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STATE OF NEW MEXICO

ENERGY, MINERALS, AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

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

CASE NO: 20964

APPLICATION OF OVERFLOW ENERGY LLC FOR APPROVAL OF A SALT WATER DISPOSAL WELL EDDY COUNTY, NEW MEXICO.

# REPORTER'S TRANSCRIPT OF PROCEEDINGS EXAMINER HEARING December 12, 2019 SANTA FE, NEW MEXICO

This matter came on for hearing before the New Mexico Oil Conservation Division, EXAMINERS LEONARD LOWE, DEAN McCLURE, DYLAN COSS and LEGAL EXAMINER ERIC AMES, on Thursday, December 12, 2019, at the New Mexico Energy, Minerals, and Natural Resources Department, Wendell Chino Building, 1220 South St. Francis Drive, Porter Hall, Room 102, Santa Fe, New Mexico.

Reported by:

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1 HEARING EXAMINER: Let's proceed to hear case 2 Number 20964, of Overflow Energy for a salt water disposal 3 well. 4 MS. SHAHEEN: Sharon Shaheen on behalf of the applicant, Overflow Energy LLC. 5 6 MS. BENNETT: Deana Bennett on behalf of NGL 7 Water Solutions Permian LLC and also on behalf of Marathon 8 Oil Permian LLC. 9 MS. SHAHEEN: I will just note for the record, we

10 actually received two other letters. One was from Calveney 11 Farms, and I think it was the Heidel, Samberson and Cox firm 12 in Lovington, but we haven't spoken with them, and we may 13 have some information about who they are, and I will have 14 one of our witnesses testify about that.

And the other one is somebody named Patsy Pates. She was on the notice list, and she sent a letter which I forwarded to OCD hearing that says I cannot approve or disapprove because I don't know what it is, is basically what she said.

20 I don't anticipate that she'll be appearing21 today.

22 MR. AMES: And there is no representative from 23 Calveney Farms to -- their legal counsel hasn't sent an 24 entry, and they are not here today.

25 MS. SHAHEEN: They sent a letter that could be

Page 5 construed as an entry of appearance, but I haven't heard 1 2 from them, and I don't think they are here today. HEARING EXAMINER COSS: They received notice of 3 4 this hearing, I assume that's why they sent the letter? 5 MS. SHAHEEN: Actually I think they may have 6 received notice through publication because they are not an 7 affected party. 8 HEARING EXAMINER COSS: Okay. We received those letters, too, but entry of appearances -- but we can proceed 9 10 with your witness. MS. SHAHEEN: I have three witnesses today. 11 12 HEARING EXAMINER COSS: Will they stand and be 13 sworn in? 14 (Oath administered.) 15 MS. SHAHEEN: My first witness is Lori Hearon. LORI HEARON 16 17 (Sworn, testified as follows:) DIRECT EXAMINATION 18 19 BY MS. SHAHEEN: 20 Ms. Hearon, would you please state your full name Q. 21 and your place of residence. 22 Α. Sure. It's Lori Hearon, and I live in Booker, 23 Texas. 24 How do you spell your first and last name? Q. 25 Α. It's Lori L-o-r-i, Hearon H-e-a-r-o-n.

Page 6 1 Q. By whom are you employed? 2 Α. Overflow Energy. 3 In what capacity? 0. 4 Α. I'm the vice president of Overflow Energy. 5 How long have you been employed by Overflow? Q. 6 Α. Just right at 15 years. 7 And what are your responsibilities at Overflow? Q. 8 Α. I work currently on the development side, so I'm over like land, which would be purchases, leases, work on 9 10 water contracts, oversee permitting, that sort of --11 Q. How long have you been employed by Overflow? 12 Α. Overflow, we were formed in 2007, but I have 13 worked for the president for 15 years. 14 How long have you been working in the oil and gas 0. 15 industry? For 15 years. 16 Α. And you are authorized to testify on behalf of 17 Q. 18 Overflow? 19 Α. Yes. 20 When was Overflow founded? You already told us Q. 21 that. 22 Yes, 2007. Α. 23 Q. What does Overflow do? 24 We operate salt water disposal wells. Α. 25 How long has the founder of Overflow been in the 0.

Page 7 oil and gas industry? 1 2 Α. He's been in oil and gas for 20 years. 3 How long has he been operating SWDs? 0. 4 Α. For about the same time, for 20 years. 5 How many salt water disposal facilities does Q. 6 Overflow operate? 7 We have 62 disposals. I would say 50 percent of Α. 8 those are in Texas, 50 percent are Oklahoma. We are a new 9 operator in New Mexico. We have one disposal that is 10 currently being completed. It's drilled and currently being completed in New Mexico now. 11 12 Q. In what areas do you operate in Oklahoma? 13 Α. We are in the Anadarko area out there. And in 14 Texas we operate in Permian and and Anadarko area. 15 Have you drilled this SWD in New Mexico? Q. Yes. Yes. Just recently. 16 Α. 17 And what's the status of that well? 0. We are currently, this coming week we will be 18 Α. completing that well. It was our first Devonian well. 19 20 What's the name of that well? Q. 21 Α. The Rose SWD. 22 Are you familiar with the application filed in ο. 23 this case? 24 Α. Yes. 25 Has Overflow determined there's a need for a salt 0.

Page 8 water disposal in the vicinity of this proposed well? 1 2 Α. Yes. 3 What operators will be using Overflow's services? 0. 4 Α. Our target operators in that area for this permit is Devon and Mewbourne and NOVO. 5 6 Now, you originally filed -- Overflow originally 0. 7 filed this as an administrative application; is that 8 correct? 9 Α. Yes. 10 And you received several -- or a couple of Q. 11 protests? 12 Α. Right. That's correct. So NGL and Marathon, and 13 then we have two other parties, which is the farm and an 14 individual, Patsy, I believe is the protesters. 15 That's Patty Pates? 0. 16 Α. Yes. 17 0. And then Calveney Farms, did you have an 18 opportunity to look into who they are and why they --19 Α. Yes. It looks like they did not need to be notified. They were surface owners, but they did not 20 have -- they are not mineral owners, and we do not lease our 21 land from them, so --22 23 0. Do you believe that Overflow's previous 24 experience in Oklahoma and Texas, including the Permian 25 Basin, enables you to drill and operate the well in

1 compliance with New Mexico regulations? 2 Α. Yes. 3 Do you have anything further you would like to 0. 4 tell the Division? 5 Well, we have received opportunity to work in New Α. 6 Mexico. We are a new operator, and we are looking forward 7 to operating safely and environmentally friendly, and we 8 just appreciate the opportunity. 9 MS. SHAHEEN: That's all the questions have I for 10 Ms. Hearon. Pass the witness. HEARING EXAMINER COSS: Do we have any 11 12 objections, or do we need to -- do you have any cross? 13 MS. BENNETT: So, Sharon, are there going to be 14 exhibits for their witnesses? Did you already hand out the 15 exhibits? MS. SHAHEEN: I'm sorry. I forgot all about the 16 17 exhibits. Thank you, Deana. To answer the question, though, there is no 18 exhibit for Ms. Hearon. 19 20 MS. BENNETT: You are not asking for her to be qualified as an expert? 21 22 MS. SHAHEEN: No. She is testifying as a fact 23 witness, not as an expert witness. 24 MS. BENNETT: Will there be someone else 25 testifying about any sort of backup in case a well goes out,

