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

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

CASE NO.: 14161

APPLICATION OF TARGA MIDSTREAM SERVICE LP TO AMEND ORDER NUMBER R-13052.

REPORTER'S TRANSCRIPT OF PROCEEDINGS

COMMISSION HEARING

BEFORE: JAMI BAILEY, CHAIR/DIRECTOR
SCOTT A. DAWSON, COMMISSIONER/DESIGNEE
ROBERT S. BALCH, COMMISSIONER
MARK A. SMITH, COUNSEL

September 22, 2011

Santa Fe, New Mexico

This matter came on for hearing before the New Mexico Oil Conservation Commission, JAMI BAILEY, Chair/Director, SCOTT A. DAWSON, Commissioner/Designee and ROBERT S. BALCH, Commissioner, on September 22, 2011, at the New Mexico Energy, Minerals and Natural Resources Department, 1220 South St. Francis, Drive, Room 102, Santa Fe, New Mexico.

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I N D E X

MADAM CHAIR: I now call case 14161, which is the application of Targa Midstream Service LP to amend Order Number R-13052. Do I have appearances in that case?

MR. SCOTT: Yes, ma'am. William Scott for applicant Targa.

MR. BRUCE: Madam Chair, Jim Bruce of Santa Fe representing Apache Corporation and Monument Operating Company Inc., and appearing in association with Andrew Taylor, in-house counsel for Apache Corporation.

MADAM CHAIR: Do you have an opening statement?

MR. SCOTT: Yes, ma'am. Targa Midstream Services LLC, formerly Targa Midstream Limited Partnership, seeks an order from the Commission amending Order Number 13052 in two respects.

First, we ask that the Commission delete the requirement to re-enter the NMGSAU Well Number 285 to 9755 feet and replug that well back to the Grayburg-San Andres formation. The 285 Well is located approximately 2950 feet north and west of the Monument Well, which is the subject of the Order 13052.

Second, we ask the Commission to amend the order to retain the Graham State NCT-F Well Number 7 as an active saltwater disposal well into the San Andres formation.

With respect to the first request to delete the requirement to re-enter and replug, Targa will call two

witnesses today: First Targa will call Mr. James Lignau and then Mr. Mike Pierce. Targa will demonstrate that the requirement to re-enter and replug should be removed from the order for several reasons.

First, Targa spent significant time from February of this year through May of this year attempting to re-enter that well and was unsuccessful after repeated efforts during that several-month period and was unable to reach the depth required by the order.

Targa incurred in excess of $1 million in connection with the efforts to re-enter and replug the well. Targa has reviewed the well records for the Monument Well, as well as for the 285 Well. Those records demonstrate the existing plugs set in the 285 Well at 5655 feet and at 6305 feet were set after that well was originally drilled, and those plugs are of good quality.

Targa will further demonstrate it's conducted an examination of wells within a one-mile radius of the 285 Well to determine whether there is a chance that that material injected in the Monument Well could migrate from that well to the 285 Well and then impact that well or other wells.

The well logs, Monument well demonstrate that the orientation of the fractures within the Monument Well run from northeast to southwest, that's across the gradient from the 285 Well, reflecting that it is unlikely that the

material injected into the Monument Well would migrate toward the 285 Well.

Further, Targa will demonstrate that the -- within the one-mile radius there are six wells that penetrate below 6000 feet. Those wells are all well cemented and well cased. There is not a likelihood the material injected from Monument Well would impact any of those wells.

With respect to the request to retain the Graham State Well, Targa has heard the concerns as mentioned in other proceedings, as well as the concerns of Apache and Momentum, and, to address those concerns, would like to retain the Graham State Well as a saltwater injection well to handle excess water.

Targa would agree to a limit of a total of 5000 barrels per day injection into the Monument Well, with a maximum of 3.38 NMCF per day, roughly 1400 barrels per day of acid gas, the balance to be water disposed in the Monument Well. Any additional water would then go to the Graham State Well.

By limiting the volume of water going into the Monument Well, it will both reduce the plume of injection from that well, and it would also provide a means to ensure that we keep good quality water going into the AGI Well. No oil contaminated water would go into that well that would impair the effectiveness of the Monument Well.

To be clear, the Graham State Well would be purely saltwater disposal. No acid gas would ever be introduced into that well. Finally, we will demonstrate in accordance with the Commission's notice requirements, Targa timely furnished notice to all operators within one mile of the Monument Well of this hearing today. We reserve time at the end of our presentation for rebuttal as necessary.

MADAM CHAIR: Okay. Mr. Bruce?

MR. BRUCE: Madam Chair, both Apache and Monument believe there are problems with Targa's plume model. First Mr. Scott said that Targa will testify that the orientation is northeast-southwest. Both of my clients believe it's the opposite, that it's northwest-southeast, which would aim directly at the Well Number 285, which is one of the big issues in this case. There is another issue about the extent of the plume. We believe that it is much larger than what Targa has modeled. In short, we believe the plume can reach Well 285.

The second point is, in the original order, the request to put plugs in Well Number 285 was done for a good reason, and nothing has changed since that order was entered. And therefore we believe the order should not be changed at this time.

There is also -- there are also two other issues, which is, although there is substantial or has been

substantial Devonian development to the east and southeast in this area, and to the north and west, there has not been substantial Devonian development. The old Devonian wells are 50 to 60 years old, and there is the possibility that the Devonian could be productive of hydrocarbons.

The old wells, like I said, are 50 to 60 years old, and with newer completion techniques as shown in the recent development of not only the Yeso but the Bone Spring Avalon, I don't think we should take the risk of contaminating the Devonian with the acid gas injection.

And finally, because the plume can reach Well Number 285, that well and perhaps others in the area could act conduits to other shallower formations, and there is substantial potential in uphole zones in this area, including the Abo Formation.

We believe that Targa has the burden of proof to show that the granting of this application will not cause waste. We don't think it could meet that burden, and we would ask that that the application be denied. Thank you.

MADAM CHAIR: Shall we swear in the first witness.

MR. SCOTT: Mr. James Lignau.

JAMES R. LIGNAU

(Having been sworn, testified as follows:)

DIRECT EXAMINATION

BY MR. SCOTT:

Q. Could you state your full name, please, sir?
A. James R. Lignau.
Q. Mr. Lignau, how are you employed?
A. I'm employed by Targa Resources.
Q. In what capacity?
A. Regional engineering manager.
Q. How long have you -- how long have you been with Targa?
A. I have been with the group of assets that we are in for about 20 years. I have only been working with Targa since they bought the company.
Q. Okay. What are your job duties in your current position?
A. My job duties are to work with the facilities, to identify and troubleshoot problem areas in the plant, and to work with them to develop projects as necessary to expand, replace, or upgrade plant equipment or plant processes which would include scoping out the projects, put cost estimates together, acquiring the firms to complete the projects, and then full implementation of the projects, ensuring that it meets our construction specifications and our environmental, and safety, and health requirements.
Q. And, in your capacity with Targa, did you oversee the efforts to re-enter and replug Well Number 285?
A. Yes.

Q. And who actually performed that drilling and replugging?

A. The attempt to replug and rework the well was done by Apache.

Q. That was under a contract with Targa?

A. An agreement, yes.

Q. Could you take a look in the notebook in front of you at Exhibit Number 1, please. And do you recognize those documents?

A. Yes.

Q. What are those documents?

A. These documents are the e-mails and work reports from Apache on the progress of the work done during the time they were trying to replug the well.

Q. These reports were provided to you in your capacity of overseeing that work?

A. Yes.

Q. When did the efforts to re-enter the well begin?

A. I believe they moved on site with the full unit on February 23. Prior to that they had done some work to move the production equipment off and get ready for the --

Q. In looking at Page 1 of Exhibit 1, looks like from February 24 through March 23, efforts were made to re-enter that well. Is that correct?

A. That is correct.

Q. And were those efforts to re-enter the well successful?

A. No.

Q. Looking at the entry for March 17, you see that entry on Page 1 of Exhibit 1?

A. Yes.

Q. There's indication there about 4100 feet twisted off. Is that correct?

A. The drilling string that they were using twisted off, yes.

Q. And after that it looks like there was some efforts to do some fishing in the well?

A. That is correct.

Q. Okay. And by March 23, Exhibit 1 indicates that the rig pulling unit was removed, and they move in a new drilling rig. Is that correct?

A. That's correct.

Q. Why is that?

A. My understanding is they weren't able to get the fish out of the hole. They had left a couple of the drill strings in the hole, and they weren't able to get that back out. They talked with drilling department, as I understand, and they decided to let the drilling department move in because they had larger equipment and can attack that kind of problem much better than what the pulling unit could.

Q. Okay. And in order for the larger rig to come in, how long did that take?

A. I guess the drilling rig moved in on May 3, so about a month.

Q. And what was the first activity the rig undertook when it moved on in the beginning of May 2011?

A. They went in and fished out the equipment that was left in the hole.

Q. And then did the larger rig try to re-enter or redrill the well?

A. Yes.

Q. And were they successful?

A. No. They went in, and, as I understand, they went along the same path that the pulling unit had started, which was actually a sidetrack hole off the original hole.

Q. And what did they do at that point?

A. When they realized they were sidetracked, they just -- they went ahead and cemented it back and then made another attempt to go in and hit the original wellbore with a directional tool.

Q. Okay. And did they also use a gyroscope at that point?

A. Yes. They did use a gyroscope as they came back out of the hole to determine the location of the hole that was drilled.

Q. Okay. And was the use of the directional tools to try to re-enter the Well Number 285 successful?

A. No.

Q. Looking at the second page of Exhibit 1, it appears that May 11, 12, 13, during that period is when the effort was made to utilize the directional tools. Is that correct?

A. Yes.

Q. And then the following several days, the 14th through the 16th, what was occurring on site trying to re-enter the well?

A. After they went back in and -- and tried with directional tools and realized that they were still not in the original hole, they came back out and set additional cement plugs.

Q. And during the time that you were trying to re-enter the well, did you consult with any other drillers or third parties on options to try to re-enter the well?

A. Yes. We had Cambrian Management as a consultant to oversee the work. I don't have a lot of experience with downhole work, but they do, so we had retained them to oversee the work and make sure that it would be sufficient to meet the requirements of the OCD order.

Q. And did Cambrian identify any additional techniques or approaches that they suggested to try to re-enter the

well?

A. No.

Q. And did you consult with a company called Scientific Drilling?

A. We had a meeting with Apache and Scientific Drilling. We were all in the room together with Cambrian, Scientific Drilling and Apache.

Q. And approximately when was that meeting?

A. I believe that was on May the 18th.

Q. Okay. And what was discussed in that meeting?

A. We discussed what options we had to try to move forward with getting the replugging work completed. During that meeting we discussed additional options to try to use directional tools, what type of bits we could use, what speed and motor to use on those bits that would give us the best likelihood of being able to go back in and re-enter the original wellbore.

During that meeting, we discussed options, but nobody was confident or comfortable that we could get back into that hole. In fact, the discussion was, we could go in and punch many more holes and attempt to get there, but, in all likelihood, the -- the likelihood that we would be successful was very, very low and would be very costly.

Q. And was one option that was considered the use of a larger bit to try to muscle your way through, if you will?

A. That was discussed.

Q. And what was the result of the discussion of that option?

A. Again, they just felt like it was a long shot that that would be successful. And so, at that point, I had to go back and discuss with our management on what our approach should be.

Q. Looking at the bottom of Page 2 of Exhibit 1, there is an entry there for a total expenditure for plugging operations. Do you see that entry?

A. Yes.

Q. And how much is that at that point?

A. That's showing $774,532.

Q. And are there additional expenses that Targa has incurred in connection with efforts to re-enter the well?

A. Yes.

Q. How much more in expenses has Targa incurred above what's shown on Exhibit 1?

A. I think the billing to date is just over a million dollars, a million and 2000 something. Something like that.

Q. And are you familiar with the Graham State Well?

A. A little bit.

MR. SCOTT: No further questions of this witness at this time.

MADAM CHAIR: Any cross, Mr. Bruce?

CROSS-EXAMINATION

BY MR. BRUCE:

Q. Just a couple of questions. Just to clarify, Targa proposes no further work on the Number 285 Well?

A. That's correct.

Q. And are you also the -- you said you are in charge, you oversaw the plugging and abandonment attempt on Well Number 285. Are you also the person responsible for overseeing the drilling of the proposed acid gas injection well?

A. I'm over the acid gas injection project which incorporates all of that.

Q. Okay. I'm looking at the advertisement for this case, and it talks about the proposed Monument Acid Gas Injection Well. Has that well been drilled?

A. Yes, sir.

Q. When was it commenced?

A. I don't have that date with me.

Q. Roughly, can you give me a month?

A. When we started the drilling?

Q. (Nodding.)

A. I really don't have a date for you.

Q. Was it drilled this year?

A. It was completed this year, yes -- or not -- we

didn't do the completion work on it. We finished drilling it.

Q. Was it commenced this year?

A. I don't recall when we started drilling.

Q. No idea? You can't even give me a month?

A. I can't remember.

Q. Was it commenced while the P and A attempts were ongoing on the 285?

A. I believe we started drilling before that. I would have to verify.

Q. I guess my question is, why did you drill the well when you didn't have permission to inject?

A. We decided to go ahead and drill the well because we were under some time constraints to move forward with the project. And, at that time, we felt like the -- the efforts in replugging the Apache Well would be successful, and we decided to go ahead and drill the well.

Q. Were any logs taken on the well?

A. Yes, sir.

Q. Have they been filed with the Oil Conservation Division?

A. I believe so. I did not file them. Cambrian or -- would have done that for us.

Q. Cambrian was the one who actually drilled the well?

A. They were our consultants, yes.

Q. And what is the -- I think you mentioned this, but what is the current completion status of that well?

A. We have drilled the hole to depth and put the casing in, and that's it.

MR. BRUCE: That's all I have.

MADAM CHAIR: Do you have any questions, Commissioner Dawson?

COMMISSIONER DAWSON: No further questions.

MADAM CHAIR: Commissioner Balch?

COMMISSIONER BALCH: No further questions.

MADAM CHAIR: I do. You may not have filed the logs to the AGI Well, but have you filed any of the other reports that are due to the OCD?

THE WITNESS: As far as I know, those reports have been filed with the OCD through Cambrian.

MADAM CHAIR: That's all I have. Next witness.

MICHAEL L. PIERCE

(Having been sworn, testified as follows:)

DIRECT EXAMINATION

BY MR. SCOTT:

Q. Could you state your full name, please?

A. Michael L. Pierce.

Q. And, Mr. Pierce, what's your educational background?

A. I graduated in 79 from the University of New Mexico with a geology degree.

Q. And could you describe your employment history briefly, please?

A. For the last -- since 1989 I have been a consulting geologist starting out in Hobbs, New Mexico. A few consulting services in my company. I'm a sole proprietor. I worked for various companies over the time period in various capacities in petroleum geology, well site exploration production, completion, and continuing that today.

Q. And you largely focused your efforts in operations in well site geologist?

A. That's correct.

Q. So you have been involved in spudding and drilling of wells, coring operations, those kinds of activities?

A. That's correct.

Q. And who are the companies or entities that you have worked for?

A. Chevron, Texaco, Hess, Targa, Arrington, a number of -- Phil Hartman, Santa Fe Energy, COG, just a number of companies.

