 9.

EXAMINER JONES: Exhibit 2 through 9 are admitted.

(Black River Water Management Co. Exhibit Numbers 2 through 9 are offered and admitted into evidence.)

MR. RANKIN: And Exhibit 10, which is my affidavit, admit that -- rather, the Notice of Publication, which is 10, and Exhibit 11, which is the affidavit, ask that those be admitted as well.

EXAMINER JONES: Exhibits 10 and 11 are admitted as well.

(Black River Water Management Co. Exhibit Numbers 10 and 11 are offered and admitted into evidence.)

CROSS-EXAMINATION

BY EXAMINER JONES:

Q. The notice you provided in this case was -- you cited Part 4. Did you not -- did you -- you probably had to kind of search for what notices to provide in this case?

MR. RANKIN: We provided notice according to the injection -- you know, the injection rules.

EXAMINER JONES: Oh, 16.

MR. RANKIN: Yes.

EXAMINER JONES: Or 26. 26. Yeah. Okay. So that one -- in other words, you went out a half mile and provided notice?

MR. RANKIN: Yes.

EXAMINER JONES: Okay. And the surface owner here is -- let's see. It might be a fee surface owner.

MR. RANKIN: Do you know the answer to that?

THE WITNESS: Yeah, Black River Management.

EXAMINER JONES: Yeah. You guys own the surface.

THE WITNESS: Yeah.

EXAMINER JONES: Yeah. Which make sense. Okay.

Q. (BY EXAMINER JONES) This BLM guidelines of 4.2 [sic], is that a difference between the two diameters, 4.2 [sic], the ID versus the OD?

A. No. It's the center clearance. Yes. Between the OD and if you look at --

Q. Oh. So it's the difference --

A. Yeah. So the reason, if you look on the exhibit --

Q. Difference in the radiuses?

A. The radius.

Q. Okay.

A. That's why I put the coupling OD and the dash as well, make sure we had the radii adequately covered.

Q. Okay. So when you say 5-inch, are you talking 5-inch IJ or EUE?

A. BTC.

Q. Okay. So it's -- it's got a bigger -- bigger pin than it's got -- I mean, it's an upset end, EUE?

A. Yes. Yes.

Q. Okay. I thought it was 5-inch interval joint --

A. No.

Q. -- tubing, but -- okay.

And it would be plastic-coated also?

A. Internally coated, yes.

Q. I think that some districts -- all our districts in the south require that, and in the northwest, it's not -- it's kind of -- you know, you can request not to do that.

A. Well, I believe it's prudent to have coated --

Q. Okay. When you do without it, then you get a lower friction --

A. And you reduce the friction by having the coating. Yes.

Q. But that stuff is about a quarter-inch from --

A. Yes, it is.

Q. So it reduces your ID?

A. Yes, it does, which is shown on that graph as well.

Q. Okay.

A. I show that with the cross section on 5-inch casing, 4.036 ID. If you'll refer to your red book, you'll find it's actually 4.164, I believe, in the red book.

Q. Okay. Okay. So you used a drift diameter of the 7-inch? So it's 7-inch -- they called it a liner in the permit, but it's really --

A. It's production casing.

Q. It's production casing all the way from surface?

A. Yes, sir.

Q. And it's -- okay. Okay. So it's -- I see what you are doing here.

Now, the step-rate test that you came up with, did you determine that you can increase the bottom-hole injection pressure higher than the .2 plus .433?

A. Yes. Actually, we could go higher.

Q. Because you can apply for that.

A. Could.

Q. You get more water in the ground if you want to spend more money on pumps, you know, out there.

A. (Indicating.)

But you can see from the step-rate test, it's a hockey-stick curve, the grey -- I'm sorry -- the gold curve. It doesn't kick up pretty fast as you move to the right.

Q. There's no break in it?

A. On the blue line, you're correct. I'm looking at the surface pressure, which is the gold line.

Q. Yeah.

A. That would be where the horsepower is required to push it down the hole.

Q. Yeah.

A. Now, the blue line, you're absolutely right. It's relatively -- no inflection.

Q. Even if you change the scale on the y-axis, you wouldn't see a break -- you wouldn't see a break in the bottom-hole pressure?

A. Almost insignificant. No. Almost a straight line.

Q. Okay. Now, so you did a falloff after this?

A. Did a falloff test, yes, 16-hour falloff.

Q. Did it show linear -- linear behavior or -- or matrix behavior?

A. After a short wellbore storage section, it went, essentially, into radial flow.

Q. Okay.

A. I think you'll see in the box there, tech box, the transmissibility -- I'm sorry. That's on the nodal analysis. The reservoir is 204,000 millidarcies. Over to the right, there is a box.

Q. Okay. There it is.

A. Yes, sir.

Q. Okay. So you've got -- your KH is quite high in this well, 204,000. And your reservoir pressure, you know what that is. And the thickness, you just used 1,000 feet?