Page 10 in case the well goes out? Do we have an engineer? 1 2 MS. SHAHEEN: Yes, we do. We have an engineer, a geophysical engineer, and both a geophysical and petroleum 3 4 engineer. 5 MS. BENNETT: No questions, thank you. 6 EXAMINER McCLURE: I have no questions. 7 MR. AMES: I don't have any questions. HEARING EXAMINER COSS: You may call your next 8 9 witness. 10 MS. SHAHEEN: For my next witness I call Mr. Brian Wood. 11 12 BRIAN WOOD 13 (Sworn, testified as follows:) 14 DIRECT EXAMINATION 15 BY MS. SHAHEEN: 16 Q. Will you please state your name for the record? Brian Wood. 17 Α. 18 And your place of residence? Q. 19 Α. Santa Fe, New Mexico. 20 By whom are you employed and in what capacity? Q. I'm the president and founder of Permits West 21 Α. Incorporated. 22 23 0. Have you been retained by Overflow as a 24 regulatory consultant in this case? 25 Α. Yes.

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1	Q. Have you previously testified before the
2	Division?
3	A. Yes.
4	Q. And have your credentials been accepted and made
5	a matter of record?
6	A. Yes.
7	Q. Since we have a couple of new-ish people here,
8	would you nonetheless provide a brief summary of your
9	educational background and work experience?
10	A. I have a bachelor's from the University of
11	Virginia, a master's from University of Wyoming. I founded
12	Permits West in 1984. We have permitted wells in 11
13	different states.
14	Q. Are you familiar with the application filed in
15	this case?
16	A. Yes.
17	Q. Turning to Exhibit 1, the C-108 that was
18	originally filed. And for easy reference, we have Bates
19	numbered the pages in the C-108 at the bottom of the
20	left-hand corner. You will see that there's page number
21	documents referred to.
22	Mr. Wood, you worked on this C-108 which has been
23	marked Exhibit 1; is that correct?
24	A. Yes.
25	Q. What was your role with the C-108?

Page 12 1 I researched it and prepared it. Α. 2 Can you tell us what Overflow seeks by this Q. 3 application? 4 Α. Overflow is requesting approval to dispose of water into the Devonian at a depth from 12,900 feet to 5 6 14,000 feet. Injection operations through the well would be 7 conducted at an anticipated average daily injection pressure 8 of 2500 psi, with a maximum injection pressure of 2580 psi, or as permitted by the Division. 9 10 Overflow proposes to inject water in an average daily rate of approximately 20,000 barrels, and a maximum 11 12 daily rate of 25,000 barrels. 13 Do you have a pool code? Q. Yes. It's 96101, the SWD Devonian. 14 Α. 15 Turning to Page 4 of Exhibit 1 -- actually, to Q. 16 Page -- yes, to Page 4 of Exhibit 1, can you tell us where 17 the well will be located? Yes. In Section 27, Township 22 South, Range 27 18 Α. 19 East, Eddy County. 20 And does Page 11 reflect the proposed location of Q. 21 the salt water disposal well in the area? 22 Yes. It shows that east of US 285. Α. 23 And what is the footage location within the 0. 24 section? 25 Α. It's 1876 from North Line and 807 from the West

Page 13 1 Line. 2 And the C-102 at Page 12, does that accurately Q. 3 reflect the proposed location within the section? 4 Α. Yes. 5 Turning to Page 7, what are the productive zones Q. 6 in the area of the review above the Devonian? 7 The Delaware Bone Spring, Wolfcamp, Strawn, Atoka Α. 8 and Morrow. 9 Is there any oil or gas zone below the Devonian Q. 10 in the area of review? 11 Α. No. 12 Is this a new well? Q. 13 Α. Yes. 14 It's not an extension of an existing project; 0. 15 correct? 16 Correct. Α. 17 **Q**. Turn to Page 15. MS. SHAHEEN: I will note here that we have 18 attached to the back of the exhibit packet 11 by 17 copies 19 of several Bates numbers to make it a little bit easier to 20 view, and that would include Page 15. 21 22 Q. Mr. Wood, turning to Page 15, is this a map of 23 the existing wells within a two-mile radius of the proposed 24 well? 25 A. Yes, it is.

Page 14 How many existing wells are within a two-mile 1 0. 2 radius of the proposed salt water disposal well? 3 At the time the application was prepared in July, Α. there were approximately three dozen producing oil and gas 4 wells, and about 25 plugged and abandoned wells, and 5 6 according to state records, 132 water wells. 7 How many existing salt water disposal wells are Q. 8 within the two-mile radius? 9 There are two SWDs. There is the Pit SWD 1 that Α. 10 is approximately two miles to the southwest of the Rita Well. The Pit is approved to dispose of into the Bell 11 Canyon and Cherry Canyon. 12 13 And then the second well is the Rhoemer, 14 R-h-o-e-m-e-r, Rhoemer Number 1, that's about a mile and a 15 half northeast of the Rita Well. It's approved to dispose into the Delaware. 16 17 0. So neither of these wells dispose into the target interval here? 18 19 Α. That is correct. 20 What is the depth of the deepest well in the area Q. 21 of review? 22 12,290 feet. The total depth was in the Barnett Α. 23 Shale. 24 And that's reflected on Page 7 of Exhibit 1? Q. 25 Α. Yes.

Page 15 1 Turning to Page 16 of Exhibit 1. Q. 2 MS. SHEEHAN: And this again is another place 3 where you have a big map in the back, if you want to look at 4 a big map. 5 Q. Is this a map of the existing leases within a 6 one-mile radius of the proposed well? 7 What it shows is all the patents that were Α. Yes. issued within a one-mile radius. There are no government 8 9 leases within a one-mile radius. Over the decades since the 10 patents were issued, the mineral rights have been severed vertically and horizontally in many different directions. 11 12 And then turning to Page 18, does this map 0. 13 identify or show the leases within two miles of the proposed 14 injection well? 15 Α. Yes. It shows basically that the vast majority of the acreage is fee acreage. There is a little bit of 16 state acreage, all of which is more than a mile from the 17 well. There is also a very tiny fragment of BLM acreage, 18 which is also more than a mile from the well. 19 20 I think I've asked this question once before, but Q. 21 to make sure I don't forget anything, do any wells within 22 the area of review penetrate the Devonian? 23 Α. None. 24 Turning to water, what's the source of the water Q. 25 that will be injected into the Rita SWD?

Page 16 It will be what I call third-party water, in 1 Α. 2 other words, water from operators other than Overflow. 3 So it's produced water? 0. 4 Α. Correct. 5 Have you reviewed the water quality of the source Q. 6 water? 7 Yes. Α. 8 This is reflected in Page 8 of Exhibit 1, and Q. 9 also Pages 19 through 22, which is Exhibit 5 to the C-108, 10 what did you determine in your review of the water quality? It's salty, very salty water. Based on the data 11 Α. 12 from New Mexico Tech the total dissolved solids range from 13 10,500 to over 300,000 depending upon the samples. 14 Did you identify any compatibility issues with 0. 15 the Devonian water? No. 16 Α. 17 0. And you provided -- did you provide a chemical 18 analysis of the disposal zone formation water? 19 Α. Yes. That's shown in Paragraph 4 on Bates 20 Page 8. 21 And can you tell us the results of that? Q. 22 Yes. Just one moment. Α. 23 The Devonian total dissolved solids range from 24 16,223 to 64,582 parts per million. 25 Can you briefly describe the Devonian formation 0.