Q. And is your work principally in New Mexico?

A. New Mexico and West Texas.

Q. Okay. And do you have any professional licenses or certifications?

A. AAPG Certified Professional Geologist.
Q. How long have you had that certification?
A. Since the early 90s.
Q. Okay. And do you belong to any professional organizations?
A. AAPG, West Texas Geological Society, Albuquerque Geological Society.
Q. Have you testified as an expert witness before?
A. I have.
Q. And have you testified before the Oil Conservation Commission in the past?
A. On one other occasion probably 15 years ago.
Q. Okay. And what about before the Oil Conservation Division?
A. Pardon me?
Q. Have you testified before the Division as well?
A. Yes. Yes. Many times.
Q. Are you familiar, Mr. Pierce, with the Monument AGI Well?
A. I am.
Q. And how are you familiar with that well?
A. I was involved with the original permitting of the well.
Q. Okay.
MADAM CHAIR: Stop a minute. You are presenting

this witness as an expert?

MR. SCOTT: Yes, ma'am.

MADAM CHAIR: In geology?

MR. SCOTT: Yes, ma'am.

MADAM CHAIR: Do you have any objections?

MR. BRUCE: No. I have no objection to his qualifications.

MADAM CHAIR: He is so admitted.

Q. Are you also familiar with the NMGSAU 285 Well?

A. I am.

Q. And how are you familiar with that well?

A. Well, this well was in the original area of review for the Monument AGI Number 1 Well, and subsequently looked at it quite a bit.

Q. Okay. In connection with your review of the 285 Well, did you look at the well logs and related materials concerning that well?

A. I have.

Q. If you'd look at Exhibit Number 2 in the notebook in front of you.

A. Yes. That's the original well file for the 285. It was originally called Shell State D Unit Number 5 drilled in approximately 1955.

Q. Okay. And why did you consult those logs?

A. When we -- when we started -- or actually after the

efforts to replug the 285 ran into problems, I looked at where the plugs were again on this and tried to figure out when exactly the plugs were set. And the reason being is, I determined it was probably set with a drilling rig right after the well was drilled and not subsequently to the pulling unit. So, in my experience, the -- what I think is significant about that is that the plugs are probably there, because they were done on the drilling rig, and they didn't move a pulling unit in and then pick up 9000 feet of tubing and then go all the way to the bottom and set plugs after they had decided to make a shallow -- so I think the well was probably originally plugged with the drilling rig and it came out laying down, and they moved the rig on it.

Q. And where were the plugs that were set according to the documents that are in Exhibit Number 2?

A. The bottom plug was set at 10,333 to 9900. It was a 180-sack plug. The second one was 9800 to 9755, 20 sacks. The third one, 6350 to 6305, 20 sacks. The fourth plug, 5700 to 5655, 20 sacks, and then the plug of the casing, the intermediate casing, reported 4050 to 3700, 175 sacks.

Q. Okay. And you heard the testimony about the efforts to re-enter the 285 Well?

A. Yes.

Q. And are you familiar with the plug that was set following those efforts to re-enter the well?

A. Yes, I have looked at what they did, yes.

Q. And, in your opinion, is that a good quality plug that was put in place there?

A. Yes.

Q. The efforts to re-enter the well that were undertaken from February through May of this year, have you formed an opinion as to the likelihood of being able to re-enter and replug the Well Number 285 at this point?

A. Yeah, I think it's unlikely that we would be successful. We took our best shot at it, and once we kicked off that plug, there was -- there was almost no chance of us getting back in the original borehole.

Q. And why do you say that?

A. Well, my personal experience over the last 30 years, I have been on a number of wells where we re-entered, and some go as planned with no problems at all, and some, they were just, you know, unlucky and not able to re-enter these plugs. And I mean in any part of the section, too, not just the San Andres, but even different parts of the section, you get a -- you get a cement plug in this wellbore, and it -- it, in certain places it can be harder than the formation, so you come down on top of it, and if you kick off, you're off of it. And you can plug back multiple times, but you still come down to that harder spot there, and you are not going to get through it.

Q. Okay. Once the efforts to re-enter the 285 Well had proven unsuccessful by the end of May, did you, at that point, consult with anyone from the Oil Conservation Division about whether there was continued need to re-enter and replug the 285 Well?

A. Yeah. I talked -- I spoke with Will Jones and made a little presentation to him at that time of the data we collected, and --

MR. BRUCE: Madam Chair, I would object. This is hearsay. If they can get Mr. Jones to testify, they can do it, but he is repeating opinion statements by a non-witness.

MR. SCOTT: I don't think he is offering anything Mr. Jones said. He is simply setting the background for the work Mr. Pierce did. He is describing the process he went through to conduct his evaluation and the people he consulted with, but he is not offering any comments from Mr. Jones.

MADAM CHAIR: Objection overruled.

Q. (By Mr. Scott) Please continue.

A. Yeah. I -- I presented Mr. Jones with work we had done, that Targa had previously done, copies of the open hole logs and a time line for the re-entry attempt, and we were -- he encouraged us to --

MR TAYLOR: Objection. Now he is testifying as to what Mr. Jones said.

Q. During what period of time did you meet with

Mr. Jones?

A. I believe it was in May of this year.

Q. Okay. And in connection with the efforts that you have undertaken to look at the Monument Well and the 285 Well, have you evaluated whether material injected into the Monument Well would be likely to migrate to the 285 Well?

A. I have.

Q. And what have you done in that capacity?

A. We -- I was not in the loop when Targa and Apache initiated the initial replugging attempt and the drilling of the Monument AGI Number 1 Well. I was contacted by Targa after the well had been drilled and the plugging attempt had -- had ceased, and they asked me to see what -- you know, to see if they had any options.

So I began looking at the 285 Well. I constructed an AOR for the 285 Well to see what -- what wells could be potentially impacted if we had migration from the AGI Number 1 Well to the 285 Well. I made a cutoff of 6000 feet because the top plug or the deepest plug in the 285 Well was at 6350 -- 6305 to 6350. So I looked at wells that penetrated 6000 feet because those are the wells that, that could have been impacted by, or would be impacted, or potentially impacted by fluid if it migrated into that well.

Q. Okay. So let's back up and go through this a step at a time. Where is the 285 Well located relative to the

Monument Well?

A. The 285 Well is approximately 2900 feet north and west of the Monument AGI Number 1 Well.

Q. Okay. And in connection with your analysis, did you look at logs and drilling information pertaining to the Monument Well?

A. I did.

Q. And would you turn to Exhibit 3, please. There are a series of colored pages in this Exhibit 3. Do you recognize those documents?

A. I do.

Q. What are those documents?

A. These are the computer-generated data off of -- off from the dipmeter that we ran as part of the open hole sweep for the Monument AGI Number 1 Well.

Q. And what do those logs show?

A. On the first page of the exhibit, the main thing is the -- the small Rose Plot, the dip. It's the bottom chart, left hand. It shows the dip in the wellbore, the open hole section from the Devonian, the top of Devonian to the TD in the well, and that's showing a southwesterly dip, west-southwesterly dip.

Q. And what does the next page show?

A. Just another -- it's a graphical representation of the same dip.

Q. Okay. And then the next several pages, what do those show?

A. The next one, the third page is the Conductive Natural Fractures Plot, and the relative direction of those fractures. And you can see those fractures are oriented northeast to southwest.

The fourth plot is, there is no resistive fractures observed in that interval. And this interval is the open hole interval from casing at 93 something to TD. The following one is no faults were observed with this interval. The next one, no microfaults. The next one with the pink arrows in it was the drilling induced fractures, which would follow approximately the same orientation as the natural fractures. And then the final is the marginal class natural fractures.

Q. And so those logs generally reflect that the orientation of fractures or the faults are along the northeast to southwest orientation?

A. Yeah, the fractures -- we didn't see any faults -- but the fractures are -- are a northeast-southwesterly direction.

Q. Okay. And did you review other information from the well records for the Monument Well to determine the porosity thickness and reservoir porosity for the injection zone for the Monument Well?

A. Yes, I did.

Q. And what did you learn from that analysis?

A. I think in the original application we estimated a reservoir porosity of 6 percent and reservoir thickness of 300 feet. And, in fact, we estimated pretty well on reservoir thickness at 300, and it came out to be 318 feet. Our porosity is a little bit better, 7.87 percent through that interval.

Q. Okay. And how did you determine the 318 foot thickness?

A. Foot by foot on the open hole logs through the open hole section.

Q. Could you explain that a little bit more?

A. Well, just looked at the open hole logs on the porosity and went through foot by foot and measured any porosity levels above 6 percent neutron porosity. And the neutron porosity, I chose that because that's what I had to work with with the old logs. There was no density porosity. Density porosity wasn't around when the majority of these other logs -- or deep wells were drilled. So the only way I can compare apples and apples was neutron porosity.

Q. And the log that you referenced that you reviewed, that's on file with the Oil Conservation Division?

A. I personally hand-delivered the copies of these logs to Will Jones. I don't know if they have been filed formally

in conjunction with the well file or not. That was Cambrian's job or within their realm, but I personally gave Will Jones all copies of open hole logs.

Q. Did you ultimately calculate the radius of injection of the plume from the Monument Well after 30 years?

A. I did.

Q. And could you turn to Exhibit 4-A.

A. Okay.

Q. Now, just to be clear, you had originally done an Exhibit 4, correct?

A. I had.

Q. And as we were preparing for the hearing, you determined that there was an error in those calculations?

A. I did.

Q. Okay.

A. I was -- I was looking at data that Apache and Momentum had filed, and it was very different than the data I had, and I couldn't figure out why. And I -- when you divide by a number that you are supposed to multiply with, you get a very different number.

Q. And does Exhibit 4-A, which is in the notebook in front of you, reflect the revised calculation of the plume?

A. It does.

Q. And what does that show for the 30-year injection radius at the volume of 5000 barrels per day?

It shows a radius projection of 1981 feet, but I have taken a little bit of slicing and shown it to be in a northeast-southwestern direction just because of the fracture pattern that we saw in the open hole logs.

Q. Okay. And do you show a radius for a lower rate of injection as well?

A. Yes. 30 year low rate of 3500 barrels a day at 1654 feet.

Q. Now, the 5000 barrels a day, that's your understanding that is a maximum amount that Targa would agree to as an injection limitation for the Monument Well?

A. That's correct.

Q. And that would have also a limitation of the maximum of 3.38 NMCF per day of acid gas?

A. That's correct.

Q. And can you explain generally the steps in your calculation to reach the radius of injection?

A. Just calculated the -- or determined the number of porosity feet, and -- well, let me just --

Q. You can just walk us through your calculation step by step.

A. Okay. I have some constants of 42 gallons per barrel, 7.48 gallons per cubic feet, 5.61 cubic feet per barrel, 3500 barrels per day low rate, 5000 barrels per day high rate. Low cubic feet per day calculation would be 3500

barrels times 5.61 which comes out to 16,635 cubic feet per day for the low rate. The high cubic rate -- high cubic feet per day rate, 5000 barrels times 5.61 again, comes out to 28,050 cubic feet per day. Constant acre feet, 43,550 square foot per acre. Reservoir thickness was 318 feet that's measured off the open hole logs. The average porosity was 7.78, again measured off the open hole logs. The net porosity, 25.02, and that comes from the 318 feet times 7.87.

Then we have the available volume per acre. That's 1,089,871.2. That comes from the net porosity feet, 25.02 times 43,560. And then we have low rate days per acre where we divide the available volume by the low cubic feet. In this case it's 1,089,871.2 divided by 19,635. It comes out with 55.5 feet or -- excuse me -- 55.51 days per acre. The high rate comes out to 38.85 days per acre. We convert that to the low rate years per acre, and that comes out with .152 years per acre for the low rate. The high rate is .106 years per acre. The low rate acres per year would be 6.58 acres per year for the low rate. High rate would be 9.43 acres per year. And then the low rate for 30 years would be 900 -- excuse me -- 197.4 acres for 30 years. And the high rate for 30 years would be 282.9 acres for 30 years. And then the final calculation, radius of injection, that's the low rate acres per year times 43,560 is equal to pi r squared, and that comes out to 1654.4 feet for the low, 1980.5 for the

high rate.

MADAM CHAIR: We don't have the calculations sheet, 4-A.

Q. Let me show you, Mr. Pierce, what I marked as Exhibit 11. Is that your calculation sheet?

A. It is.

MR. SCOTT: May I approach?

MADAM CHAIR: Yes, please.

Q. And Exhibit 11 is the calculations that you just described --

A. It is.

Q. -- depicted on Exhibit 4-A?

A. It is.

Q. Looking back at Exhibit 4-A, that radius of injection, would that impact the 285 Well?

A. It's unlikely.

Q. Why is that?

A. Well, it -- the fractures that we measured in this well show a northeast-southwesterly direction, and the fluid is going to migrate along those lines. It's not going to go across the fracture. It's going to go along the fractures.

Q. Okay. And the radius of 1981 feet, that's short of the distance from the Monument Well to the 285 Well, correct?

A. It is.

Q. The injection interval for the Monument Well is from 8350 feet to 9200 feet?

A. Correct.

Q. Is that the Devonian and deeper?

A. It is.

Q. Is there a cap on the Devonian?

A. There are Woodford caps in the Devonian, the Woodford Shale.

Q. Do you have an understanding how thick that is?

A. In the Monument AGI Well, it's approximately 100 feet thick.

Q. And have you looked at the well logs for the 285 Well?

A. It's a similar thickness in the 285 Well.

Q. If the natural trend in this area were from northwest to southeast, based on the information that -- that you have gathered, would the injection from the Monument Well be likely to impact Well 285?

A. If -- if there's a regional direction of flow in the deep like there is higher up in the formation or in this section, it would have the tendency to push against the Monument -- the injection in the Monument AGI Well, and push it to the southeast and not allow it to go to the northwest, you know, the direction of flow is from the northeast -- northwest to the southeast.

Q. And so the flow would be away from the 285 Well?
A. That's correct.
Q. Now, you mentioned that you looked at wells within a one-mile radius of the 285 Well to see if any of those wells could be impacted by material injected into the Monument Well. Is that correct?
A. Yes.
Q. And describe again what specifically you were looking at.
A. Looking at the wells that were deeper than 6000 feet that -- in the AOR for the 285 Well.
Q. And what was the reason for the 6000 foot limitation?
A. The highest plug in the NMGSAU 285 Well, which is 6305 to 6350, I arbitrarily chose 6000 feet as a cutoff, which is a little above that plug, but just -- just as an added safety factor, if you will, just to catch any wells that might have fallen in there.
Q. And how many wells did you identify within that one-mile radius?
A. Six additional wells that were not in the original AOR for the -- that we hadn't addressed in the original AOR for the Monument AGI Number 1.
Q. And if you turn to Exhibit 5, please.
A. Okay.

Q. What does that exhibit show?

A. That's a map showing where the wells are. The dots in green are the six wells that are deeper than 6000 feet, and the red -- but did not penetrate the injection interval. And the red dots are deeper wells that did penetrate the injection interval that were evaluated during the original application.

Q. And of the -- of the six wells that you looked at specifically within your area of study, what investigation did you undertake?

A. I just pulled the well files and looked at where casing was set and how much cement was used to cement the casing and where the perforations were and what plug back TDs were.

Q. Okay. And if you would look at Exhibit 8, please.

A. Okay.

Q. What are those documents?

A. These are the casing diagrams for the six wells.

Q. And those reflect the information that you gathered based on your studies of those logs and records?

A. That's correct.

Q. And did you form an overall conclusion whether any of those six wells were likely to be impacted by material that would be injected in the Monument Well?

A. Yes, I did. All six of these wells were -- were

properly cased and cemented and plugged back appropriately, so it's unlikely that these wells will -- could be contaminated.