A. I used 800 feet. We drilled into it roughly 800 feet, yes, open hole completed.

Q. Okay. So the Devonian in this area, can we consider bottom and side water drive, correct? I mean, if you were producing.

A. If you were producing, yes.

Q. The water would come from somewhere?

A. Somewhere else.

Q. We have had cases here before that showed that the influence of the injection into the Devonian doesn't go very far, and that's what you're showing here, correct? Doesn't influence the pressure in the Devonian --

A. Much.

Q. -- much --

A. Correct.

Q. -- very far from the wellbore --

A. That's correct.

Q. -- even at the high rates?

Now, the capacity that you had to inject, say there was no limit on your cost -- I mean, you could drill a big casing and put huge tubing. What would be your -- you've got these two yellow dots in your Devonian.

A. Uh-huh.

Q. Is that your injection performance relationship or -- in other words --

A. That's essentially the IPR curve. For an injection well, it's hard to call it that --

Q. Yeah.

A. -- but that's the IPR curve. And you can -- that is a straight line extrapolation, oh, for another inch or so to the right, and then it'll curve up a little bit.

Q. Then it'll finally curve up.

A. Yes.

Q. You actually did crank it up, and you tested it pretty good, then?

A. Well, of course, sir (laughter).

Q. Okay. Okay. That makes sense. You've got to

know what you're dealing with.

There are two things that I understand that the Division is a bit concerned about, and it may be that David wants to get -- get some operators in to have a little discussion on this, because it seems to be that you guys are not the only ones and just -- we had the Mesquite hearing. And one was the fishability of it.

A. Yes.

Q. And the other one that I actually wasn't aware of is some are concerned about the influence of too much injection into -- near the basement rocks that might influence possible seismic activity in the future. You didn't bring your geologist today, but --

A. No.

We are about 1,000 feet above the basement, however.

Q. Yes.

A. And we have done internal evaluations, again, being a prudent operator, to make sure that doesn't impact us in the future. So we believe that we're in decent shape here.

Q. Yeah. I have heard that there is an interest -- normally, the operators not to --

(Examiner Brooks returns to the hearing.)

EXAMINER BROOKS: You're right. It's 3:30.

It's been changed, and I was not alerted.

EXAMINER JONES: I was just -- we went over this, and I just was reiterating that -- we were talking about the concerns than the Division has in these type cases, not to -- I don't want to get out of line here in a hearing.

Q. (BY EXAMINER JONES) We're just taking what you say and processing it and everything. But -- but some operators -- we have heard that no one wants any tremors because they might -- it's going to get blamed on the oil patch if it happens, you know.

A. Uh-huh. Uh-huh.

Q. And you, of course, probably feel the same way.

A. Yes.

Q. Especially if you have properties in Oklahoma or Texas or places --

A. Well, as a prudent operator, we don't want to jeopardize our future operations with issues such as that as well, so we're looking at all the things we can to make sure that we are going to be prudent to not have these kind of impacts happen.

Q. Is there possible faults in this area? Did you talk to your geologist about that?

A. Yes. Yes to the geologist question.

Q. Okay.

A. We have proprietary in-house 3D seismic and other data image logs, a lot of data in the area and have evaluated that information to make sure of the issues, in putting these wells in the right places that we're comfortable with.

Q. Okay. Okay. Thanks for saying that.

Another concern that I had was if something happens to these big wells -- big disposal wells and you have trouble plugging the well properly because you can't fish it, will then -- then that's a concern to the Division. You know, we try to put those plugs from the bottom on up. And this particular well here, I was looking at it, and I don't see the logs on the well. And for some reason, our logs all got -- that's on there are all -- that I saw were cement bond logs, and they're all copied -- well, there is one mud log, but it was all copied in black and white and was it was very hard to read on our site. And it's possible the person scanning it in our Artesia office -- we didn't even have a scanner there until recently, I think --

A. Correct.

Q. -- so it's possible that could have happened. And it could be that I'm going to be asking for the logs on this well just because I don't think that I saw them in there.

And then on the bond logs, it did show that there was some -- there was, on the 7-inch, I think it went up to 7,000 feet or so.

A. 7,400 feet, I believe.

Q. Okay. Okay. So you're aware of the cement placement on the casing on this well?

A. Yes.

Q. So the question to you, then, is: If there was a problem fishing this casing -- or this tubing -- this big tubing, can you get into it with a perf gun enough to get down to shoot through two strings of pipe and possibly plug it with inside-outside plugs?

A. Well, with 5-inch tubing in the hole, 5-inch casing, we'd easily be able to go in with 3-3/8 slickguns with large charges and certainly perforate through multiple strings of casing and tubing, absolutely, and cement sheath. I believe that would be yes.

Q. Okay.

A. And from a plugging perspective, having that size, with that full bore packer, we'd be able to go through either coil tubing or stick tubing to go down into the upper hole and properly plug back up.