Page 17 in this area? 1 2 Α. It's basically composed of limestone and Dolomite. 3 4 Q. Are there any water wells within a one-mile radius of this surface hole? 5 6 Α. Yes. 7 And within a two-mile radius? Q. 8 Α. Yes, there are. 9 And that's also reflected on, I believe, Page 8 Q. of Exhibit 1, and also Pages 23 through 28, which is your 10 11 Exhibit G to the C-108, the state engineer's records. Where 12 is the closest possible underground source of drinking 13 water? 14 That would be the Quaternary Formation at the Α. 15 surface. The deepest water well within a two-mile radius is 300 feet. 16 17 0. And can you describe -- can you describe it in relation to the Devonian? 18 It's more than two miles above the Devonian. 19 Α. 20 Is there an underground source of drinking water Q. below the Devonian? 21 22 Α. No. 23 Did you obtain a chemical analysis of fresh water Q. 24 from any water well? 25 Yes. We sampled two fresh water wells within a Α.

Page 18 one-mile radius, total dissolved solids of 6,380 parts per 1 million or higher. 2 3 And that information can be found in Bates 0. 4 Numbers 29 through 34; is that correct? 5 Α. Right. 6 Mr. Wood, did you provide an affirmative 0. 7 statement regarding no evidence of open faults or any other 8 hydrologic connection between the disposal zone and any 9 underground source of the drinking water? 10 Α. My geologist Cory Walk provided that. 11 And what was the basis for that affirmative ο. 12 statement? 13 Α. He is -- basically the way the well is proposed to be drilled and completed, and more than anything else, 14 15 the Rustler Anhydrate, which is immediately below the Quaternary Formation. 16 17 Turning to notice and Page 54, did you provide 0. 18 the proof of notice that's found on Page 54 going forward? 19 Α. Yes. 20 In your experience, was there anything remarkable Q. 21 about providing notice as required in this instance? 22 Α. No. 23 Was Exhibit 1 prepared by you or at your 0. 24 direction? 25 Α. Yes.

Page 19 1 In your opinion, will granting Overflow's Q. 2 application promote the interest of conservation and result 3 in the prevention of waste and the protection of correlative 4 rights? 5 Α. Yes. 6 MS. SHAHEEN: With that, I have no more questions for this witness and I pass the witness. 7 8 MS. BENNETT: I forget, was Mr. Wood gualified as an expert? I don't object, but --9 10 EXAMINER McCLURE: He did. He previously --MS. BENNETT: Testified, okay. 11 12 MS. SHAHEEN: But I never tendered him or offered 13 him as an expert in this case, and I do so now. And if you 14 want, I can go all the way back through his testimony. 15 HEARING EXAMINER COSS: He is recognized. MS. SHAHEEN: Yeah, thank you. And I would also 16 offer Exhibit 1 into the record. 17 18 HEARING EXAMINER COSS: Exhibit 1 is so admitted. 19 MS. SHAHEEN: Thank you. 20 MS. BENNETT: Thank you. 21 (Exhibit 1 admitted.) 22 CROSS-EXAMINATION BY MS. BENNETT: 23 24 Q. A moment ago you mentioned that Mr. Walk prepared 25 the hydrologic connection affirmative statement that's

Page 20 required by the C-108. Is Mr. Walk going to testify today? 1 2 Α. No. 3 0. He's not here? 4 Α. No. We do have another expert witness that will address the topic, though. 5 6 0. Okay. So does Mr. -- I mean, looking at the 7 materials, it looks like Mr. Walk prepared the seismic risk 8 assessment. 9 That is correct. Α. 10 And did he prepare the fault slip probability Q. 11 analysis? 12 Α. Yes. 13 But he is -- is the other expert who is here Q. 14 today able to talk to his fault slip probability analysis? 15 Α. Yes. 16 When you were testifying earlier you mentioned Q. 17 that there were two salt water disposal wells within two miles. 18 19 Α. Correct. 20 And are those existing salt water disposal wells? Q. 21 Α. Yes. 22 When you did your analysis of the well within the Q. 23 2 mile, or 1.5 mile, or 1 mile radius, did you look for 24 proposed salt water disposal wells? 25 Α. What I looked for was anything that has been

Page 21 approved -- has an approved APD by the Division. 1 2 So no applications that are pending? Q. 3 Α. Correct. Again, unless an APD has been approved. 4 Q. But if an application was submitted before your 5 application, for example, you wouldn't know if an APD had 6 been approved, that wouldn't show up on your 7 Α. Correct. 8 On Page 7, and I'm using the Bates number pages Q. 9 at the bottom, this is easily fixable, I think, B-2 disposal 10 interval open hole from 132,900 feet? Α. 11 Yes. 12 I'm sure that's a typo? Q. 13 Yes. It should be 12,900. Α. 14 Okay. Will the other expert be able to talk 0. 15 about the affirmative statement about the hydrologic 16 connection? I would think so, yes. Yes. 17 Α. Okay. Those are the only questions I have for 18 Q. 19 you. Thank you. EXAMINER McCLURE: I don't have any questions for 20 21 this witness. HEARING EXAMINER COSS: Okay. And you might or 22 23 might not be the witness prepared to answer this question, 24 but I see that your first casing string to be set at 25 approximately -- where did I see that?

Page 22 1 THE WITNESS: 3655. HEARING EXAMINER COSS: 3655. And you believe 2 3 that the base protected the pool water. 4 THE WITNESS: Oh, yes, yeah. Yeah, it would more than protect the Quaternary. 5 HEARING EXAMINER COSS: And where is the Rustler 6 7 formation? 8 THE WITNESS: Rustler is -- basically it's going 9 to be probably in the top 2000 feet. Probably between the Salado and Delaware. 10 HEARING EXAMINER COSS: And have you been able to 11 determine in this area if there is any protectable water 12 13 within the Rustler or there's fresh water in the Rustler? 14 THE WITNESS: It appears not simply because the 15 deepest fresh water well within a two-mile radius is 300 feet, and the Salado is at 430, the Rustler would be below 16 that. 17 HEARING EXAMINER COSS: Okay. Well, that all 18 seems to check out, but I might potentially ask you for some 19 additional proof of all that. 20 21 THE WITNESS: Sure. 22 HEARING EXAMINER COSS: With that, I don't have 23 any further questions. 24 MS. SHAHEEN: You may be excused. My next 25 witness, please.