Q. Okay.

MR. SCOTT: At this point, Madam Chair, I would like to use a Powerpoint just to have one of the exhibits up on the screen so it's a little easier to discuss, so if I could have one second to arrange here.

MADAM CHAIR: Shall we take a ten-minute break?

MR. SCOTT: That would be fine.

MR. BRUCE: And, Madam Chair, can I ask one thing, since we are taking a break now, my clients have not had an opportunity to see the logs from the AGI Well that were drilled because they looked on OCD's website and couldn't find them. I wondered if we could get the logs so my clients could review them at this point. That might speed --

MR. SCOTT: We have them here.

MADAM CHAIR: Let's take a 15-minute break to give your clients a chance to look at those.

MR. BRUCE: Thank you.

MADAM CHAIR: We will reconvene at 10 after 10.

MR. SCOTT: Thank you.

(Recess taken.)

MADAM CHAIR: Shall we go back on the record.

MR. SCOTT: Thank you.

Q. (By Mr. Scott) Mr. Pierce, let's talk about each of the six wells that you identified and gave further study to. If you turn to Exhibit 6 in the notebook in front of you. I put that exhibit up on the screen for reference purposes, and I'm going to ask you to go back and forth between Exhibit 6 and Exhibit 8, talking about each of those wells.

A. Okay.

Q. So the first of the six wells I want to talk to you about is this well in the upper left portion of the area of study, that's the W A Weir Well, correct?

A. Yes, Weir 15.

Q. And what's the total depth of that well?

A. It was drilled to 7550.

Q. And is that well cased all the way down?

A. Yes. They set five and a half casing at 7550 to surface.

Q. And what do the well logs for that well reflect in terms of the casing and cement?

A. They -- the TOC, they put an external casing packer, they sit one at 7123 and at first they cemented that with 125 sacks, and they cemented the second stage with 1075 sacks, and the TOC on that using 50 percent efficiency is 3339 feet from surface.

Q. Okay. And what is the distance of the W A Weir Well from the 285 Well?

A. Approximately 5100 feet.

Q. Okay. So for material injected in the Monument Well to potentially impact that well, it would have to migrate 2985 feet to the 285 Well, and then another 5100 feet over to the W A Weir Well?

A. Correct.

Q. And as we discussed earlier, the orientation of the plume for the 285 Well is along the northeast-southwest orientation, correct?

A. Correct.

Q. So the material would be flowing against the direction reflected by the logs?

A. Against the direction of the 285 Well, yes. Perpendicular to -- to the 285 location.

Q. And even if the material were to flow across to the W A Weir Well, that is cased and cemented all way down. Correct?

A. Correct.

Q. The next well I want to talk to you about is just south of the W A Weir. That's the W B Maveety, correct?

A. Yes. The Number 11 Well.

Q. And what is the total depth of that well?

A. 7610.

Q. Okay. And is that well cased?

A. It is also with five and a half from surface to

7610.

Q. And what do the records show in terms of the casing and cement for that well?

A. They, on this one, they set also an external casing packer at 7091 foot, cemented the first stage with 175 sacks and second stage with 1050 sacks. The TOC on the second stage is estimated to be 3390 something -- it got cut off on mine -- with 50 percent efficiency, 3390 from surface.

Q. Okay. And the Maveety Well is how far from the 285 Well?

A. Approximately 4485 feet.

Q. Okay. So, again, the material would have to travel 2985 feet to the 285 Well, and then travel northwest another 4400 feet before it would reach the Maveety Well, correct?

A. Correct.

Q. And with the casing and cement work on that well, it's not likely the material would get into that wellbore?

A. That's correct.

Q. Okay. Next let's talk about the Maveety Number 12, which is due south of the Maveety Well. How deep is that well?

A. 7593 feet.

Q. Okay. And is that well cased all the way down?

A. It is. Seven-inch casing to 7593.

Q. And what do the records for that well reflect in

terms of the cement work?

A. TOC by bond log is 1966 feet from surface.

Q. And so like the other two wells, that one was cased and cemented all the way down?

A. Correct -- well, it's -- the TOC on the long string is at 1966 to surface. They didn't quite get it all the way. It didn't quite circulate.

Q. Next let's talk about this well, it's right at the bottom of the -- the south end of your area of study. What is that well?

A. That is the State D Number 6 Well.

Q. Okay. And how deep is that well?

A. It has a total depth of 7877, and it was plugged back to 7205 where five-and-a-half inch casing was set at 7205 to surface.

Q. Okay. And the records for that would reflect what in terms of the cement work?

A. They plugged back the open hole section from 7205 to 7877 with 100 sacks of cement, and then the TOC on the long string is at 5744 using 50 percent efficiency again.

Q. Okay. And what is the distance of the State D Number 6 Well from the 285 Well?

A. Approximately 5300 feet.

Q. So material injected in the Monument Well would have to travel northwest 2985 feet and then turn and travel almost

due south another 5300 feet to reach the State D Number 6 Well?

A. That's correct.

Q. And then moving around the arc of your circle of the study, this well that's reflected on Exhibit 6, this being about 5003 feet from the 285 Well, which well is that?

A. J R Phillips Number 10.

Q. And what's the total depth on that well?

A. 7700.

Q. And is that well cased all the way down?

A. It has five-and-a-half-inch casing set from surface to 7700 feet.

Q. Okay. And what do the logs show with respect to the cement work for that well?

A. The records say that the cement circulated, but I did a TOC calculation and came up with a TOC of 5130 with 50 percent efficiency.

Q. And then the last of the six wells, which was just a little bit due north and west of the Phillips Well, what is that well?

A. That's the Targa Midstream Graham State Number 7 Well, the existing saltwater disposal well for the plant.

Q. Okay. And what is the total depth on that well?

A. Total depth would be 7700 foot on that, and plug back would be approximately 4956.

Q. Okay. And how far is that well from the 285 Well?

A. Approximately 3500 feet.

Q. Okay. On each of the six wells we just discussed, the Weir, the Maveety, the Maveety 12, Graham State, J R Phillips, and State D Number 6, the total depths of those wells are above the injection zone for the Monument Well, correct?

A. They do not penetrate the injection zone for the Monument AGI Well.

Q. So based on your review of the wells -- well logs for each of those six wells and the information from the well logs and other data for the Monument Well and 285 Well, do you have an opinion whether material injected from the Monument Well would impact any of those six wells?

A. I do. I think it's highly unlikely that material injected into the Monument AGI Number 1 would impact any of those six wells in that 285 AOR.

Q. And that's because?

A. Adequate casing and cementing of six wells, and, on top of that, the distance the material would need to travel to reach those wells.

Q. All right. Just as a housekeeping matter, let me ask you to look at Exhibit Number 7.

A. Okay.

Q. What is that exhibit?

A. This is just a list of wells in the area of review for the 285. The first page is all the -- all the wells deeper than 6000 feet.

Q. Okay. And it was from this listing of the wells that you focused in on the six that we have just discussed?

A. Correct.

Q. Did you, in connection with your work on this matter, review the Oil Conservation Division's files to identify operators of wells within a one-mile radius of the Monument Well?

A. I did.

Q. Would you look at Exhibit Number 9, please? What does that exhibit reflect?

A. That's a representation of the map I made for the operators in the AOR.

Q. When you had completed your study of the logs for the Monument Well and materials for the 285 Well, in your review of these wells within the one-mile radius, did you review that information with Mr. Jones?

A. Yes.

Q. And did you provide him essentially the material that we have reviewed here today?

A. Much of it, yes.

Q. And following your conversations with Mr. Jones, what was your understanding of how he wanted you to proceed?

MR. BRUCE: Again, objection about Mr. Jones. He is testifying what Mr. Jones is stating. Again, this is hearsay testimony.

MR. SCOTT: I'm asking the witness what his understanding was of how he was to proceed.

MR. BRUCE: Then that's even more. You are asking his opinion of Mr. Jones' thought.

MR. SCOTT: I'm simply asking the witness to testify as to his understanding as to how he was to proceed.

MADAM CHAIR: It is hearsay. We have to sustain that objection.

Q. (By Mr. Scott) How -- how did you proceed at that point, Mr. Pierce?

A. I went back and -- and visited with Targa, indicated what I had done and suggested that we make a motion or a file an application to amend the original order based on the information that I had received and previously covered.

Q. Based on your analysis and review of the OCD's records, is there production from the Devonian in this area?

A. No, not in this immediate area. The Monument structure was very thoroughly tested with DSTs when it was originally drilled in the 50s and 60s, numerous DSTs in that section, and it did not uncover producible hydrocarbons. And those DSTs are the same type of processes we use today, just not as often.

Q. All right. And in looking at the materials that you reviewed in connection with this work, have you formed an opinion whether material injected into the Monument Well could potentially contaminate the Drinkard, or Abo, Wolf Camp, Pennsylvanian, Mississippian, and the Montoya zones?

A. I think it's unlikely that the -- the fluid would migrate up to 285 where it would then be possible to move uphole and reach those -- those formations. I think it's unlikely it could happen.

Q. Is there any production within the zones between the Abo and McKee in this area?

A. To my knowledge, there are no -- there is no production below the Abo until you reach the McKee Formation, or the AGI did not penetrate the Ellenburger and McKees further down.

Q. Okay.

MR. SCOTT: I have no further questions of this witness at this time. I would move the admission of Exhibits 1 through 9 at this point.

MR. BRUCE: No objection.

MADAM CHAIR: And 11?

MR. SCOTT: When it comes to that one.

MADAM CHAIR: Okay.

MR. SCOTT: Exhibit 10 in the notebook of materials that's been provided is my affidavit and copies of the

letters of notice that we mailed out to the operators within a one-mile radius, together with the return receipt cards. I move the admission of 10 A and B.

MR. BRUCE: No objection.

MADAM CHAIR: They are so admitted then.

(Exhibits Targa 1 through 10 A and 10 B admitted.)

MR. SCOTT: And then I would move the admission of Exhibit 11.

MR. BRUCE: What is Exhibit 11?

MR. SCOTT: It's the calculations page.

MR. BRUCE: Okay. I thought that was 4-A.

MR. SCOTT: That's the diagram.

MR. BRUCE: Okay. Okay. I have no objection to that.

MADAM CHAIR: They are so admitted.

(Exhibit Targa 11 admitted.)

MADAM CHAIR: Do you have any cross-examination?

MR. BRUCE: Yes, Madam Chair.

CROSS-EXAMINATION

BY MR. BRUCE:

Q. Mr. Pierce, is this the first acid gas injection well you have worked on?

A. Yes, it is.

Q. In looking at Exhibit 2, the data you talked about from the OCD's file on what is now Well Number 285, and if

you go five pages in, all of these plugs, they are estimated, aren't they?

A. Estimated fill, yes.

Q. But those -- the original plugs were never tagged, so there is no -- there is no guarantee where they are located?

A. That's correct.

Q. Then you were talking about no production in this area and you were talking about the DSTs. What is the vintage of the Devonian and Fusselman Wells in this area at the time they were drilled to the Devonian and Fusselman?

A. 50s and 60s. They are quite old. There may even be a 40 well in there.

Q. And DSTs, the operators never went in and completed the wells and produced them at that time?

A. That's correct.

Q. Now, if an area, an interval is called what you are indicating is non-productive, is that the same as being non-prospective?

A. I'm not quite sure how to answer that. You refer to the drill stem test, the DSTs, and that's one tried and true way to evaluate a specific formation in that you -- you open up essentially the formation, test it to the atmosphere and withdraw any fluid that's in -- that's in the formation. And in those DSTs, to my knowledge, they never recovered

producible hydrocarbons, so I think, in that respect, that this is not respective for the Devonian because it's been previously tested.

Q. Well, you wouldn't dispute that there's been a massive improvement in drilling and completion technology --

A. Sure.

Q. -- in the last 50 to 60 years?

A. Absolutely. Absolutely.

Q. Looking at your exhibit -- I don't know what it's marked now, 4 or 4-A, the calculations you did.

A. Yes, sir.

MR TAYLOR: 11.

MR. BRUCE: That's 11. Mr. Scott told me earlier it was 4-A, so that's why I --

Q. And let's just go to the bottom two lines.

A. Yes, sir.

Q. Because the low rate, 1654 feet, and the high rate, 1980 feet --

A. Yes, sir.

Q. -- in your original calculations, what were those numbers?

A. I don't have the original calculations with me, sir.

Q. Were they more like 3- to 400 feet?

A. In the original ones, yes.

Q. And I think you said earlier you did -- there was an arithmetical error?

A. Yes. When you multiply the low cubic feet -- or when you divide the low cubic feet per day instead of multiply it, you come up with a very different number.

Q. Now, in that prior case you also did a 100 percent safety factor, didn't you?

A. Yes.

Q. So if you added that 100 percent safety factor to these calculations, you would come up with 3300 and 4960 feet, would you not -- or 3960 feet?

A. I don't know. I would have to do the calculation.

Q. By 100 percent safety factor, you are just multiplying by two, correct?

A. Correct. I don't think it's linear, though. Is it? It would be bigger, yes.

Q. Now, in looking at your -- and we can just pick one of them -- Exhibit 5 or 6, when you give data, these are all existing wells?

A. Yes, sir. I don't know exactly which one you are looking at.

Q. Either 5 or 6. Or is that 7? Okay.

MR. SCOTT: Six.

Q. Six, it doesn't really matter, but on either exhibit, you are just talking about existing wells?

A. Correct.

Q. Isn't it possible that additional deep wells can be drilled in the future within this one-mile radius?

A. Sure.

Q. So even though you are saying that these wells are properly cased, cemented, plugged, and abandoned, newer wells could be drilling into a reservoir that's contaminated by acid gas, couldn't they?

A. That's possible. Yes, sir.

Q. And then if you go to your Exhibit -- I think it's -- yeah, your Exhibit 8, and a few pages from the back, I believe you have some wellbore sketches of the Monument AGI Number 1?

A. Yes, sir.

Q. Now, who prepared these, Mr. Pierce?

A. Joe Gibson, the drilling guy that was out on the drilling rig.

Q. Okay. I just -- in the lower right-hand corner, the wellbore sketches --

A. Yeah.

Q. -- it's dated 2003. I presume that's a simple typo.

A. I -- Mr. Gibson is an independent consultant that he plugged this into his computer. I don't know where that data came from. This is just copies of what he gave me, but obviously that date is incorrect.

Q. Did you -- did you consult with Targa regarding the drilling of this well?

A. No, sir. I got into this well when we did the open hole logs. That was my --

Q. When was that done?

A. The date of logs was May 26 of this year.

Q. And in the upper left-hand corner it shows that this well was spudded March 21, 2011.

A. That's correct.

Q. And, to the best of your knowledge, that's an accurate date?

A. Yes, sir. Like I said, I was not involved in that, so I -- so I assume that's a correct number, correct date.

Q. And if you look at the first page of your Exhibit 1, that was several days after March 17 when the -- when the re-entry had already twisted out, correct?

A. Say again?

Q. If you look at the entry for March 17 --

A. Correct.

Q. -- you were talking about when it had twisted out, so there were already some issues with the re-entry at that point.

A. Yes.

Q. Of the 285 Well.

A. Correct, yes.

Q. Now, you are aware that Cambrian is the consulting firm that supervised the drilling of the AGI Number 1?

A. Yes, sir.

Q. Are you aware that they advised Targa not to drill the AGI Well prior to completing plugging and abandonment of the 285 Well?

A. No.

MR. SCOTT: Objection, hearsay, Your Honor. It's what someone else told Targa, hearsay.