So, unfortunately, I've had plenty of experience fishing around the world. This does not appear to me to be a significant fishing problem, but it can be done.

Q. Okay.

A. I don't want to. I don't intend to.

Q. Right. Hopefully, you'll never have to.

A. Correct. But it does appear that with this construction and these thoughts in mind, we can do that.

Q. Yeah. It seems it's to your benefit to not ever have to fish here, because you're going to affect your operations around there if you have to shut your wells in.

A. Yes. That's correct.

Q. You've done a really good job of putting this all together. I appreciate you doing the nodal analysis and the R curves and the -- and this one was another one that we were going to -- that we didn't have in the previous case. That one -- you said it was a Stanford --

A. Stanford University model.

Q. So they -- last time I saw one of those presented, it was a concentric shells of radial -- where you draw the circles around the well and then you -- in other words, you set up your grid that way. It's not a rectangular grid.

A. We set up a radial grid pattern.

Q. Radial.

A. That's still in there. It continues to evolve.

Q. Okay. And for a disposal well, it can't be that difficult to set up something?

A. It's not.

Q. It's one disposal well.

A. It's not.

Q. You might have that other well to contend with, but it's not --

So what -- I guess the porosity in that Devonian -- it's always been a mystery to me how it can take so much water, and it just goes away, you know. So is it --

A. I'd like to defer to my geologist for that answer, but I will tell you from a reservoir engineer's perspective, the transmissibility is quite high.

Q. It's quite high.

A. So from that, porosity permeability is good.

Q. Okay. You know, since I've come to work here, I've been aware that EPA has a -- has a -- called a radial influence equation that they use --

A. Yes.

Q. You're probably familiar with it.

A. Yes.

Q. But, basically, if you let this well -- if you

just drilled into this well and completed it and let it sit, you said the initial pressure on this well was --

A. 6,204.

Q. 6,204?

A. Yes. That's the pink star, yes.

Q. So that's like -- so what fluid level would that be if it was point --

A. I don't have my calculator in front of me.

Q. I should be able to figure that one, but, like, 12,000. So it would almost stand fluid to the surface.

A. Almost. Almost.

Q. You're assuming this is normally pressured, then?

A. Yes, sir, pretty close to.

Q. Okay. Some of the Devonians that I've seen actually will not stand to the surface. They'll stand down to --

A. Down a couple hundred feet.

Q. Yeah, or more even --

A. Yeah.

Q. -- so you can skim them sometimes, those older Devonian wells.

A. (Indicating.)

Q. But you're not -- are you, in this well, near an area that has not been produced in the Devonian?

This is a saline reservoir?

A. Yes.

Q. Adam used to study the -- when he was here once before, he studied the --

A. Let me glance back at my -- I believe we're in a saline.

Q. We call it saline reservoirs for CO2 sequestration. You know, in other words, not oil. It doesn't have oil.

A. No, it's not. And it's not below the 10,000 ppm, so we don't have the EPA drinkable-water situation.

Q. Oh, yeah. It's like 50,000, isn't it?

A. Yeah. So we're in a saline environment. That's correct.

Q. Okay. I'm not sure. I was under the impression it was a 5-inch interval joint.

A. My drilling engineer provided me the data that's on my chart --

Q. Okay.

A. -- and it is 5-inch PTC 15,000 [sic] per pound.

Q. You should know. I assume the 5-inch is a pretty unusual size. It's unusually 5-1/2.

A. We found some. We haven't purchased it yet, but we have found some.

Q. Okay. And those BLM guidelines you're talking

about, are they somewhere in there? It's a federal agency you're talking about, so they might be --

A. Surprisingly, it's not necessarily published. It is in an email that's online. Phillip -- it's in my -- Paul --

Q. Paul Schwartz?

A. Paul and Phillip here, yeah.

Q. Oh. Oh.

A. It's actually in the Mesquite record.

Q. Okay. Thank you.

EXAMINER JONES: Mr. Brooks?

EXAMINER BROOKS: I don't know anything about this.

EXAMINER JONES: Okay.

(Laughter.)

Q. (BY EXAMINER JONES) I saw the -- well, it's been submitted from the Mesquite. We asked them for a nodal analysis. So, basically, they can increase their tubing size on three wells -- three or four wells and defer drilling another well --

A. Yes.

Q. -- basically. So it will save them how much it costs to drill a well. But then that would increase the fishing risk. They were willing, I guess, to take that risk. And you are, too, sounds like.

A. That's correct.

Q. Okay. Thank you very much.

A. Thank you.

MR. RANKIN: Mr. Green, I don't think I have any further questions.

With that, Mr. Examiner, I'd ask the Division to take this case under advisement.

EXAMINER JONES: Okay. Thank you-all for coming.

MR. RANKIN: If there is any additional information --

EXAMINER JONES: Okay. I'm sure if there is, Mr. Catanach will be calling.

Case Number 15720 will be taken under advisement.

(Case Number 15720 concludes, 3:17 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.

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