Page 23 1 MICHAEL FRAIM (Sworn, testified as follows:) 2 DIRECT EXAMINATION 3 4 BY MS. SHAHEEN: 5 Dr. Fraim, please state your full name and place Q. 6 of residence. Michael A. Fraim. I currently live at 151 Hop 7 Α. 8 Tree Trail, Corrales, New Mexico, 87048. And I also live in the Middle East in Dhahran, Saudi Arabia. 9 10 Would you spell your last name for the court Q. 11 reporter? 12 Α. F-r-a-i-m. 13 By whom are you employed? Q. 14 I'm employed by KFUM in Saudi Arabia, and also Α. 15 Main Fraim Innovation here in the State of New Mexico. 16 Q. In what capacity are you employed in those two 17 places? Associate professor at KFUM, and I'm part owner 18 Α. in Main Fraim Innovation here in New Mexico. 19 20 Have you been retained by Overflow as a petroleum Q. 21 engineer in this case? 22 Yes, ma'am. Α. 23 Have you previously testified before the 0. 24 Division? 25 Α. Yes, ma'am, and it was back in 1990 for Phillips

Page 24 Petroleum Company when we did the largest Entrada frac pack. 1 2 That was a problem we had no permeability into the salt water disposal well, and we had to get approval to do a --3 4 about a 1500 foot frac pack in that well to intersect natural fracturing that was off on the seismic, so we had to 5 6 qo frac over to it. 7 We also to had to get approval for the largest 8 radial frac for coal bed methane in the Fruitland Coal production in that area for Phillips Petroleum Company, and 9 10 those are the two major things that I testified before the 11 Commission. 12 And at that time were your credentials accepted 0. 13 and made a matter of record? 14 Well, I had to. I had to testify, so I assume Α. 15 so, and whether they are still in the record or not, I do not know. 16 17 0. Nevertheless, that was a little while ago? 18 Α. Yes. 19 Q. Could you tell us a little bit about your 20 experience since then? Yes, ma'am. I have three degrees from Texas A&M, 21 Α. all in petroleum engineering. I have a minor in math, a 22 23 minor in some geophysics and mining, and my major expertise 24 is hydraulic fracturing and stimulation, and EOR activities 25 that includes in situ combustion, steam, CO2, and various

Page 25

1 other polymer injection.

2 Now, with that I have, my work experience with 3 Phillips ends up being about ten years. That was from '89 4 to '90. Our major themes, projects for that was the collapse of the Ecofisc in North Sea where we were watching, 5 as is documented in the thing, it sunk 60 foot into the sea 6 7 floor. 8 And this was due by salt water or let's call it cold sea water injection causing desolution, and of course 9 10 it made the collapse as it went down, so we had to watch that. 11 12 Now, over in California, this pertains to the 13 case, we are looking at using microseismic, and there we 14 also use microseismic to inject the cone of collapse as it 15 went into the sea floor. Over in California we were looking at steam. 16 We were injecting steam in thermal operations and for things 17 above 2 -- 2500 feet, we had cases of steam breaching to the 18 surface. So at that point in time I was working for Arid 19 Energy, which is a part of a joint venture for all the 20 companies, Shell, Exxon, Phillips Petroleum, and Arco and 21 various other people at that time. 22 23 We were watching this because due to the 24 earthquakes that we were having there, faults would appear 25 after a .6 or .7, whatever they had over there at the time,

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and we had to watch that on microseismic in real time so we did not have a breach, and this will be impertinent for the slides coming up, on how to detect and when this fluid movement or fault slip would start to occur.

And the other things that we have seen when I worked for Phillips Petroleum is I have used to detect when fluids are going to come through a wellbore of some sort, and that would be with the noise log, and we'll talk about that soon, too.

10 And then in the Anadarko Basin, it seems now they 11 are using microseismic on the wellhead to detect when, let's 12 call it seismic events are happening near wellbore, and in 13 this case we are going to have to be away from the wellbore, 14 so I'm going to be recommending, if you want to detect that 15 event, a seismic array that we used over in California. So 16 with that, that's my experience level.

Q. Let's back up just a little bit. You have had a
number of years of experience in secondary and tertiary
recovery; is that right?

A. Yes, ma'am. And I also taught at King Fahd as well as Texas A&M in the Middle East on Capstone projects where enhanced oil recovery was the major subject area.

Q. I understand you also have a number of patents.
Can you describe some of the patents that are relevant to
your testimony today?

Page 27 1 Α. Yes. I have 70-something patents in the 2 literature. Some of them it is everything from how to use acoustic stimulation for -- in salt water disposal wells, or 3 4 actual water wells to enhance the permeability both absolute 5 and to cause near wellbore fatigue fracturing to keep it 6 stimulated as you are building up scale, you'll fracture it 7 and keep it flowing. 8 There is also microseismic to detect how to 9 correct a three-dimensional survey using cross wellbore 10 seismic to detect vertical fractures. In fact ABO analysis in this one, actually we did the first dataset for Area 11 12 Energy. We used cross wellbore seismic to detect the 13 vertical fractures in the steam in Bell Ridge. That's what 14 we used. And now they can do it with ABO analysis. 15 And turning to this, are you familiar with the 0. 16 application filed in this case? 17 Α. Yes, ma'am. MS. SHAHEEN: I would tender Dr. Fraim as an 18 expert witness in petroleum engineering and geophysical 19 engineering. 20 21 MS. BENNETT: No objection. 22 HEARING EXAMINER COSS: The witness is so 23 recognized. 24 BY MS. SHAHEEN: 25 If you will turn to Exhibit 3, Dr. Fraim, this is 0.

Page 28 the wellbore schematic. And if you would please describe 1 2 the casing program for this proposed well -- yes, 3 Exhibit 3. 4 Α. All right. What page is it on? It's right behind Tab 3. Unclip your -- unclip 5 Q. 6 your, and then there is a Tab 3. There you go. 7 Excellent. We will start out with 13 3/8 45 --Α. 8 48 pound J-55, we will put that down to 3655 in this 9 diagram. We'll cement to surface. This will protect our 10 fresh water resources here. And in case the Commission deems that we have 11 12 fresh water below this, which will be low probability of 13 that, we will extend it to whatever they deem to be that 14 surface, 900 foot or whatever. 15 HEARING EXAMINER COSS: I'm seeing now that you have written 3655, whereas before I was reading 365, which 16 makes a real big difference. 17 18 THE WITNESS: Oh, yes, ma'am. Yes, ma'am -- yes, 19 sir, sorry. And then we will follow this up by our 20 Α. intermediate, which will be 9.625, 47 pound, P-110, and we 21 will install that to 955 -- 9550 foot, and we'll cement to 22 surface on this. This should isolate all the deep gas zones 23 24 in the area and prevent gas from migrating up to the surface 25 casing at that point.

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Then as we go to, for our final production casing 1 2 before we do the open hole interval, we use 7.625 inches, 39 pound, P-110, and we'll cement only to 200 foot up into the 3 4 casing to seal it off. It should seal it off, but in case 5 the Commission wants us to cement to surface, that can also б happen. In case you have questions, you want to see nothing behind the surface casing -- I mean the production casing, 7 8 you want a full cement anulus, then that can also happen. 9 And then we will drill out open hole and do a 10 matrix acid stimulation in the Devonian to actually do our salt water disposal. 11 12 I want to turn back now to Exhibit 1 on Page 5, 0. 13 and if you could tell the Examiners about the tubing. 14 All right. Our tubing will be 5.5 inches, 25 Α. 15 pound L-80. The setting depth will be 2 -- 12850 foot, and our packer will be at 1 -- that will be the same. 16 Our 17 stainless steel packer will also be at 12850 foot, also. So both the -- it looks like we have no tail 18 piece in the tubing off the packer. So it will be 19 essentially whatever the packer is, plus the probably one 20 and a half foot will be our tail piece. We will probably 21 have an X nipple in there. 22 23 0. Backing up to the casing, one more question, was 24 the available data sufficient to permit you to determine the 25 casing depths and to accurately calculate the cement tops