MADAM CHAIR: Sustained. And he has no foundation, either.

Q. Just a couple of final questions, Mr. Pierce. When you were talking about the logs and the data you were taking out of that, is neutron porosity affected by matrix type?

A. Yes.

Q. And what matrix did you use in determining?

A. Limestone. That's standard for Permian Basin is using limestone matrix for open hole logs.

Q. And is this interval you are looking into limestone and dolomite?

A. It's a combination of both.

MR. BRUCE: That's all I have.

MADAM CHAIR: Commissioner Dawson?

COMMISSIONER DAWSON: The drill stem tests on the wells were drilled to the Devonian --

THE WITNESS: Yes, sir.

COMMISSIONER DAWSON: -- in the area? Do we have that information?

THE WITNESS: It's -- it may not be in this packet, but it's in OCD files.

COMMISSIONER DAWSON: Okay.

THE WITNESS: I mean in the well files that OCD keeps.

COMMISSIONER DAWSON: No further questions.

MADAM CHAIR: Dr. Balch?

COMMISSIONER BALCH: No questions at this time.

MADAM CHAIR: I would just like clarification on several exhibits. In Exhibit Number 3, there are quite a few rose diagrams.

THE WITNESS: Yes, ma'am.

MADAM CHAIR: The first of them has the four different graphs, and then the bottom left is the Rose Dip Plot.

THE WITNESS: Yes, ma'am.

MADAM CHAIR: Which is the dip of the Devonian itself?

THE WITNESS: From -- it's the dip of the open hole section, all the dips in that section.

MADAM CHAIR: Okay. And then trending west-southwest?

THE WITNESS: Yes, ma'am.

MADAM CHAIR: And that is the dip of the formation?

THE WITNESS: Yes, ma'am.

MADAM CHAIR: And then do you have another one that has the Rose Strike Plot of the conductive natural fractures.

THE WITNESS: Yes, ma'am.

MADAM CHAIR: And that's trending northeast-southwest.

THE WITNESS: Yes, ma'am.

MADAM CHAIR: And that is the strike of the natural fractures.

THE WITNESS: Yes, ma'am.

MADAM CHAIR: Which had downdip?

THE WITNESS: And updip.

MADAM CHAIR: And updip, yeah.

THE WITNESS: Yes, ma'am.

MADAM CHAIR: We are just clarifying what we are looking at here.

THE WITNESS: Yes, right. Right.

MADAM CHAIR: Then you have a Rose Strike Plot of the drilling induced fractures.

THE WITNESS: Yes, ma'am, and they are --

MADAM CHAIR: Which is also to the southwest?

THE WITNESS: Northeast-southwest.

MADAM CHAIR: Northeast-southwest?

THE WITNESS: Yes, ma'am.

MADAM CHAIR: And then we have a Rose Strike Plot of the marginal class natural fractures.

THE WITNESS: Yes, ma'am.

MADAM CHAIR: Which is mostly north-south.

THE WITNESS: And if you look at where they occurred, they occurred in two specific intervals in the open hole section.

MADAM CHAIR: Okay. But they are less than 90 degrees, but significantly off --

THE WITNESS: Right.

MADAM CHAIR: -- of the conductive natural fractures?

THE WITNESS: Right.

MADAM CHAIR: So there can be a tendency for migration towards south, as well to the west-southwest?

THE WITNESS: Right. I think you said the key word there when you said "conductive." My understanding of marginal class fractures is that they are not as conductive. What does that mean? I don't know. They are just not as conductive as conductive fractures. These -- these were prepared by Halliburton and computer-generated, so I don't know what the scale is for marginal class. I don't have a handle on that.

MADAM CHAIR: Those are all the questions I have. Thank you.

MR. SCOTT: A couple of redirect questions?

MADAM CHAIR: On the questions that were asked?

MR. SCOTT: Yes.

MADAM CHAIR: Yes.

REDIRECT EXAMINATION

BY MR. SCOTT:

Q. Mr. Pierce, Mr. Bruce asked you about your original calculations --

A. Yes.

Q. -- in one of his questions?

A. Yes.

Q. And at the time when you referred to the original calculations, that's when the application for this well was submitted?

A. Correct. In 2008.

Q. And at that time you didn't have any drill hole information, well logs, any of that sort of data available to you for the Monument Well.

A. No, I did not.

Q. And so because you didn't have that specific data available, you utilized the 100 percent safety factor in your calculations, correct?

A. Yes.

Q. The calculations you have done now, you have actual data as to the Monument borehole and the injection unit. Correct?

A. Yes. That's correct.

Q. So you have actual data on porosity and --

A. Yeah. No estimated numbers there.

Q. Mr. Bruce asked you some questions about deep wells potentially being drilled into this area. Do you recall those questions?

A. Yes.

Q. The information on this well, the Monument Well, would be of record with the Oil Conservation Division, correct?

A. Yes, it should be.

Q. So anyone who would be proposing to drill a deep well in this area would have access to those and would need to obtain approval from OCD before drilling a well that might impact an area that would be close to this well and it could be impacted by material injected through the Monument, correct?

A. Yeah, I would assume. They would certainly need to know that there is an injection well, regardless of acid gas or not in the area.

Q. Mr. Bruce asked you some questions about the relative timing of starting the drilling of the Monument Well

versus re-entry of the 285 Well. You are familiar with the Order Number R-13052 in this case?

A. That's the original order?

Q. Yes.

A. Yes.

Q. And ask you --

MR. SCOTT: May I approach the witness?

MADAM CHAIR: Yes.

Q. If you look at Paragraph 15 of that order, that paragraph imposes a time limitation on Targa to complete the well and commence injection or the authority granted under the order would terminate. Correct?

A. I think you got the wrong paragraph.

Q. Paragraph 15?

A. 15, okay. Yes, that's correct. "The injection authority herein granted shall terminate within one year after the effective date," so if the operator has not commenced injection operations --

Q. Okay. So by virtue of time lines under the order, Targa was commencing work to try to diligently not only re-enter the 285 Well, but commence work on the well authorized by the order, correct?

A. Correct.

MR. SCOTT: No further questions.

MR. BRUCE: Can I follow up with one question?

MADAM CHAIR: Yes.

RECROSS-EXAMINATION

BY MR. BRUCE:

Q. Regarding the time deadline for injection, the original order was entered almost three years ago, correct?

A. Yes.

Q. And are you aware that Targa obtained two extensions of that injection deadline from the Division?

A. I did not know that.

Q. So they could have asked for a third extension of that deadline?

A. Possibly.

MR. BRUCE: Thank you.

MADAM CHAIR: Nothing further, the witness may be excused.

THE WITNESS: Thank you, Your Honor.

MADAM CHAIR: Do you have any other witnesses?

MR. SCOTT: We have no other witnesses at this time. We would reserve the right to recall these witnesses or other witnesses in rebuttal if necessary.

MADAM CHAIR: Okay.

MR. BRUCE: Call my first witness?

MADAM CHAIR: Yes.

ROBERT STEVEN JOHNSON

(Having been sworn, testified as follows:)

DIRECT EXAMINATION

BY MR. BRUCE:

Q. Will you please state your name and city of residence for the record?

A. Robert Steven Johnson, Midland, Texas.

Q. Who do you work for and in what capacity?

A. I work for Apache Corporation. I am a geologist in the Monument and Eunice area.

Q. Have you previously testified before the Commission?

A. No, I have not.

Q. Could you summarize your educational and employment background for the Commissioners?

A. I graduated 1976 with a bachelor's degree in geology from Hope College. I have a master's degree from the University of Kentucky which I acquired in 1979. From 1979 to 1989 I worked with Amoco. For the first six years I was in New Orleans. I worked off-shore, Gulf of Mexico, on-shore Arkansas, Mississippi, and Louisiana. I was then transferred to the international division. I worked Egypt and lower Africa. I left Amoco and I went to Saudi Aramco in Saudi Arabia. I was 15 years there, worked the Arabian plate, mainly Devonian clastics and carbonates along the Red Sea.

When, I left Aramco, I spent a year with Occidental in Houston, and I worked their on-shore north valley plain in Yemen.

I then hired -- I was then hired by Apache where I spent two and a half years in Egypt. The last year and a half I have been working with the Permian region here in Midland.

Q. And Apache has substantial assets in this area, does it not?

A. Absolutely.

Q. The Monument-Eunice area?

MADAM CHAIR: Is he being tendered as an expert geologist in that area?

MR. BRUCE: Yes. I was just go to asking that, Ma'am.

MADAM CHAIR: Okay. Any objection?

MR. SCOTT: No objection.

MADAM CHAIR: So admitted.

Q. (By Mr. Bruce) Mr. Johnson, does Apache oppose the granting of the relief sought by Targa in this case?

A. Yes.

Q. And maybe just to summarize briefly, from a geologic standpoin5, why do you object to the granting of the application?

A. We object on several specific criteria. First

criteria is on the -- on the dipmeter, we evaluated the dipmeter that we were given originally. It was a poorly-copied exhibit, 8 1/2 by 11. We have since seen the logs here, and I agree with Mr. Pierce's interpretation that the natural fractures of the overall interval go from northeast to southwest.

I also, as you mentioned, there is a set of what they call marginal fractures, which are north to south trend. What Mr. Pierce didn't mention, though, is if you look at the rose diagram that you have which shows the northwest -- northeast-southwest trending fractures, there is also a conjugate set of fractures which trend northwest-southeast.

Borehole -- the dipmeter, the high resolution dipmeter only really tells you what's going on in the borehole itself, and it may be -- you can maybe even extrapolate out a few feet from the borehole.

When you start looking at what's called far-field analysis, in other words, getting away from the dipmeter data and start trying to make an interpretation of what's going on in a more regional extent, it becomes very dangerous. The data that we have, the regional data that we have -- and we have worked this area and other operators have worked in the area -- tends to show more of a northwest-southeast regional trend.

I think that if you drill a borehole anywhere on

this structure, you are going to get different orientations depending on the stress fields that you see at that location. It is on the flank of an anticline. There has been uplift, there's been stress and strain, so you are going to get changes out there. And when you start to try to make far-field -- far-field analysis, that's dependent both upon the stress field of the overall area, as well as the geology.

The geology in this case would consist of the depositional environments, deposition -- the lithology, the layering, compartmentalization and other things. The point being, it's difficult to extrapolate from the borehole to a regional extent, and as I have already mentioned, we have two additional fracture orientations that they didn't mention in their initial exhibit.

Secondly, the dipmeter wasn't run over the overlying shale. You drill through the shale, set the casing, and then drilled it and ran a dipmeter. We don't know if the shale is fractured or not.

As far as the comments on being unproductive versus non-prospective. I have seen nothing. I haven't had a chance to look at anything, and I have seen nothing entered that talks about -- shows that might have existed in the DST data that has been acquired, there was mud log shows, no sample strips in showing.

DSTs are generally used to evaluate porous

intervals. It's a discrete tool to evaluate porous intervals, and I think that they've done a good job of evaluating the porous intervals that were in the zone. However, as is mentioned, there's been a dramatic revolution in technology in the last 15 years, 10, 15, 20 years, and we don't just look at the porous zones now; we look at the tight zones, too.

And in this -- in this interval that the logs that we saw today show, you have porosities that range from less than 6 percent up to more than 40 percent porosity. So there is -- there are a mix of both tight and porous zones in this interval. And we don't what's in the porous zones here -- excuse me -- the tight zones here or other.

The drilling, the deep drilling that's been done in this area -- I put together a map, goes probably 10 to 12 miles in every direction -- and what you see is the deep wells are clustered in areas as you would expect, structures where there's been some production. As you go away from the structures, there are wells in between, but not a significant number. And, if you go to the north and the northeast, it looks almost baron.

The point being, I'm not saying that there is commercial hydrocarbons here. I'm not even saying it's prospective. I'm just saying we don't know, and certainly not with the advantages that new technology brings.

Q. Okay. Mr. Johnson, let's go back to what you were talking about with the dipmeter, and if you could go to Targa's Exhibit 3 that you have, I believe, in front of you.

A. Uh-huh.

Q. And maybe leaf through -- and since the pages are unnumbered, be sure you reference the Commission to which ones you are talking about, but maybe go into more detail commenting on those particular plots.

A. The only thing I wanted to point out, if I can show this, this is northeast-southwest trend, and I absolutely agree that that is there on this borehole. But I want to point out that there is a perpendicular trend that's a conjugate trend which goes northwest-southeast.

MADAM CHAIR: Is that the one labeled Rose Strike Plot?

THE WITNESS: It's conductive natural fracture. It's the one that shows the northeast-southwest trend.

A. And then the other one I would point out is the one you have already mentioned, which is the north-south trend, which when they call it marginal, I'm not sure what that is. Marginal is just -- I think they mean they don't know for sure what it is.

The point that I would make on this is, at some point there will be leakage in other directions other than northeast-southwest given these fractures. We don't have an

idea of capillary pressures. We don't know how long it will take, but it's just inconceivable to say it's not going to happen. It will happen. Whether it's a couple of years or geologic time, it will leak.

Q. Secondly, you mentioned the overlying shale. What you are saying there is there is a question as to its integrity?

A. I don't know. We can't answer that. We don't know.

Q. Now, you've already discussed the -- again, you said you have -- in your work in this area, you looked at other Devonian wells in this area, in a large area, correct?

A. Uh-huh.

Q. And, again, looking at this specific area to the north and west, there are very few Devonian wells?

A. Yes, relatively speaking. Compared to the other areas, yes.

Q. What about -- and let me refer you to -- and maybe this one was also for our next witness -- Exhibit 1, which is simply a radial plat, Apache Exhibit 1.

A. I don't have that with me here.

MR. BRUCE: If I could approach the witness.

MADAM CHAIR: Yes, you may.

Q. Now, that's a plat showing the location of the AGI Well and of the Apache's Number 285 Well?

A. Correct.

Q. And it has data from the Abo, but could you discuss production in other zones uphole from the Devonian?

A. As is mentioned, I reviewed Mr. Pierce's transcripts from the 2008. All the intervals, in the fracture units that are shallow, we have Grayburg in the area, there's Yates. The Abo is certainly productive in this area, but it's not right in here. It's productive to the west, I believe, and there is production that we have to the southeast which we are currently drilling now. And the only point that I would make on this is this is an area we would certainly consider moving into looking for Abo potential if we have -- if we can get the leases. Certainly it's something to consider.

Q. And you would be -- if something migrates uphole through one of these wellbores in the area, that could destroy the Abo potential in this area?

A. I -- that's beyond me. I would rather have one of the engineers address that.

Q. That's fine.

A. I assume it would, but I don't know that for a fact.

Q. And we also submitted a cross section. Do you have that in front of you?

A. No, I do not.

MR. BRUCE: If I could approach again?

Q. Can you just identify that for the Commissioners and

discuss what that is reflecting?

A. This is a generally east-west trending cross section that goes through -- flows east to the AGI Well, goes to the 285 Well and Apache and goes into Maveety WD 12. The only point I would make off this is the logs are old. It's difficult to make a lot of assumptions and correlations. I think there is connective porosity throughout these intervals. The overall correlation is -- is pretty good. If you start talking about -- about discreet zones of porous or tight, I think you start to get into a little bit more subjective, but overall there should be both long-term porosity intervals throughout this area, as well as short -- shorter zones or zones that are not as long or as widely distributed, and they will be interspersed among tighter carbonates. That's all I really to point out on this.

Q. And these zones are continuous across this area?

A. The overall zone is, yes, but when you talk about porosities or tight streaks, I haven't gotten that kind of detail on it.