Page 30 1 and bottoms? 2 Yes, ma'am. We have used the offset well, Α. 3 Rosa -- Rose Number 1. 4 Q. Was there any evidence of a potential for casing 5 leaks? 6 Α. No, ma'am. 7 Will the wellhead be put through the back Q. 8 pressure valve? 9 Yes, we will put a check valve in. Α. 10 Q. And what is the proposed average and maximum 11 daily rate of volume to be injected? 12 Α. 20,000 barrels per day average with a peak 13 rate of -- 20,000 barrels per day average, with a peak rate 14 of 25,000 barrels a day, with less than the .65 psi per foot 15 injection gradient at the top perf, or 2580 at the surface. 16 Q. And the maximum pressure would be? 17 Α. 2580. 18 Okay. And how will the water be delivered to the Q. 19 well? Most probably it will be by pipeline, but there 20 Α. is the case of taking some truck traffic on 285. 21 22 Q. Do you foresee any need to request a higher 23 injection pressure from the Division in the future? 24 Α. No, ma'am. This should be a declining -- after 25 peak, there should be a decline in the rates of the

production wells around the area. 1 2 Dr. Fraim, can you tell us about the Devonian Q. 3 formation porosity and permeability? Yes, ma'am. Based on offset logs that came from 4 Α. 5 the Rose SWD Number 1, we have an average of 5 percent, but 6 it does range up to 10 percent for thin streaks, and it 7 actually goes down to 2 percent for some bigger streaks 8 inside the heterogenous Devonian. 9 What is the upper confining unit? Q. 10 Α. We are going to assume that to be the Barnett Shale, ma'am. 11 And the lower? 12 Q. 13 Α. We actually didn't drill down to that, but I'm going to assume that's a low porosity zone in the Devonian. 14 15 And are you satisfied that the injection fluids ο. 16 will remain contained within the disposal interval? 17 Α. Yes, ma'am. 18 How will the applicant obtain test data for 0. 19 logging? We'll use the neutron density and resistivity, 20 Α. and that's how we'll pull our porosity, and the resistivity 21 22 will be looking for hydrocarbons if present. 23 Now, I understand, Dr. Fraim, that you conducted Q. 24 a seismic risk analysis; is that correct? 25 Yes, ma'am. Α.

Page 32 And you had reviewed Mr. Book's --1 Q. 2 MS. SHAHEEN: Is it Book? MS. BENNETT: 3 Walk. 4 0. Mr. Walk's previous assessment; is that right? 5 Α. Yes, ma'am. 6 As a result you determined that he -- his data 0. 7 was older than what was available to you; is that correct? Yes, ma'am. 8 Α. 9 And he perhaps used a different software than Q. 10 what was available to you; is that right? 11 Α. Yes, ma'am. 12 Q. And --He used the G-I-S -- well, let me see. He used 13 Α. the USGS public dataset for the known faults in the area, 14 and then we had 3D seismic that's not available in the 15 16 public, and then Marathon had a much bigger dataset that 17 they shared a screenshot with us. 18 And you used that data in a different software 0. program to do your analysis? 19 20 Α. Yes, ma'am. 21 And now we come to our main event, which is our Q. PowerPoint presentation, and it might take a minute. It 22 23 looks like my computer may have gone to sleep. 24 This PowerPoint represents your seismic review; 25 is that right?

1 Α. Yes, ma'am. 2 MS. SHAHEEN: And feel free to ask any questions 3 that you have as he goes through. I could ask him 4 questions, but I think it will flow more smoothly if he takes us through his PowerPoint, but you are welcome to ask 5 6 any questions at any time. 7 HEARING EXAMINER COSS: It just mimics Exhibit 4? 8 MS. SHAHEEN: It mimics Exhibit 4. There have been a few changes, and we will provide those changes to 9 10 Kathleen, but for the most part Exhibit 4 in your hard copy is what you will see here. 11 12 HEARING EXAMINER COSS: And this will be 13 submitted? MS. SHAHEEN: This will be submitted. 14 MR. AMES: Ms. Shaheen, to clarify, you will 15 submit a corrected exhibit to both OCD and to counsel? 16 17 MS. SHAHEEN: Yes. 18 MR. AMES: Thank you. THE WITNESS: It didn't change the numbers, we 19 just made it more pleasing to the eye. 20 Α. All right. Seismic review of Rita SWD Number 1, 21 location 27, 22 South, 27 East. This is in your exhibit. 22 It's Exhibit 1-038. 23 24 What is of concern here is we have a seismic 25 event of 3.9 on the Richter scale very close to our well,

and we also have some events that are away from the well 1 2 that we know that are existing in the State of New Mexico. 3 So we do see something is happening over here, 4 and we don't want it to happen over here, so hence we did 5 our review. 6 Now, in order to get that 3.5 event, things have to have a fault that goes, and what we were looking for is a 7 8 fault that goes to basement. We have to have a large fault, 9 more than a mile long, and it has to have enough energy to make it a 3.9 event here that occurred in 1974 on 11-28. 10 So in doing that, we had to combine the data of 11 12 the Marathon dataset as well as ours. Ours was only a 13 simple dataset that was in this area right here, which 14 represents this section, but Marathon's data goes much 15 bigger. So they allowed us to use their screenshot and go ahead and track the fault all the way out. 16 So this direction, ours was a little bit more 17 like this, and we moved it a couple of days ago after 18 conference with Marathon's data. So now we have the fault 19 of concern that goes to the basement, and it generally is 20 located along this blue line. 21 22 Now, we are looking for near vertical faults that 23 goes into the basement. This is what's going to generate 24 your activity of your seismic of over 2.5 on the Richter 25 scale.

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Here is the fault. This is our fault pick, and it is near vertical in the Devonian. And you can see it kind of spins off this way. It becomes non-vertical as you get above the Barnett Shale. This means it has enough vertical stress to keep it close to .65 and keep movement from happening.

And in the vertical area, you only have the ratio to keep the vertical stress of the slip. So this will have a lower stress state, and we'll go in through the program that we used to calculate that, but this is going to have less than .65 to make some fault --

12 And other local faults that are not shown, but 13 you can actually see some of the stuff here in the, in the 14 3D seismic, they are all tilted, at least at this angle 15 here, so that means they are going to be over .65 in what's 16 going to make them slip.

17 HEARING EXAMINER COSS: Could, if we are asking 18 questions now, could you describe how that geometry would be 19 created, normal thrusting -- I'm just not used to a fault 20 kind of that way.

THE WITNESS: This is a reverse fault, or at least what they deem as being a reverse fault. Now, it could be -- I have not done a detailed seis -- looked at the detailed seismic of Marathon, but it's labeled as -currently labeled as a reverse fault. So it's vertical.

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Page 36 We know that, you can see the slip as it's going 1 2 through here, so we know, we know that there's something that has happened. And that's -- and it's near vertical, 3 4 so that's the one we are going to concentrate on. 5 HEARING EXAMINER COSS: Okay. 6 THE WITNESS: We know there has to be one in here 7 because we have a 3.9 event that happened in 1974, so we 8 have to look for something that's vertical, hits, intersects 9 the basement so you can have large enough land mass to move 10 so that it moves and makes that amplitude. HEARING EXAMINER COSS: And the geometry where it 11 curves to the right, that's described through overburden 12 13 stress or --14 THE WITNESS: No. That's because this happened -- this was in place while this was being laid 15 down, so it moves that way because these were -- these 16 17 sediments were put in later. 18 HEARING EXAMINER COSS: What's the scale on this image? 19 THE WITNESS: Well, this will be approximately, 20 between near surface, so it's probably around 6- or 700 feet 21 because all this other stuff up above would be -- you would 22 23 have the cones here, so they cut that out. 24 And I suspect this is around 16- to 18,000 feet 25 at the bottom, but right here is in the 14,000 foot, and
Page 37 1 that little yellow line is the Barnett Shale. 2 HEARING EXAMINER COSS: How far across would that 3 be? 4 THE WITNESS: This right here, this is 3800 feet, so 3800 foot, and then this is about another 3800 foot, so a 5 total of 7600 foot from the point to out here. 6 HEARING EXAMINER COSS: About a mile and a half? 7 8 THE WITNESS: About a mile and a half. HEARING EXAMINER COSS: Okay, thanks. 9 All right. All right. We are going to use the 10 Α. software from Stanford's fault slip analysis for Rita SWD 1. 11 12 I will go through technical details. 13 We used vertical stress gradient of 1.05, maximum 14 horizontal stress of .86, minimum is .62. Maximum horizontal stress direction is 155. Initial reservoir 15 pressure gradient .43. 3700 feet is the top of our perf 16 17 based upon the offset Rosa SWD Number 1. BY MS. SHAHEEN: 18 19 ο. I'm going to interrupt real quick. Did you say 20 3700 or 13,700? 13,700. Sorry about that, ma'am. 21 Α. Our aquifer thickness is approximately 200 feet, 22 5 percent porosity, 35 millidarcies for permeability. This 23 24 comes from offset data, but the porosity actually comes from 25 the Rita -- or Rose Number SWD 1.

HEARING EXAMINER COSS: 200 feet isn't the whole 1 2 thickness of the Devonian. It's how much --THE WITNESS: No. It's the one that we're 3 4 concerned that has enough porosity and permeability to shift water over. No, there's more of it, but it's not -- it's 5 6 not going to contribute to what's happening. 7 All right. For this geomechanics we are going to 8 assume a straight line because it just helps with the computing. It doesn't change the answer because we are 9 10 mostly interested in the Mohr circle which, which is this yellow dot. That's the tangent. And where zero zero is is 11 12 where the well is, and that's going to be shortest distance 13 between the well and the fault, so that's where you want --14 that's where the slip will start.

So when we say slip, we are looking at seismic events at .05 to 1, so that's what our calculations are going to be looking for. If you want something greater, then have you to start looking at what's going to happen over a mile. Because you've got to get the fault separated enough over a mile if you want to start looking at something that happens in the 2.5 and plus range.

All right. Here is our yellow dot, and here's the yellow dot that's not in full compression, it's not in full tension, so we have a combination. As our pressure increases you will notice that the red line will start to

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approach the tangent point on the Mohr circle, and that's your failure envelope. Or something -- not failure of the fault, we are not cracking the rock, the rock is already cracked, all we are trying to do is say, when are you going to make a jump.

6 Here is our geomechanics probability. We have to 7 use probability here because first thing we haven't -- we 8 didn't drill up right over there on the fracture itself and 9 take the data, we have to use best engineering 10 approximations.

So what we did, we did a Monte Carlo simulation. 11 12 Some of the values of less than 2 percent, our maximum, our 13 graph is minus 4 to plus 4. Friction coefficient, SHmax 14 Azimuth, dip of the fault, strike of the fault, pressure 15 gradient that represents what we physically do in the reservoir, SHmax gradient, SHmin gradient, and vertical 16 17 stress gradient. We kind of know this one really good, we know what this one is going to be, and the rest we have to 18 get best available data. 19

20 BY MS. SHAHEEN:

Q. For the record, let's clarify. You say, "We know what this one is, and we kind of know what this one is," what are you referring to when you say this --

A. Vertical stress gradient, we know from a densitylog, how much it's going to weigh because we have an offset.

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1 The shears, and the -- most of these numbers are going to 2 come from your seismic, so your shear Azimuth, the dip, the 3 strike, SHmax gradient, and these will come -- we are going 4 to do best engineering estimates from the seismic data.

5 After you put these in, you are going to allow 6 the Monte Carlo to take a bunch of answers and do all the 7 combinations, and you will now give yourself a probability 8 curve of -- from -- and we choose points of P10, 10 percent 9 of the results will fail at 943 psi pressure over gradient.

10 So the gradient is .47. So we are now looking at 11 900 psi. So if you add that to it, it fails at .54 psi per 12 foot. So it will allow an event, which we are going to call 13 0.5 on the Richter scale, you will have a mess -- you can 14 have a probability of the detectable event of a fault slip 15 at .54 psi per foot. The P50 is .55 per foot, and P90 is 16 .56 per foot.

Q. To clarify, so the P10 represents 10 percent of
the cases that are original -- the variables you used in the
Monte Carlo analysis?

20 A. Yes, ma'am.

Q. And then the P50 is 50 percent of those cases -A. Will fail.

23 Q. Okay.

A. And then 90 percent of the cases will fail at 1340. This is your tornado diagram that shows you the --

which is what we just plotted here, which is this curve 1 2 right here is now laid out. There is the start of it, and there's the end of it, and you can see that it's right here, 3 4 and the 943 psi sits about right here. 5 All right. Here is our -- now we've got fault 6 slip analysis for Rita, and now we are going to look at the 7 hydrology. This is the water going into the 200 foot 8 intervals that we consider porous and impermeable, not the low porosity portion of it. 9 10 At five years we are at 400 psi at the minimum distance of the fault between the wellbore and the fault 11 12 face. So that means our Mohr circle, we've now pushed the 13 line down by 400 psi and we're approaching the township 14 point right here. 15 And if you look at the radial flow equation, we start at somewhere around 800 psi here, and it declines out 16 by 10 kilometers, it's at almost zero. So all we are doing 17 is pushing the pressure wave out. Here is the two 18 dimensional color graph demonstrating that. 19 So again, P10 is 943, and that means we have, if 20 it's at 800 -- well, actually, we are not at 800 pounds, we 21 are approximately 200 pounds out there right where the 22

fracture face is. 23

24 Now let's go to 25 years, which is what we are 25 mostly concerned with. We are at maximum rate, 25,000

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1 barrels a day, which is not -- we have to do this as the 2 most pessimistic case for the state.

3 Here is our wellbore. Again now we are up at 4 approximately 1100 and about 50 psi here near the wellbore, and we are declining out, and we are at 800 at the fracture 5 6 face, and of course as you go away going either to the southwest or northeast, you are going to be less than 800 7 psi for water gradient at the fracture. Again it's 943, 8 9 1137, or the P90 is 1340. So we are still safe at 25 years 10 at max rate.

Now, we know that we're not living life in a vacuum. We have SWD Number -- Patriot SWD Number 8 at 3.8 miles. It's been approved for 25,000 barrels a day. Rose Number 1, these guys, 4.2 miles away; Top Gun Federal SWD 1, 4.5 miles away at 20,000. These are drilled, so we are going to say they are real and they're going to be injecting at max rate.