Q. Okay. Now, again it's been acknowledged that the older wellbores, the deeper wellbores in this area are 50 to 60 years old. Could you comment on those older wellbores and casing or cementing integrity? Or would you rather have the engineer?

A. I would rather have someone else comment.

Q. Now, maybe just one final issue to address. Is the Devonian, the proposed injection reservoir or zone, is that homogeneous or heterogeneous.

A. It's a mix of carbonates. It's got limestone, dolomites, and in that sense it's homogeneous. In the sense of carbonates, it's heterogeneous in the sense it has different qualities.

Q. And does that reinforce your -- just looking at it geologically, would the plume be more likely to follow the permeable streaks in this reservoir?

A. Absolutely.

Q. So if they were oriented different than Mr. Pierce testified, there could be a danger to the Well Number 285?

A. If the plume can get to fractures that are oriented differently, yes, than those shown.

Q. Was the cross section, Exhibit 2, prepared under your supervision?

A. It was prepared by Brett Pierson, the geologist who was handling this area while I was absent.

Q. And have you -- do you agree with the contents of that cross section?

A. Yes.

MR. BRUCE: Madam Chair, I move the admission of Apache Exhibit 2.

MADAM CHAIR: Any objection?

MR. SCOTT: No objection.

MADAM CHAIR: So admitted.

(Exhibit Apache 2 admitted.)

MR. BRUCE: I pass the witness.

CROSS-EXAMINATION

BY MR. SCOTT:

Q. If I understand correctly, Mr. Johnson, you did not prepare Apache Exhibit 1, correct?

A. Apache Exhibit 1 was prepared by Mr. John Nelson, who is --

Q. You did not prepare it?

A. I did not, no.

Q. And Apache Exhibit 2, you did not prepare that?

A. That's prepared by --

Q. Did you prepare any exhibits in connection with this proceeding?

A. I have some that haven't been presented.

Q. When you were talking about areas being prospective or not, when you said you didn't see anything from the DSTs, mud logs, or other indicia, have you undertaken independently to review well files for Devonian wells in the area?

A. I have not.

Q. You talked about, with respect to Targa's Exhibit 3, one of the plots showing, in your view, some risk of marginal leakage to the northeast and southwest?

A. To the northwest --
Q. Northwest and southeast.
A. Yes.
Q. I'm not good with directions. You have not -- didn't calculate any porosity or potential distance that material might migrate through those areas that you believe may have some leakage, have you?
A. No. John Nelson, the engineer of the group, has.
Q. The Woodford Shale is recognized as being a cap for the Devonian throughout this area, isn't it?
A. (Nodding.)
Q. I need you to answer for her.
A. Yes.
Q. And do you know what the thickness of the Woodford Shale is in the area of the 285 Well?
A. Not offhand, no, I do not.
Q. Do you know what the thickness is in the area of the Monument Well?
A. No.
MR. SCOTT: No further questions.
MADAM CHAIR: Commissioner Dawson?
COMMISSIONER DAWSON: I have no further questions.
MADAM CHAIR: Dr. Balch?
COMMISSIONER BALCH: None at this time.
MADAM CHAIR: Have you are recommended any drilling

in this area to Apache?

THE WITNESS: We have, and we have -- I believe it's shallow at this time. Should be both from the Abo on up.

MADAM CHAIR: That's all I have. Any redirect?

MR. BRUCE: No redirect.

MADAM CHAIR: The witness may be excused.

JOHN EDWARD NELSON

(Having been sworn, testified as follows:)

DIRECT EXAMINATION

BY MR. BRUCE:

Q. Would you please state your name and where you reside?

A. John Edward Nelson, Midland, Texas.

Q. And who do you work for?

A. Apache Corporation.

Q. What's your job at Apache?

A. Reservoir engineer for the Eunice and Monument area.

Q. Have you previously testified before the Commission?

A. I have not.

Q. Would you summarize your educational and employment background?

A. I graduated from the University of Texas 2005 with a bachelor in mechanical engineering. I went on to work at

British Petroleum for three, three and a half years, and then I transferred to Apache in Midland. I've been with them one year.

Q. And does your area of responsibility at Apache includes the Eunice-Monument area?

A. It does.

Q. Are you familiar with the reservoir matters pertaining to the Apache operations in this area?

A. I am.

Q. And have you reviewed Targa's application?

A. I have.

MR. BRUCE: Madam Chair, I tender Mr. Nelson as an expert reservoir engineer.

MADAM CHAIR: Any objection?

MR. SCOTT: No objection.

MADAM CHAIR: So admitted.

Q. Mr. Nelson, could you refer to Exhibit 1 and identify that and discuss some of the production in this area.

A. The red numbers on Exhibit 1 represent the Abo cums in the area. And those are oil cums, not gas. Sorry if that's a little misleading. Typically gas is in red, but these are oil cums. And, as you can see, there is, further west, there is -- the cums are quite a bit larger in the Abo Formation, and there is also some Abo cums just southeast of

the NMGSAU 285 Well.

On Exhibit 1, the blue outline on the west side of the diagram is the Monument Abo unit, which we are operators of. And, as you can see, the formation that's been unitized there is the Abo, and on the west side of that unit and in the central part of that unit we have -- we have had production from the Abo.

Q. And Apache owns a lot of interest throughout this area, correct?

A. That's correct.

Q. Shallow and deep?

A. (Nodding.)

Q. Although the production in the Abo is not as high to the southeast on this plat, there are some wells that have produced a fair amount, have they not?

A. That's correct.

Q. And does Apache desire to protect any of the Abo zone so that it can develop that zone in the future?

A. That's right.

Q. Did you also calculate the radius of injection and prepare an exhibit for that?

A. I did.

Q. And is that marked Exhibit -- Apache Exhibit 6?

A. Yes.

Q. Could you discuss what you did for that exhibit and

maybe also at the end discuss -- take a step back. During the break, did you also look at the new exhibit, Exhibit 11, that was submitted by Targa at this hearing?

A. I did.

Q. And did you take some of those factors into account so that you can compare apples to apples?

A. I did.

Q. Okay. First let's go through your exhibit as it is and discuss that for the Commission.

A. I used a lot of assumptions that Mike Pierce made back in 2008 for the injection amounts. Starting at the top of the exhibit, injection volume, I'm using the lower case here, and that's 3500 barrels per day. Now, that doesn't included the acid gas volume, which would be in addition to the 3500 barrels a day.

And then just like Mike used in 2008, I used 30 years. That would be injecting 365 days each year, and with those you can calculate how many barrels would be injected into the ground after 30 years. And if you move down a few rows, that is, where it says, "After 30 Years," that is the cum injection volume. It's approximately 38 million plus barrels.

Now, to convert this into a radial area this would be exposed to, you would have to convert those barrels into cubic feet. And if you move up a few rows in the conversion

factors, I use the conversion factor that one barrel equals approximately 5.6 cubic feet. So I converted the 38 million plus barrels to the cubic feet, which is on the line just below it, and that's 215 million plus cubic feet of injectate, not including acid gas, after 30 years of injection on a daily basis.

And I initially had used the average porosity that Mike had mentioned in 2008 which he estimated to be approximately 6 percent of the injection interval. And what I did was, instead of using the reservoir net pay of 300 feet, which he initially used, I wanted to convey the sensitivity or I wanted to better understand sensitivity that the radius of exposure had to changes in this injection interval, this net pay.

So, in reality, we wouldn't expect that the injectate would permeate through the injection interval evenly, and that's because there is a good chance that the -- that the lithology here, that the rock isn't homogeneous throughout. And what the injectate will find are the zones of higher permeability, higher porosity, and especially if there is any natural fractures in that -- in that interval, it's going to migrate toward those natural fractures and travel through those pathways.

I have also assumed here in this calculation that it would be a radial flow. That it would be a perfect -- if you

look at it from a bird's-eye view, it would be a perfect circle. As has been discussed earlier today, there is good chance it would be an ellipse. What direction that might be, obviously I don't know. I don't know if it's necessarily in the northeast to southwest direction or perpendicular to that, but I think it's very difficult to predict accurately what direction that will be.

But for the sake of coming up with a radius of exposure, I assumed radial. That would be a perfect circle. So, with that, if you would picture this volume of injectate to be a circular disk, what you have is the volume of 215 million plus cubic feet of injectate that need to the fill a circular disk.

So if you divide that volume by the lateral height that this would be injected, which, to be more conservative, but what I -- what I would say is more realistic with the actual injection height, I used 50 feet instead of 300 feet, and that is more in the lines of this injectate going through -- going into these higher perm, higher porosity zones.

So using that 50 feet, I divided that into 215 million plus, and then out of that 50 feet, only 6 percent of that is open bore space where any kind of fluid can travel through it. So I divided that number again by 6 percent, and that gave me the area, if you are looking at it as a

bird's-eye point of view, the area of exposure of this injectate. And to convert that into a radial footage, you simply divide by pi, take the square root of, and that's the bottom row on the exhibit, and that's the 4778 feet.

Q. And that distance could certainly reach the 285 Well?

A. Absolutely.

Q. And, again, what you are using is the radial depiction would minimize any impact as opposed to a preferred orientation of the plume?

A. That's right.

Q. And, again, to emphasize, you used 50 feet because you don't think it's going to inject equally into the 300, 318 feet of the injection zone?

A. I think it's -- I don't think it's very realistic to assume that the entire net pay is homogeneous and that injectate is going to travel equally out from the Monument AGI Well, that if you assume it's homogeneous, then you are assuming that the leading edge of this injectate is equal all along that leading edge coming out from the injection well.

And then, during the break, Mike presented a couple of new numbers in Exhibit 11, and I believe the net pay was 318 feet, the porosity was 7.8 percent. Again, I kept it a 50 foot net pay to give it more -- just to understand the sensitivity of this radius of exposure, and I used a 7.8

percent this time, which, if you are going to have larger porosity, generally you are not going to have a larger area of radial exposure, assuming everything else is constant.

And the number that I got -- I'm sorry I don't have an exhibit of this -- obviously it's going to be less than the 4778 radial feet. I'm getting about 4200 feet radius, which is still greater than the distance between Monument AGI and the NMGSAU 285 Well.

Q. And, again, if that happens and fluids migrate up the 285 Well, that could jeopardize, at the very least, the future Abo development in the immediate area?

A. It could. It absolutely could.

Q. Were Exhibits 1 and 6 prepared by you or under your supervision?

A. Yes.

Q. And, in your opinion, is the denial of Targa's application in the best interest of conservation and the prevention of waste?

A. Yes.

MR. BRUCE: Madam Chair, I would move the admission of Apache's 1 and 6.

MADAM CHAIR: Any objection?

MR. SCOTT: No objection.

MADAM CHAIR: So admitted.

(Exhibits Apache 1 and 6 admitted.)

MR. BRUCE: Pass the witness.

CROSS-EXAMINATION

BY MR. SCOTT:

Q. Mr. Nelson, you testified you used 50 feet instead of 300 or 318 feet into your calculations, correct?

A. Yes.

Q. You could have chosen a different number, 100 feet, 200 feet?

A. Yes.

Q. And each time you change that number, that's going to change your end product of your calculation?

A. Yes.

Q. In fact, that thickness that you select is a significant factor in the overall calculation, is it not?

A. Yes.

Q. When you prepared Exhibit 6, had you reviewed well logs or data concerning the Monument AGI Well?

A. No, I didn't have access to them. I could not find them on the OCD website.

MR. SCOTT: No further questions.

MADAM CHAIR: Commissioner Dawson?

COMMISSIONER DAWSON: No questions.

MADAM CHAIR: I do, but I bet Dr. Balch does, too.

COMMISSIONER BALCH: I do.

MADAM CHAIR: You go first.

COMMISSIONER BALCH: You mentioned sensitivity. Over what range of values did you perform?

THE WITNESS: I did 50 feet for my low end on the net pay, 300 feet for the high end on the net pay. For the injection volume I did 3500 feet for the low end and -- sorry -- 3500 barrels a day for the low end, and 5000 barrels per day for the high end.

COMMISSIONER BALCH: What was your minimum and maximum radius?

THE WITNESS: Off the top of my head, without my spreadsheet in front of me, I can't tell you. Sorry.

COMMISSIONER BALCH: Can you give me a rough estimate?

THE WITNESS: For the low end radius, I believe it was close to 1950 feet, approximately, that's using 300 feet net pay and 6 percent porosity. And I believe that was 3500 feet or 3500 barrels per day. That was the low end, about 1950 feet. The high end here would probably be here on Exhibit 6.

COMMISSIONER BALCH: Okay. No further questions.

MADAM CHAIR: Okay. As an engineer, what would you recommend to be done to Number 285 now? What can be done to Number 285 now?

THE WITNESS: I think that's something a drilling engineer is more suited to answer than me.

MADAM CHAIR: Okay.

MR. BRUCE: And we will present another engineer.

MADAM CHAIR: You do have another witness? Okay. Would you expect a buffering or retarding effect of the acid gas on the migration of the acid gas through the limestone and dolomite formations?

THE WITNESS: Not necessarily. And I think it also has to do with -- with the phase that the acid gas stays in or is in. If it stays in a liquid phase versus a gas phase, it's going to -- it's going to permeate at different rates through the reservoir.

MADAM CHAIR: So would you expect that those rates to be -- to have a major effect on the radius of migration?

THE WITNESS: Sure.

MADAM CHAIR: To enhance or to retard through the fractures?

THE WITNESS: If it dropped below -- if it flashed in the reservoir and the pressure dropped below the flash point and it turns into a gas phase down in the reservoir, or if it did seep into NMGSAU 285, that wellbore, and it managed to flash into a gas phase, then it would certainly spread faster and cover a wider radius.

MADAM CHAIR: That's all I have. Thank you.

MR. BRUCE: I have nothing further of this witness.

MADAM CHAIR: This witness may be excused. It's 11:25. How long do you expect your next witness to take?

MR. BRUCE: This witness will not take very long. I have about five minutes of direct testimony on him.

MADAM CHAIR: Okay.

MR. SCOTT: May I inquire, is this your last witness for your case?

MR. BRUCE: It's my last witness from Apache. I have two witnesses from Monument.

MADAM CHAIR: So we will be going into the afternoon, and we'll take an early lunch so that you all can actually get in and out of the restaurant.

MR. BRUCE: That would be fine, and I think my first witness for Monument will be quite short, the geologist I have for Monument will be longer.

MADAM CHAIR: Okay. Thank you.

BOBBY LEE SMITH

(Having been sworn, testified as follows:)

DIRECT EXAMINATION

BY MR. BRUCE:

Q. Would you please state your name?

A. Bobby Lee Smith with Apache Corporation.

Q. And who do you work for -- I mean, excuse me -- where do you reside?

A. I reside in Midland, Texas.

Q. What's your job with Apache?
A. I'm the Permian Region drilling manager.
Q. Have you previously testified before the Commission?
A. Once. It's been 1985 or something like that. It's so long ago, I don't remember the exact year.
Q. Why don't you just testify a little bit about your drilling experience in the Permian Basin?
A. I have been in Midland, like I said, since 1983. Transferred in there with Coastal Oil and Gas Corporation as a drilling engineer, and worked in the production group for a few years. In 1996 I went to work for the company that became XTO Energy. I was their drilling manager for ten years. Left in 2005 to do some independent things with allusions of becoming wealthy which didn't happen, so I joined Apache in April 2010, and I have been the drilling manager there since that time.
Q. And --
A. Drilled thousands of wells in the Permian Basin.
MR. BRUCE: Madam Chair, I tender Mr. Smith as an expert drilling engineer.
MADAM CHAIR: Any objection?
MR. SCOTT: No objection.
MADAM CHAIR: So admitted.
Q. Mr. Smith, you have in front of you Exhibits 3, 4

and 5. And before we start into them, were you the -- it's been testified that Apache was overseeing the proposed plugging on the 285 Well. Is that correct?