Cumulative effect at 25 years is approximately 18 So that's their radial -- we assumed radial flow, 19 158 psi. and that's what it's going to be at the wellbore. We are 20 going to see that additional at that fracture face point. 21 22 So let's go ahead and look at those results. And 23 that gives us a safety margin of 179 at the P50 case. 24 Here is our case right here. That's nothing 25 happening, but as you can see, here is pressure versus time

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Page 43 and years where you see that we are growing and we hit 800, 1 but we know that there is three other wells that have been 2 3 drilled, that puts us another 150 psi above. 4 Well, that puts us at 950 psi. So for 10 percent of cases you probably are going to see a .05 event if you 5 have a microseismic array out there near this location. 6 Your P50 case will be 11 -- your safe at the P50, and also 7 8 you're safe at the P90. So this would be our assessment of fault slip analysis for Rita SWD 1. 9 10 And with that, I will return that back to counsel. Now, here's -- I think we need to go ahead and say 11 12 this, too. For a probability of the 2.5 Richter scale 13 event, we are still less than 2 to 3 percent because you 14 have to have a mile of this stuff above 943 for this event 15 to happen. And I think these are the Richter scale, or at 16 least that's what the USGS is the concerned with is events 17 that are over 2.5. And with that we are less than 2 to 3 18 percent probability that that will happen at the end of the 19 25-year period. 20 Nothing is ever zero, but that's what -- with 21 that, I will hand it back over to the counselor. 22 23 0. Under the circumstances you have described here, 24 the fault slip analysis, what do you recommend in light of 25 your conclusion?

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A. All right. For, if we are back in California and we want to drive this to zero event possibility for 2.5 Richter scale event, then we would start watching it with a microseismic array starting somewhere in about five years from now.

6 So it would have to be put in, and what I mean by 7 array, that's a fiber optic array. Texas currently has several of them. They even have one in New Mexico, by the 8 way, they actually have an array and they are actually 9 10 watching this throughout the state of Texas so they can detail not only our -- this, these events, are done by the 11 12 array of USGS. In other words, it just points, and they are 13 going to say, "Hey, close to this surface location, this is 14 what happened."

Texas is getting down to the point I want to know not only did it happen near the surface, but I want to know the depth because I want to know, if I'm injecting in this zone and here's the depth, is it a fault that's moving and causing this seismic event. Is it a slip fault? Is it a vertical fault? What's happening there?

21 So with that, I -- also for California, this is 22 not enough resolution. When you have to have -- know if 23 steam is starting to move up, we need to know where is that 24 fault, what earthquake event caused it, and where is the 25 nearest injection well, we need to actually either decrease

Page 45 the steam injection or actually shut it in for a while and 1 2 make sure those events don't show up anymore. 3 Did I answer your question, counselor? 4 0. I think so, but I have a follow-up question. So you have had experience in California doing this type of 5 6 monitoring with respect to steam injection; is that right? 7 We use the same array also to track how we put in Α. our hydraulic fracs because we are only 16 foot apart, we 8 have a 1000-foot intervals, so we need to put a production 9 10 frac in because the stuff only moves an inch or inch and a half per year. So we only put 16 foot between the 11 12 fractures, so we actually have to track the fractures, 13 hydraulic fractures we put in, and for production and steam 14 injection, plus what's happening towards the surface. So we 15 have to make sure they don't propagate due to the earthquake jerking the ground and putting a new fracture that didn't 16 exist back to surface. 17 18 If you were to put in a microseismic array in Q. 19 this area, where would you locate it? For -- since now we know there are events, and 20 Α. also we do have this fracture by Marathon right here, I 21 would either put it -- the Commission can choose by their 22 23 geologist where they would like to put it, but you should be 24 able -- whether you put it in this section right here on 25 this well or even go over here, you've be able to have high

1 enough resolution to look at it for probably two to three 2 miles.

But if you spread your array out a little bit more, then you can even go to a four-mile radius and get -because we are looking at stuff at 12,000 feet and below, so your resolution is going to degrade from what you pick up on the surface as you go down. So I just recommend you put your cross out there in the mile, whoever's got some BLM land, just plow it in.

10 And the data that you would get from from this ο. 11 array, would it be limited to injecting in the Rita Well? 12 Α. No, everybody. Whether it's this fault, or these 13 faults in this area right here, if you make it big enough, you can actually start detecting what's over here, too, if 14 15 you desire to do that. I mean, this is what the Commission needs to know because it's happening. 16

Q. Is it your understanding that Overflow is willing
to implement a monitoring program like this?

A. Yes, ma'am. It will be tied into the USGS
technical program just like in Texas. This idea for you
to look at this.

22 Q. It could be --

25

A. Tied in, yes, for the public data for theCommission to use at their discretion.

Q. Or in the alternative, it might be proprietary

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Page 47 data, but the Division would be -- would have access to that 1 2 data; correct? 3 Α. That's correct. 4 Q. In your opinion, in light of your testimony 5 today, can this project be operated so that the injection 6 fluids will remain contained within the injection formation? Yes, ma'am. 7 Α. 8 In your opinion, can this project be operated so Q. 9 that public health and safety and the environment will be 10 protected? Yes, ma'am. 11 Α. 12 Were Exhibits 3 and 4 prepared by you or at your 0. direction? 13 14 Yes, ma'am. Α. 15 And in your opinion, will granting Overflow's Q. 16 application promote the interest of conservation, result in 17 the prevention of waste and protect correlative rights? Yes, ma'am. 18 Α. 19 MS. SHAHEEN: I don't believe I have any other questions right now, although I anticipate I will have some 20 redirect after Ms. Bennett. 21 22 HEARING EXAMINER COSS: I will give you the 23 opportunity to redirect after Ms. Bennett had a chance to 24 question. Ms. Bennett? 25 MS. BENNETT: I don't have any objection to the

admission of 3 or Exhibit 4 subject to a few questions I
 have, but I want to make sure Exhibit 4 doesn't include the
 fold-out pages.

MS. SHAHEEN: No, they are the demonstratives for
5 Exhibit 1.

6 MS. BENNETT: That's what I thought. So with that caveat, I don't object to the admission of 3 and 4. 7 8 But having heard Mr. Fraim's testimony and Ms. Shaheen's 9 explanation about why Mr. Walker -- I'm sorry -- Mr. Walk's 10 study may not be as relevant as earlier anticipated, I do have an objection to the admission of Mr. Walk's geologic 11 12 study, as well as his fault slip probability analysis, and that's for two reasons. 13

One, as Ms. Shaheen stated, he relied on old data, and Mr. Fraim has further revised updated data that he's relying on, so that tends to make Mr. Walk's studies, I think, unreliable at this point, or at least superceded by --

19 THE WITNESS: It's superceded.

20 MS. BENNETT: So I would say that should be 21 removed. And additionally, Mr. Walk isn't here for me to 22 cross-examine, and so there is no way I can actually verify 23 the veracity of his statement in either his geologic 24 assessment or his fault slip probability analysis. 25 MS. SHAHEEN: To clarify for the record, I

Page 49 believe Ms. Bennett is referring to Pages 35 through 43 of 1 Exhibit 1. 2 And if I could have just a few seconds to confer 3 4 with my client, I can respond to Ms. Bennett's objection to 5 that. 6 HEARING EXAMINER COSS: I don't have any problem 7 with that. 8 (Conferring.) 9 MS. SHAHEEN: Overflow has no objection to 10 removing Pages 35 through 43 from the record in Exhibit 1, and we can make that change in our submission to the 11 12 Division with the PDF of the exhibits. 13 HEARING EXAMINER COSS: Okay. Well, the Division 14 will sustain the objection, and Pages 35 through 43 will be 15 removed from the exhibits. MR. AMES: They will remain in the exhibits, but 16 17 the objection is sustained. 18 MS. SHAHEEN: So does that mean you don't want me to take them out of the electronic? 19 20 MR. AMES: They are in the record already. 21 MS. BENNETT: With that clarification, then I would like to point out there is no statement about the 22 23 hydrologic connection as required by the C-108 in Item 12, 24 so I would ask that, to the extent this case is taken under 25 advisement today, that it be done.