A. That's correct.

Q. Under -- under an agreement with Targa?

A. Yes, sir.

Q. And you were the one for Apache in charge of overseeing that?

A. Not initially. Initially that was handled by our -- we have a group that does P and A work for us, and they started out working on the well with a pulling unit and ran into some trouble pretty early on, and that's one of the things we have is to -- we get brought in when there is trouble wells like that to help folks work on it.

Q. Okay. And Exhibits 3, 4 and 5, these exhibits were prepared by Apache from the drilling department, correct?

A. Yes, sir. I believe these were prepared by Mr. "Marcamana". He is one of my young engineers that works in our group.

Q. Could you go through them and discuss -- and they might be out of order, but I think we have the -- I think I have the wrong ones in front of me, but I think we have the original status, we have the proposed replugging and the current status?

A. That's correct. They are labeled on here, Exhibit 3

was the pre-workover wellbore diagram, which shows intermediate casing that was set back when the wells were drilled. And then it depicts a cement plug that was spotted in the wellbore when they plugged the well.

Exhibit 4 was the -- this is proposed replugging of the well. These things were drilled out. This is to meet what I assume is OCD guidelines for current plugging obligations.

And Exhibit 5 is the current status of the well, which is basically the same as the pre-existing wellbore diagram before the workover started.

Q. Okay. Were you able to achieve what you thought was necessary to properly plug this well?

A. No. We did not accomplish our objective to drill out the plug and spot additional plugs in the wellbore.

Q. And so you never achieved the status depicted on Exhibit 4 --

A. No, sir.

Q. -- the OCD -- or the proposed replugging procedure?

A. No, sir.

Q. At this point, before any injection is allowed into the AGI Well, in your opinion, should additional work be done to properly plug the 285 Well?

A. Again, my expertise is in drilling. It's not

reservoir engineering or geology, and I can't really answer that question.

Q. When -- now, you were involved in meeting with Targa, were you not?

A. I was involved in several meetings with Targa representatives and the Cambrian Management representatives in our office in Midland, Texas.

Q. And Cambrian was a consultant for Targa?

A. Cambrian is a consulting firm in Midland that does project management type of work for various operators if they don't have an operations group. I know those guys.

Q. In those meetings did you recommend terminating the plugging operations?

A. No. This operation was under our direction, but it was at the request of Targa, and all final decisions basically were made by them. That's the way we wanted it.

Q. Okay. But you're not the one who recommended terminating --

A. No, sir. We left that up to them, and they went back and consulted with Cambrian, and I assume that some of their management group, and then they responded to us that they would like to terminate our actions out there and move to another location.

Q. And you said Exhibits 3, 4, and 5 were prepared under your drilling department, correct?

A. Yes, sir. One of my engineers prepared them.

MR. BRUCE: Madam Chair, I'd move the admission of Apache 3, 4 and 5.

MADAM CHAIR: Any objection?

MR. SCOTT: If I could question the witness about Exhibit 4. I don't have a problem with 3 and 5.

MADAM CHAIR: I think it's appropriate.

VOIR DIRE EXAMINATION

BY MR. SCOTT:

Q. Sir, you testified that Exhibit 4 was prepared by one of your engineers, correct?

A. I believe so.

Q. You did not personally prepare this?

A. No, sir.

Q. Did you review Order Number 13052 in connection with the preparation of Exhibit Number 4?

A. I have read through it before, yes.

Q. You said you assume that Exhibit 4 shows what OCD requires for plugging?

A. Uh-huh.

Q. Do you know specifically what OCD requires?

A. I don't have that order in front of me.

Q. Do you --

A. No.

Q. -- personally know what those requirements are?

A. The OCD typically tells you where to spot plug.

Q. And you don't know specifically what they required with this well?

A. No, sir.

MR. SCOTT: I would agree to the admission of Exhibits 3 and 5. I don't think the witness had a basis to testify as to the substance of the diagram in Exhibit Number 4. He doesn't know what was required, where those plugs would be. I don't think he can support the admission of that exhibit.

MR. BRUCE: It was prepared under his direction by one of the people in the drilling department. I think it's a valid exhibit.

MR. SCOTT: I don't think there's been any showing, Madam Chairman, that this individual had knowledge of what the requirements were or understanding as to that. There is not an adequate foundation to support the admission of this exhibit.

MR. SMITH: I would like to ask you just one question, if I may.

THE WITNESS: Yes, sir.

MR. SMITH: When you reviewed Exhibit 4 and/or when it was being prepared, were you at that time familiar with the requirements of the order, and did you review the order in connection with reviewing this?

THE WITNESS: No, sir. I did not have time to do that. I do know, you know, the order specified where the plugs are set, and I did not double check to see if these are correct anticipated plugs. Again, these plugs were never spotted because we never got to that point, so this is just a diagram of what would have been done if we were able to -- successfully able to reopen.

MR. SMITH: Did you instruct the person who prepared Exhibit 4 to do it in conjunction with the review of the order?

THE WITNESS: That was his -- that was his -- he was requested to do that, yes, sir. Now, I can't verify that without looking at the order again exactly what the order said that to spot the plugs mainly because we never got to that point. I mean, if we had got this drilled out, then we would have definitely -- everybody would have been on the same page. We would have made sure the plugs were spotted and tagged. The requirements were in that order to tag the plugs properly, but we never got to that point.

MR. SMITH: As a manager, did you confirm with the person who prepared Exhibit 4 that it was done pursuant to your instructions to do it --

THE WITNESS: I did.

MR. SMITH: -- in accordance with the order?

THE WITNESS: Yes, sir. He was instructed to follow

the order and show the plugs on the diagram.

MR. SMITH: And you confirmed that he did?

THE WITNESS: Yes, sir. I have -- he told me that he did, and I did not go back and double check. I mean, right now we have, you know, 24 drilling rigs running in the Permian, so we have a lot of stuff going on. I did not personally go and verify that these plugs shown on this diagram were the same as what was on the order.

MR. SMITH: But it was done under your direction?

THE WITNESS: Yes, sir.

MR. SCOTT: May I follow up with a question on that?

MADAM CHAIR: Yes.

MR. SCOTT: May I approach the witness?

MADAM CHAIR: Okay.

FURTHER VOIR DIRE EXAMINATION

BY MR. SCOTT

Q. Let me show you, sir, Order Number R-13052 and call your attention to Paragraph 2 of that order. Could you read that, please?

A. "The Division should allow the operator to apply administrative" -- can you tell me -- I'm sorry, I thought you meant the highlighted.

"Prior to any injection the NMGSAU Well Number 285, API Number 30-025-12481, operated by Apache Corporation, shall be re-entered to 9755 feet and replugged back to the

Grayburg-San Andres producing interval with placement of new cement plugs above and below the equivalent of Devonian Fusselman injection interval. Operation on this well shall be supervised by the Division's Hobbs District Office, and exact placement of the cement plugs shall be determined after consultation with the Hobbs district geologist. Targa shall notify the Engineering Bureau of the Division in Santa Fe of the completion of this work and receive written confirmation from the Bureau prior to commencing injection into the Monument AGI Well Number 1."

Q. Now, that order doesn't specify the exact location of each of the plugs shown on Exhibit 4, does it?

A. No, sir.

Q. You have no basis for knowing the exact placement of those plugs at this point, sir?

A. Not according to that.

MR. SCOTT: Again, Madam Chair, I would move that Exhibit 4 not be admitted. The witness doesn't have an adequate foundation to support the document.

MADAM CHAIR: We will not admit Exhibit 4.

MR. BRUCE: Madam Chair, if I could put one witness on to very, briefly. Frankly, that plugging procedure in Exhibit 4 is what Targa required in its compensation agreement with Apache, and that is why Exhibit 4 was prepared that way.

MADAM CHAIR: Well, if you want to put that witness on, then we can review our decision after that point.

MR. BRUCE: I have no further questions of this witness. I don't know if anybody else does.

MADAM CHAIR: Okay. Do you have any --

MR. SCOTT: No.

MADAM CHAIR: -- cross-examination. Do you have any questions?

COMMISSIONER DAWSON: No questions.

COMMISSIONER BALCH: Not from this witness.

MADAM CHAIR: As I understood your answer, I had previously asked the reservoir engineer if he had any opinions on what could be done to Number 285, and he said he could not answer, that he preferred to have a drilling engineer --

THE WITNESS: Yes, ma'am.

MADAM CHAIR: -- answer that question. But as a drilling engineer, you deferred answering that question. Is that correct?

THE WITNESS: To do what?

MADAM CHAIR: What could possibly be done to Well Number 285 at this point?

THE WITNESS: I didn't know I was asked that question. Are you asking me now?

MADAM CHAIR: Yes.

THE WITNESS: Okay. You know, we made many attempts to try to re-enter this wellbore. There were no directional surveys on the original wellbore, which is not uncommon for a vertical well, typically just inclination surveys, not directional surveys, but it looked like, you know, from our work, it appeared that we had, at some point, the start of a new hole, trying to redrill out those plugs. And that's why -- the attempts we made were to find the old wellbore, to drill them out, and we never were confident that we were in the old wellbore.

I made suggestions in our last meeting with Targa and Cambrian, you have a couple of things to try, if they wanted to. Basically it's their decision, not mine. It's our wellbore, but they are basically paying for it, so I wanted them to make the decision. I suggested possibly a hole opener, which is a -- it's run above a bit and it basically opens up the hole to a bigger diameter, hoping that if we were sidetracked, we would intersect the old wellbore and be able to get in it and accomplish our objective, and they elected not to do that at that time. And then they called back shortly after that and told us to release the rig and move off the place.

MADAM CHAIR: Is that the only option that you --

THE WITNESS: The only other option would be to keep, you know, keep drilling like we were and hoping that we

somehow drilled into the old wellbore. And it may or may not happen, you know, there is no guarantee that it would. There is no guarantee that it wouldn't.

MADAM CHAIR: Okay. That's all I have.

MR. BRUCE: Maybe we should break for lunch at this point because I only have one copy of this, anyway, the next exhibit.

MADAM CHAIR: This witness may be excused. Let's break for lunch. It's 20 minutes until 12. Let's reconvene at a quarter to 2.

MR. BRUCE: At?

MADAM CHAIR: At a quarter to 1.

(Lunch recess taken at 11:40 a.m. The hearing was reconvened at 12:45 as follows:)

MADAM CHAIR: Back on the record.

MR. BRUCE: Madam Chair, we are trying to find the document that supports Exhibit 4, we believe it's in a notice that's been filed with the Division, but at this point we will move on from that. And we are trying to locate that document, but at this point I think we will just go to the last two witnesses.

MADAM CHAIR: Would you call your last witness.

MR. BRUCE: Mike Parsons from Momentum.

MICHAEL J. PARSONS

(Having been sworn, testified as follows:)

DIRECT EXAMINATION

BY MR. BRUCE:

Q. Would you please state your name and city of residence?

A. I'm Michael J. Parsons, from Albany, Texas.

Q. And what is your relationship to Momentum Operating Company?

A. I'm the president of the company and one of the owners.

Q. Is Momentum here opposing the relief requested by Targa in this case?

A. We are.

MR. BRUCE: Madam Chair, I'm not qualifying Mr. Parsons as an expert.

Q. Does Momentum own producing wells within the area of review of this application?

A. We do own wells in that area of review of the injection well, yes.

Q. And what -- what zones are your wells producing from, zone or zones?

A. I believe they are producing from the Abo and also from the Yates. I believe that's correct.

Q. Okay. And could you tell us why Momentum is

opposing this application? Why is it worried about the granting of this application?

A. Well, we have some experience with acid gas injection wells in the area of review from our other production. It's not been a very pleasant experience.

DCP permitted an acid gas injection well with a wellbore configuration much like the one permitted by Targa. The acid gas migrated up the open hole section, down natural recurring faults and into our wellbores of our producing wells over one mile away and resulted in a fairly dangerous situation for our company and -- and a tremendous loss of both financial and reserves inside our leases.

Q. And you have retained an expert to testify on Momentum's behalf, have you not?

A. We have. We have contacted Jay E. Smith Engineers to give us some expertise in this case, and we have retained them.

Q. Okay. And so you just want to produce the capability of your acreage and of your existing wells to produce from the Yeso and the Abo?

A. That is correct. We are concerned about the acid gas injection well, and we are concerned about the lack of the well being -- or the inability to get the well plugged of Apache's, and we are concerned about what the migration, which eventually will happen, it's going to migrate

somewhere, and we are concerned it will migrate into our wellbores.

MR. BRUCE: Thank you. I pass the witness.

MR. SCOTT: No questions.

MADAM CHAIR: Do you have any questions?

COMMISSIONER DAWSON: You said you had an open hole section over a mile away that created a dangerous situation?

THE WITNESS: Yes, sir. It was in Texas. It was a DCP permitted well with an open hole section. The depth of the well was a little over 7000 feet. It had about 800 foot open hole section. We had producing wells in the area, in the area of review and outside the area of review, ranging in depth from 3100 feet up to 2500 feet. The acid gas migrated up natural occurring faults and into our wellbores over one mile away. We -- presented our case to the Texas Railroad Commission. We also litigated the case with DCP. I'm not allowed to, under the terms of the settlement, to discuss all the considerations, but the well has been plugged. DCP instituted an SRU as a result of the migration.

COMMISSIONER DAWSON: No further questions.

COMMISSIONER BALCH: In that example you are just talking about --

THE WITNESS: Yes.

COMMISSIONER BALCH: -- what was the vertical separation between your producing horizons and the injection

horizon and the formations?

THE WITNESS: Over 1000 feet.

COMMISSIONER BALCH: What were the formations?

THE WITNESS: The formations that the injection well was put into was the Simpson or equivalent to the Simpson and the Viola. I'm not familiar with what -- where that geologically would be in this area, but it was the Simpson or the Ellenburger. Our wells were in the Brown Dolomite and the Moore County line.

COMMISSIONER BALCH: I have no further questions.

MADAM CHAIR: I have no questions. You may be excused.

THE WITNESS: Thank you.

MR. BRUCE: Madam Chair, the first exhibit for the next witness is a geologic plat which was 8 1/2 by 11, fairly scrunched together. This is just a bigger depiction of that same area.

MADAM CHAIR: Do you have a copy for the court reporter?

MR. BRUCE: I will give her one. (Exhibit to be provided.)

MICHAEL JAMES DONOVAN

(Having been sworn, testified as follows:)

DIRECT EXAMINATION

BY MR. BRUCE:

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

A. Michael James Donovan.

Q. Where do you reside?

A. Tyler, Texas.

Q. And who are you employed by?

A. By James E. Smith and Associates.

Q. And have you been -- has James E. Smith and Associates been retained by Momentum in this case?

A. Yes, sir.

Q. And what is your technical background?

A. I have a degree in geology. I'm licensed in the state of Texas as a professional geoscientist.

Q. And when did you receive your degree and from whom?

A. Texas Tech University, 1991.

Q. And have you been employed by James E. Smith and Associates since that time?

A. I have been with James Smith and Associates for 15 years. Actually hired off with Schlumberger to start my career.

Q. And what type of services do you perform for that

company?

A. Oh, it's a wide range of services. We are a full spectrum geological and engineering consulting firm, regulatory matters, geological matters, reserves, well planning, operation. We have an operating company, Spartan Operating, that we operate under as well. I'm the staff geologist.

Q. Do you have specific experience with acid gas injection wells?

A. Yes, sir. I have been directly involved with design, planning, permitting, drilling, and completion, as well as supervising and monitoring acid gas injection wells, as well as many saltwater disposal wells as well.

Q. And have you reviewed Targa's application in this case?

A. Yes, sir, I have.

Q. And have you reviewed data, geologic data that you think is pertinent to refuting that application?

A. Yes, sir, I have.

MR. BRUCE: Madam Chair, I tender Mr. Donovan as an expert petroleum geologist.

MADAM CHAIR: Any objection?

MR. SCOTT: No.

MADAM CHAIR: So accepted.

Q. Mr. Donovan, could you identify Exhibit 1 for the

Commission and describe what is depicted on that plat.

MR. SCOTT: This is Exhibit 1?

MR. BRUCE: That is Exhibit 1.

A. This is a structure map that I obtained from a third-party mapping service, Geomap, that we have a subscription with. It's a structure, subsurface structure map on the top of the Devonian. And I have annotated on the map the position of the Monument AGI, as well as the problem well, the 285 Well.

Q. Now, in your review of the area, in your opinion, what is the orientation of -- what would be the orientation of a plume from an injection well such as this?

A. Well, the plume for the injection well would, of course, be a function of how much injectate you are putting in the wellbore, of course, also what the reservoir properties would be, porosity and so forth, thickness. As far as the orientation goes, that's going to typically follow the path of least resistance type of stuff.

Q. And within -- have you reviewed data regarding fractures in this area to show what, in your opinion, would be the preferred direction, preferred orientation?

A. There is two different pieces of data that I have, one, of course is the map that we have here. Two is an eight and a half by 11 window shot of the fracture log presented by Targa in Exhibit 3, I believe -- yes, 3.

Q. And what does that show you?

A. Well, the -- let's start with the Targa exhibit. The -- the one plot that I think is a key plot which we talked a little bit about with prior expert testimony is the Conductive Natural Fractures Plot. Indeed you do see fractures there are oriented in the northeast-southwest direction. Also you see fractures oriented in many other directions, really, in all directions. There's only one quadrant on the plot that has minimal fractures.

When you look over to the interval we are talking about on this thing, it's difficult to read, but it's approximately 8400 feet to 9150, and you can see many, many numerous fractures that they have picked on this interval. And the plot kind of shows that what you've got is a densely, heavily fractured interval with varying orientations throughout the interval.

If we were to narrow down a couple hundred feet, you might get more of an orientation in one particular fashion or the other, but part of the reason why it's kind of a more random plot is we've just got a huge interval that we are evaluating here.

The other piece of evidence is the Geomap structure map which they show a large fault, approximately 6800 feet, it looks like, scaled on the map to the west. That fault runs north-northwest, south-southeast. Generally I would

expect that the fracture system over the general structure would probably follow that same line due to the minor-major stress axes that created that fault.

One reason that possibly they have this scattering of fractures is because when you look at your structure map, you can see the Monument AGI is positioned right on the crest of anticlinal structure where possibly you don't have as great of a difference between the minor and major stress axes that create the natural fractures.

Additionally, he's got -- he's got a plot in here where we talk about drilling induced fractures that shows an orientation -- difficult to see on my copy because it's an old faxed copy, but it looks like it's northeast-southwest. But those drilling induced fractures will be a function of the insitu stress today when the well was drilled, not necessarily the stresses that were in play at the time of the faulting and the natural fractures occurring in the reservoir.

So it looks like that on these plots, anyway, at this point on the reservoir it may be that, a, it's more of a -- isot -- isotropic -- I'm sorry -- isotropic in nature in where it's more of a scattering, versus maybe if you were to go over to the side of the structure or something like that you might see more of a delineation in one orientation or another.

Q. Would I be correct in restating what you are saying, you are agreeing with Mr. Johnson that Exhibit 3, the items depicted, the fractures depicted there, would this be localized by the wellbore?

MR. SCOTT: Object to the form of the question.

A. Well, in fact, this is a single --

MADAM CHAIR: Can you re-ask it?

Q. Did you listen to Mr. Johnson testify?

A. Yes, sir, I did.

Q. You heard that he stated that what you are looking at on these exhibits is merely just -- fractures immediately by the wellbore?

A. That's correct. It's actually at the pinpoint location of the wellbore. It would not tell you what the fracture system is five or ten feet away from the wellbore, much less throughout the field system.

Q. Now -- and I want you to look -- in a little while I will give you Targa's Exhibit 11 which they presented today, but overall, what is your opinion of their approach in their modeling of the plume system?

A. I believe their approach in modeling the plume is deficient. The first problem I noted with the application is the radius that was calculated was simply a radius based on the water injection. It did not account for the acid gas portion of the injectate.

There were no thermodynamic calculations, as far as I know, to determine what the volume of the injectate would be at the reservoir conditions of temperature and porosity. We would need to know what the thermodynamic properties of the injectate would be so that we would know what volume is actually being injected and what space that would occupy.

So I would maintain that as of right now, we don't know how much acid gas will be injected at reservoir conditions as far as the volume goes because there are no -- in my experience, typically for this type of rate, 2 to 3 million, it's probably going to be in the range of 1000 to 2000 barrels, in addition to the 5000 barrels that -- the water portion.

Q. So what you are looking at is just the water, but when you add the acid gas in the downhole permit situation, depending on the reservoir condition --

A. Correct.

Q. -- it would lead to increase in the actual volume being injected?

A. That's correct. It would be 5000 barrels of water per day plus some volume of the dense gas phase, if it indeed were in the dense gas phase. We don't know that because we don't have any phase envelope, any thermodynamic calculations, anything like that. Don't have any sort of pressure calculations that would determine what kind of

wellhead pressure we would expect, and what kind of sand phase pressure we would expect, and that would determine the behavior of the acid gas injectate.

MR. BRUCE: If I may approach the witness, Madam Chair.

MADAM CHAIR: Yes.

Q. I have handed you their Exhibit 11, which is the calculation they did regarding this -- the injection. First, Mr. Pierce used the 318-foot interval, I believe, in his calculation?

A. Yes, that's what it looks like.

Q. Would you use that figure?

A. No, sir, I would not.

Q. And why?

A. Because we now have an open hole log on the well. If you look at the open hole log, the first thing that I see -- and today is the first day I have seen it -- the first thing you see is that it's run on a matrix of limestone. Limestone matrix, that's what the porosities would be calibrated to for that matrix. If you look at the PE curve, as well as the density curve, they strongly suggest that the entire interval in fact is actually dolomite. The PE value for dolomite is 3. Limestone would be 5. Of course sand is 2 -- we don't have to worry about that. But you can look down the full log interval, and it's almost a straight line.

There's a little bit of deviation here and there, but it's almost a straight line on 3.

Also, if you look at the density porosity, it actually reads negative, in most cases say negative 5, negative 10, well, that tells you it's not on the correct matrix. But absent of that, that's okay because they present a cross porosity for us.

MADAM CHAIR: We are not --

COMMISSIONER DAWSON: We don't have that exhibit.

MR. BRUCE: I mean, they weren't presented. He is just commenting off the logs that were given to us a couple of hours ago.

MADAM CHAIR: We don't have copies of them to follow his testimony.

MR. BRUCE: All we were given was one set, Madam Chair. We can certainly supply more to the Division, or I can give you that set and Mr. Donovan can probably testify off of his memory.

THE WITNESS: Probably so. I can probably give you this one. I have scratched on it a little bit.

MADAM CHAIR: We need copies to follow after that --

MR. BRUCE: Yes, ma'am.

MADAM CHAIR: -- after the hearing is closed.

MR. BRUCE: If we can mark that Targa Exhibit 6. And if I could, Mr. Donovan, make a few notes -- actually,

it's my Exhibit 6.

(Exhibit Monument 6 identified.)

Q. And, Mr. Donovan, now that the Commission has that in front of them, can you comment on the log?

A. Well, let me back up a little bit. You will notice the PE curve, which will be in Tract 2. It's usually scaled zero to 10, and it's that kind of dashed curve that runs right about that third division, and you can see it's almost stacked on that third division all the way down. And they will label it somewhere on the log. They will show PE. That's the photoelectric -- that's what can tell you the lithology.

If it's on a 3, that's dolomite. Five is limestone, and 2 is a sand. So that's a good lithology indicator. It's one of the strongest indicators. Additionally, you can look at the solid curve to the far right in Tract 3, and you can see that tract is the full scale tract for four divisions. It's 3 porosity units to a negative 10 porosity units. So those first five divisions are actually negative porosity reading. And it's reading negative porosity because it's logged on the incorrect matrix. It's actually a dolomite logged onto limestone matrix.

Now, in addition, what they do for you is they give you a cross block porosity, and that will be not a function of the actual lithology because they will take that and enter

a cross plot electronically and they kick out that curve. That's the little -- I think it's a dotted line curve.

You can follow that curve and see where the 6 percent porosity line would be, which would be eight tract -- eight grids, if you want to call it that, from the right-hand side. Five would be zero, and then it's two, four, six. The curve that's past that -- could I approach and point it out, by chance?

MR. BRUCE: With the Commission's permission.

MADAM CHAIR: Sure. I think we have pretty much pointed it out between the three.

A. You can see the curve to the left of that is the neutron porosity. The neutron porosity would be shifted down when it's corrected to the dolomite matrix, and the density will be shifted up when it's corrected to the correct matrix.

But nonetheless, they give us this cross block curve, which tells us the porosity for those intervals. So what you can do is follow that -- it's actually -- it looks like a dash dot curve. And you can see that what you've got is essentially where it crosses the 6 percent line, you've got about 12 feet down here at 8650 to 8680. Right there you can see where that dot dashed line crosses the 6 percent mark. The rest of the log before that, you can see it does not cross the 6 percent mark. There is no porosity below that point that's above 6 percent.

As you move up above that, you can see there is no porosity that crosses the 6 percent mark until you get up here to 8532. And that's where you can see where it starts to touch the 6 percent line, you've got approximately 22 feet in the interval from 8477 through 8532 that shows porosity above 6 percent. And that's the only porosity in this wellbore on their well log that shows porosity above 6 percent. That totals up to be 34 feet of total porosity that's above 6 percent.

Q. And would that figure be in line with the figure that Mr. Nelson used in calculating his radius?

A. It's close to his. Actually he used 50. It should come down to 34 feet for this pinpoint location.

Q. And that would make the plume even larger than --

A. Much larger. And I can certainly calculate that real quick with my calculator. But essentially you've got some minor porosity that's barely above 6 percent down here at the 8650 level. I would suspect that all the injectate is probably going to go in this interval here at the 8470 to 8532 interval, path of least resistance, again, that's where it's going to go. All of the stuff down here, none of this stuff is going to take fluid.

One of the prerequisites of having a disposal is have the capacity to take the injectate, which, of course, is porosity, and there is little or no porosity below 8680.

Q. And the flow of the injectate will favor the zones of higher porosity and permeability?

A. Correct.

Q. Furthermore, you don't believe that the formations, that the injectate is displacing the formation fluids on a 100 percent sweep basis?

A. That's the problem with a simple volumetric calculation. It assumes three things. It assumes radial flow, it assumes a homogeneous injection interval, and also assumes 100 percent sweep efficiency where the injectate is displacing borehole fluids at 100 percent. We know that is not the case.

There is actually a sophisticated model developed down here at Sandia by the name of the Swift Two Model, and what we have seen in those models, typically what you have is the near wellbore you have a high concentration of the injectate, but out there on the leading edge, what happens, it just becomes a decreasing concentration as it leaves. And that decreasing concentration -- we actually usually model after the one percent concentration, and it's much farther past just a simple volumetric calculation due to mixing of the fluids, as well as potentially some gravity differences due to the difference of density of the formation fluids versus the injectate fluids.

Q. Based on what you have just testified, do you

believe there is a -- the plume is much larger than calculated by Targa?

A. Extremely larger, yes, sir, I would suspect, yes.

Q. And it could reach the Well Number 285?

A. I believe it could, yes, sir.

Q. And if gets to that well, what is the issue then?

A. Well, from what I understand, at the 285 what you've got is an interval between approximately 6300, which includes the Abo down through the injection interval, which is potentially in communication, the Abo with the proposed disposal zone.

Q. And that could damage existing and future production?

A. If the injectate reaches the wellbore, migrates up through the unplugged interval and back out into the productive Abo, then it's going to be disbursed beyond that. And then of course then we have to think about the behavior of the injectate once it reaches that reservoir.

If that reservoir is depleted, then the acid gas is going to behave differently than in the other wellbore -- I'm sorry -- in the other zone. If it's a depleted zone, it potentially could flash to gas, and once it gets into a gas phase, it could really start to migrate because of the huge differences in the formation fluids density versus gas density.

Q. So what is your ultimate conclusion regarding Targa's proposal?

A. I don't believe that they have met the burden of proof to demonstrate there is little or no chance even for the injectate to reach that potential problem wellbore.

Q. And just, of course, for the record, you did perform some calculations on the plume, did you not?

A. Yes. I did several calculations using the parameters that were submitted by Targa. I did some cases for 5000 barrels a day. I did some for 3500 barrels a day. I used his 300 feet and 6 percent, because that's what I had prior to this. I also did a couple of cases where I estimated what the acid gas injectate portion would be. Again I used about 1400, approximately, for the 5000 and 3.38 case, and 1100 barrels for the 2.26 million case, I believe it was.

Q. Okay. And were Exhibits 2 through 5 prepared by you?

A. Yes, sir.

Q. And without going into the -- you have already described how you calculated it. Would your numbers come up with a larger plume radius than Mr. Pierce did?

A. Than Mr. who?

Q. Than Mr. Pierce, Targa's witness.

A. Yes. Yes. And, of course, if we were to plug in

what I would consider the actual porosity and thickness, they would be even more extreme than these numbers, probably in the range -- in fact I calculated one a few minutes ago. It's about 5900 feet.

Q. Substantially more than a mile?

A. Yes. Using the 6400 and 34 feet, and I gave them 20 percent for the 34 feet, which is pretty optimistic, and still came up with 5900. And that's, of course, again assuming radial flow, homogeneous injection, and 100 percent sweep efficiency. So that's going to be a very best case scenario.

Q. Were Exhibits 1 through 5 prepared by you?

A. Well, the Geomap, of course, is purchased. I did not prepare the structure map. That's somebody, a geologist. I did annotate it with the position of the two wells, and I highlighted the fault. The fault, of course, is there. I just put the purple line.

Q. And Exhibits 2 through 5 were prepared by you?

A. Yes. Yes, sir.

MR. BRUCE: Madam Chair, I would move the admission of Momentum Exhibits 1 through 5, plus Exhibit 6 which is the large map that Targa presented or Targa gave to us today.

MADAM CHAIR: Any objection?

MR. SCOTT: Madam Chair, I'm a little lost because I don't have any Momentum's Exhibit 5. I have an Exhibit 2, 3

and 4, which are the calculations, but no Exhibit 5.

(Document provided to Mr. Scott.)

MR. SCOTT: No objection.

MADAM CHAIR: They are so admitted.

(Exhibits Momentum 1 through 5 admitted.)

(Exhibit Monument 6 admitted.)

MADAM CHAIR: Any cross-examination? Do you pass the witness?

MR. BRUCE: I pass the witness:

MR. SCOTT: Can we take a short break and consult with my witness?

MADAM CHAIR: Let's reconvene in ten minutes at 1:30.

MR. SCOTT: That will be fine.

(Recess taken.)

MADAM CHAIR: Thank you. All right. We have finished with direct testimony. Any cross-examination?

MR. SCOTT: Nothing. No questions.

MADAM CHAIR: Any questions from the Commission? Commissioner Dawson?

COMMISSIONER DAWSON: No questions.

MADAM CHAIR: Commissioner Balch?

COMMISSIONER BALCH: I have no questions.

MADAM CHAIR: And I don't either.

THE WITNESS: Thank you.

MR. TAYLOR: We pass this witness. I believe -- no. We are going to have one more witness to basically document this Exhibit Number 4, so if we could take a few minutes. Mr. Bruce is upstairs getting copies of the document that I just e-mailed so that he can print it out to use as an exhibit. So if we can take a five-minute break.

MADAM CHAIR: Yes, another five.

MR. TAYLOR: I apologize. We didn't know this was going to go --

MADAM CHAIR: Okay. We will reconvene in five minutes.

MR. TAYLOR: Thank you.

(Recess taken.)

MADAM CHAIR: Let's go back on the record.

MR. BRUCE: Madam Chair, I have handed everyone Apache Exhibit 4-A, which is the plugging proposal filed with and approved by the Division regarding the plugging procedure which was proposed by Apache. Also, I believe Targa was involved in this. If you look at the very last page, it's virtually -- it is what Exhibit 4, Apache Exhibit 4 is, and I would just move the admission -- I would ask that the Commission to take administrative notice of its -- of the well file, of the Well Number 285 and to admit Exhibit 4 in the record.

MR. SCOTT: Your Honor, we would stipulate that it's

a document on file with the agency, and -- but for whatever it's worth on that basis.

MADAM CHAIR: All right. We will accept Exhibit Number 4 -- I'm saying that too many times -- as qualified.

(Exhibit Apache 4 admitted.)

MR. BRUCE: I have nothing further in this matter.

MADAM CHAIR: Do you have any closing statements?

MR. SCOTT: We have a rebuttal witness. We call Mr. Mike Pierce.

MICHAEL PIERCE

(Having been previously sworn, testified as follows:)

DIRECT EXAMINATION REBUTTAL

BY MR. SCOTT

Q. Mr. Pierce, you were sworn in earlier. You are still under oath.

A. Okay.

Q. You were present during the last witness' testimony concerning the logs that we reviewed on Mike Donovan's testimony?

A. That's correct.

Q. And is the approach that Mr. Donovan described standard practice for the Permian Basin?

A. I think you are referring -- you're referring to the logging, and the standard industry practice in the Permian Basin is to use -- to calibrate the Limestone Matrix.

It's -- it's -- I don't know why the reason, it's just been that way for many years.

Q. In your experience, have you seen the logs use any other matrix?

A. On occasion, you know, they use the Sandstone Matrix, and the Dolomite Matrix on occasion, but I have never seen a Dolomite Matrix in the Permian Basin.

Q. And could you explain, was the comparison or the analysis that Mr. Donovan was making of the logs, is that an apples to apples comparison?

A. No, not exactly. When we first started this, I looked at, within the record, all the old logs that were involved in the 50s and 60s in the Devonian. The only logs available then were -- that had porosity -- were gamma ray neutron logs. It didn't have a density tool, they didn't have cross porosity available. Those were invented sometime later in the future.

So the only way I could compare this well, the new well, with the old ones is using the neutron porosity. And even then, you know, it's not a great comparison because back then we didn't have API standards to work with. Now everything is calibrated to the same thing, API standards. That was not available in the 50s and 60s, and the only way I could come up looking at those old logs and coming up with porosity estimates was to look at this gamma ray and

estimate -- I mean the neutron and get -- estimate the porosity off those old logs, and that's the only way I can compare this log to the old logs, and that's how I came up with -- if you look at the neutron porosity, you will come up with 318 feet of greater than -- 6 percent or greater.

Q. And, Mr. Pierce, would you just walk us through how you do that analysis of the log?

A. It's just a foot-by-foot analysis, I mean, you know, where the neutron curve crosses the 6 percent line. And then -- and then log that number, you know, how many feet are 6 percent, how many logs are 7 percent neutron porosity and so on.

Q. Okay. Could you give an example in the log that we have?

A. We'll take 84 -- 8400 to 8402. If you look at that, the far curve is just a hair above 6 percent, the far left curve. And if you go down to about 18 feet further to 8417 to 19, you know, that is almost 7 percent neutron porosity. And just a foot-by-foot basis throughout the whole open hole interval is how I came up with the 318 feet of porosity, neutron porosity variance of 6 percent.

Q. Are there areas that are significantly higher than 6 percent?

A. Yes, there are. There are areas that are below 6 percent and areas that higher than 6 percent.

Q. Could you point out the areas that are significantly above 6 percent?

A. Like the previous witness pointed out, at 84 -- 8478, you know, that porosity tops out at almost 40 percent.

Q. And in the calculations that you submitted that support Exhibit 4-A and Exhibit 11 to Targa's exhibits, those are based on an injection limit of 5000 barrels, correct?

A. Correct. That's fluid and gas.

Q. And further on the assumption that it's a maximum of 3.38 NMCF per day of gas, correct?

A. Correct.

Q. And do you know, is that injected in the fluid base?

A. Yes, it's injected in the fluid base. That's not my area, but in the previous hearing, there would be a back pressure value on there that would keep it at a pressure above to keep it in the --

Q. And based on the analysis that you have done of the current and the old well logs and the well files for the surrounding wells in the area, is it your view that the -- there is not a risk that material injected into the Monument Well would migrate to and impact the 285 Well?

A. I think it's unlikely that the fluid will migrate to the north against the fractures and against the regional flow if it exists down in the deep to reach the 285 Well.

Q. And is it your view, Mr. Pierce, that the requested relief here, which is to eliminate the requirement to re-enter and replug the 285 Well and to leave the Graham State Well in place as a saltwater injection well with the 5000-barrel-per-day limit on the Monument Well, does that protect correlative rights and prevent waste?

A. Yes, I believe it does.

Q. You have in front of you a map that was introduced by Momentum?

A. Correct. It's, like the previous witness, it's a structure map from Geomap, and I would -- all I would like to do is point out that, where the Monument AGI Well spot is, they have that at a closure that pretty close to it has a subsea depth of 4703, and our subsea depth is 4753. We are 50 feet lower than this map shows. So this -- this map should be, while it's a good thing to get a regional view of, you can't take it at face value because a lot of these numbers are not correct.

Q. And that may be all you wanted to talk about that map, but I have one other question I want to ask you about. If you can look at Apache Exhibit 1, which I will hand to you. Apache Exhibit Number 1 shows a number of wells along the west side of the map, and then a number of wells in the southeast corner.

A. Correct.

Q. Is that an explanation for that distribution of wells in the area?

A. The wells in the western part of the map are part of the Monument Abo field, it's a reef trend. It's an Abo reef. The wells in Section 1 and 6 and portion of Section 36 are platform carbonate. They are totally different rocks, different bases, different rock types.

Q. And that reef trend that's along the west side that's the edge of that?

A. Yeah. It's pretty close to the edge of it, judging from the production numbers here on the eastern side of the western trend. These numbers, if you look at the production numbers, you know, pretty quickly go from over, you know, 3- or 400,000 down to 4000 and 10,000 and 22,000, so you are pretty much out of that reef trend there.

Q. Okay.

MR. SCOTT: No further questions at this time.

MADAM CHAIR: Any cross?

CROSS-EXAMINATION

BY MR. BRUCE:

Q. Just very briefly. Was there anything wrong with Mr. Donovan's log analysis?

A. No. They just were comparing apples and oranges.

Q. Well, just because something has been done one way for 40 years doesn't necessarily mean it's correct?

A. It doesn't mean it's wrong, either. It's the only way I could compare -- the only mechanism I had to use the old logs and relate them to the new logs.

MR. BRUCE: That's all I have, Madam Chair.

MADAM CHAIR: Commissioner Dawson?

COMMISSIONER DAWSON: I have no questions.

MADAM CHAIR: Commissioner Balch?

COMMISSIONER BALCH: I'm not familiar with the Geomap, the Geomap that they just used, the top is from --

THE WITNESS: They employ their own people, I would think, and pick, but it's -- or I assume. I have never worked for Geomap. They have people who pick tops, so there could be some differences in where they pick tops at.

COMMISSIONER BALCH: I have no other questions.

MADAM CHAIR: And I have no questions.

RECROSS-EXAMINATION

BY MR. BRUCE:

Q. Just based on the last question, did you do a structure map, yourself?

A. Yes, sir. It was introduced in the first hearing.

MR. BRUCE: Thank you.

MADAM CHAIR: This witness may be excused then. Do we have any other witnesses?

MR. SCOTT: No witnesses.

MADAM CHAIR: Do you have any closing arguments?

MR. BRUCE: If I could take 30 seconds, the shortest closing argument I have ever done. Mr. Pierce, when he originally testified, he said, quote unquote, "It was unlikely that fluid would migrate to the 285 Well, where it is possible it could migrate uphole." Well, we think the chances are a lot stronger than that, a lot stronger than that, but even he admits there may be an issue. We just think the application should be denied unless Targa can re-enter and properly plug the 285 Well. Thank you.

MADAM CHAIR: Mr. Scott, do you have a closing?

MR. SCOTT: I do. Through the witnesses that Targa has presented today, we have demonstrated that the two items requested in the application should be granted.

First with respect to the request that the requirement to re-enter and replug the well be eliminated, we have demonstrated through not only our witnesses, but Apache's witnesses that it's not possible at this point to get back into that well. No one has identified a specific means that would provide any sort of reasonable assurance that you are able to get back into that well to reset those plugs.

Targa has already incurred in excess of $1 million and spent several months undertaking efforts trying to re-enter that well. No one can give them a guarantee that we would be able to get back into that well, and if we continue

to try, it's going to do further damage to that wellbore and surrounding areas and may make matters with that well worse rather than better.

Second, Mr. Pierce has demonstrated through his analysis that the wellbores in the area of concern are, first of all, completed above the depth of injection from the Monument Well, so there would not be communication between that zone and the six wells that were identified, that there is Woodford Shale 100 feet thick in the area that serves as a cap on the Devonian, which is the injection zone for the Monument Well, and that would serve as a check on the spread of contamination in that fashion.

The six wells are all cased and cemented to depth with good casing, good cement. It's not likely that even if material were able to migrate to those wells, that they would be able to get into those wells and migrate up. More importantly, Mr. Pierce demonstrated through actual well data, including Exhibit 3 and other data concerning the actual Monument Well itself, the nature of fracturing and the conditions in that well, and the expected radius of injection.

There have been a lot of questions raised about the radius of injection. Momentum and Apache spent a great deal of time positing different scenarios, throwing out different porosities, different thicknesses, but they didn't provide

any reasonable justification for their numbers. Mr. Nelson picked 50 feet as his number essentially at random. He provided no OCD standard, no petroleum engineering standard, no accepted industry standard, nothing as his basis for selecting 50 feet. He admitted he had not looked at well logs or other data as the basis for his selection of the 50-foot number; he simply selected that number.

Unlike the numbers proffered by Monument and Apache, Mr. Pierce has reviewed the actual logs, undertaken a foot-by-foot analysis of those logs, and based on that has determined the average porosity, the available zone for the injection, and has calculated the radius of injection which demonstrates that it is short of the location of the 285 Well, and that the likely direction of the injection is along a northeast to southwest orientation, which would be across grade from the 285 Well.

Even if you accept the assertion contained in Apache's and Monument's filing that there is a trend from the northwest to southeast, that indicates that injection of the Monument Well, which is located southeast of the 285 Well, would tend to flow away from the 285 Well, not to that well, again demonstrating that it would not enter the 285 Well below and result in a problem.

As we indicated at the outset, we requested specifically that the Graham State Well remain in place as a

saltwater injection well that can take the excess water so that the injection for the Monument Well would be limited to a total of 5000 barrels a day with a limitation of 3.38 NMCF per day on the gas that would be injected. That establishes an injection limitation that was not contained in the original order in this case, and would provide an added measure of safety at this point, given the fact that we are not able to get back into the 285 Well.

To be very clear, no acid gas would be injected into the Graham State Well. Significantly, no one has objected to the Graham State Well remaining in place, neither Apache nor Momentum nor the OCD raised any issue with that request in our application.

Also significantly, the Oil Conservation staff was served with the application, did not oppose Targa's application, and has not sought to oppose it during the course of this hearing or introduce any exhibits or documents opposing the application.

We would therefore ask the Commission enter an order modifying Order R-13052 as requested in our application.

MADAM CHAIR: Commissioners, would you like to go to executive session to deliberate this case today?

(Discussion off the record.)

MADAM CHAIR: Before we go into executive session, I ask that both parties provide our attorney with findings and

conclusions.

MR. BRUCE: When would you like them, within two weeks?

MADAM CHAIR: That would be good so that we would be able to sign the order at the next scheduled meeting.

MR. SCOTT: May I ask, do you want findings and conclusions and a proposed form of order, or just findings and conclusions?

MR. SMITH: Both, please.

MR. BRUCE: Are we dismissed, Madam Chair?

MADAM CHAIR: And we need to have a copy of the log for the court reporter.

MR. BRUCE: We will get that to the court reporter.

MADAM CHAIR: The Commission will go -- do I hear a motion to go into closed session in accordance with New Mexico Statute 10 15 1 and the OCC Resolution on Open Meetings Act?

COMMISSIONER DAWSON: I will motion.

MADAM CHAIR: Do I hear a second.

COMMISSIONER BALCH: Second.

MADAM CHAIR: All those in favor --

MADAM CHAIR, COMMISSIONER BALCH, COMMISSIONER DAWSON: Aye.

(Executive closed session was held, and the hearing was concluded as follows:)

MADAM CHAIR: So we are back on the record. Do I hear a motion from a Commissioner to come back on the record from executive session?

COMMISSIONER BALCH: I make that motion.

COMMISSIONER DAWSON: I will second.

MADAM CHAIR: All those in favor.

MADAM CHAIR, COMMISSIONER BALCH, COMMISSIONER DAWSON: Aye.

MADAM CHAIR: The only topics discussed had to do with this case. We have asked attorneys for both parties to submit findings and conclusions by the close of business October the 5th. We have found in favor of Targa on all points, and the order from the Commission will reflect that decision.

Is there any other business before the Commission?

(No response.)

MADAM CHAIR: Do I hear a motion to adjourn?

COMMISSIONER BALCH: I will motion to adjourn.

MADAM CHAIR: Is there a second?

COMMISSIONER DAWSON: I will second.

MADAM CHAIR: All those in favor.

MADAM CHAIR, COMMISSIONER BALCH, COMMISSIONER DAWSON: Aye.

MADAM CHAIR: Thank you very much.

(Concluded 3:32 p.m.)

REPORTER'S CERTIFICATE

I, IRENE DELGADO, New Mexico CCR 253, DO HEREBY CERTIFY THAT ON September 22, 2011, proceedings in the above-captioned case were taken before me and that I did report in stenographic shorthand the proceedings set forth herein, and the foregoing pages are a true and correct transcription to the best of my ability.

I FURTHER CERTIFY that I am neither employed by nor related to nor contracted with any of the parties or attorneys in this case and that I have no interest whatsoever in the final disposition of this case in any court.

WITNESS MY HAND this _____ day of September 2011.

Irene Delgado

Irene Delgado, CCR 253
Expires: 12-31-2011