Page 50 So with the caveat that Mr. Fraim submit a signed 1 2 affirmative statement about the hydrologic connection or 3 lack thereof as required by the Paragraph 12 of the C-108. 4 MR. AMES: So are you doing cross? MS. BENNETT: I'm asking for some affirmative 5 6 relief, not cross, because there is no hydrologic statement now for me to do cross on. 7 I'm --8 MR. AMES: You can ask if there is anything. 9 MS. BENNETT: I can ask him if there is, but the 10 C-108 actually requires an affirmative statement, and typically that has been required by Mr. Goetze to be a 11 12 written statement. If you're allowing a verbal statement, 13 I'm happy to ask him that. 14 MR. AMES: I understand what you are asking, Ms. Bennett, but this is the time for cross. You will be given 15 an opportunity to make a statement. 16 17 MS. BENNETT: Thank you. 18 MR. AMES: Now is not the time, though. 19 CROSS-EXAMINATION 20 BY MS. BENNETT: 21 Q. Mr. Fraim, thanks for being here today. 22 Α. Thank you, ma'am. 23 That was a really in-depth presentation. I 0. 24 appreciate it, and some of my questions are going to be very 25 fundamental, so I apologize in advance. And I also

Page 51 apologize if I don't use the exact right terminology, and I 1 2 hope that you will be patient with me as we kind of --Yes, I understand. 3 Α. -- speak the language. 4 ο. 5 Α. You are a lawyer, and you probably got this 6 question from an engineer, so fire away. 7 We are already playing telephone. I wanted to Q. 8 ask you a question about Exhibit 3, which is the wellbore 9 schematic. 10 Α. Yes, ma'am. 11 What is the, for my own edification, what is IPC 0. tubing? What does IPC stand for in the 5.5 IPC tubing at 12 13 12850, in the middle of the wellbore diagram? Here. Personally I would just, I would go with the L80 14 Α. designation that's in the, the written portion of this. 15 16 That's just a slang term. I would just --17 Q. That you use? Α. 18 Yes. 19 I was trying to figure that out, too, because Q. 20 when I look at Page -- I think it was Page 6 that you were 21 reading from --22 Yes, that's the one that we would --Α. 23 It also says IPC tubing, though, so that first Q. 24 one you said L80, that's what, for the record --25 Internally coated is what it stands, internally Α.

Page 52 polymer coated tubing so you do not have corrosion. 1 But 2 that's just the coating on the tubing. Is that correct, you 3 are doing internally coated. 4 So -- but what the -- what will keep our fluids contained will be the L80 strength of it, but the coating is 5 6 designed to prevent corrosion. 7 Okay. Thank you for that clarification. Q. 8 Α. All right. 9 Now, let's see. During one of the questions I Q. 10 think you were asked how water was going to be getting 11 delivered to the site for the well to be injected. 12 Α. Yes, ma'am. 13 And you mentioned it could be either piped or by Q. 14 truck? 15 Α. Yes, ma'am. 16 Do you have any knowledge about any contracts Q. 17 that Overflow has with operators to get water either by pipe 18 or by truck? 19 Α. Previous testimony. She has pointed out the -the she is --20 21 THE WITNESS: Am I allowed to say that? MS. SHAHEEN: Yeah. This is actually outside the 22 23 scope of Dr. Fraim's testimony and it would be a question 24 that would be better for Ms. Hearon. 25 MS. BENNETT: If it's possible, I would like to

Page 53 recall Ms. Hearon. No, not yet, sorry 1 2 THE WITNESS: She is sitting right there. I see 3 Ms. Hearon. MS. BENNETT: When we are done with Mr. Fraim's 4 questioning, if that's a possibility. 5 6 MR. AMES: If I understand correctly, Ms. Hearon 7 has already been excused. If Ms. Shaheen would agree to 8 recall her, then that might be appropriate. 9 MS. BENNETT: I will say that Mr. Fraim did 10 testify that he understood water was going to be brought in either being piped or in the truck, so I don't think this is 11 12 actually outside the scope of his testimony. It might be 13 outside the scope of his knowledge. 14 THE WITNESS: The percentage --15 MR. AMES: Hold on. MS. BENNETT: It might be something you don't 16 17 know, and it's fine if you don't know, but I thought it was tied to his testimony. 18 19 MS. SHAHEEN: The contract --MR. AMES: Ms. Shaheen, Direct everything to the 20 21 Examiner. 22 MS. SHAHEEN: Ms. Bennett referencing the contract is what would be outside the scope of Dr. Fraim's 23 24 testimony. So to the extent she has any questions about 25 contracts, that would have to be directed to Ms. Hearon.

Page 54 MR. AMES: Ms. Bennett, do you want to reframe 1 2 your question for this witness? MS. BENNETT: No. 3 MR. AMES: You do not. 4 5 MS. BENNETT: I would ask to be allowed to recall 6 Ms. Hearon. 7 MR. AMES: She is not your witness, Ms. Bennett. 8 I don't know how you recall her. 9 MS. BENNETT: I'm asking Ms. Shaheen for the 10 opportunity to recall her witness. MS. SHAHEEN: We have no objection for the 11 12 limited purpose of asking her about any existing contracts. 13 MR. AMES: Ms. Bennett, does that satisfy you? 14 MS. BENNETT: Absolutely. 15 MR. AMES: Then can you reframe your question to, to conform to the scope of the direct testimony for Dr. 16 Fraim? 17 18 MS. BENNETT: I'm happy to try to, I'm not sure that you know the answer. I'm not trying to be 19 argumentative here. If you don't know, I guess my question 20 really is directed at Ms. Hearon, so I don't know there is 21 any point of me reframing it for him. 22 23 MR. AMES: So you withdraw the question? 24 MS. BENNETT: I withdraw the question. 25 MR. AMES: Thank you.

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1	BY MS. BENNETT:
2	Q. Earlier today I asked who the witness might be
3	that would be able to answer a question about a backup
4	system if the well were to go down, and I think the
5	indication was that that would be you. Is that something
6	that you are able to talk about?
7	A. All right. Can you state what "going down"
8	means?
9	Q. If the well if there were to be a collapse of
10	the well, if the well cannot take water for any reason.
11	A. They have another well drilled.
12	Q. And what's the backup? How would water from the
13	Rita Well get to the Rose well?
14	A. Most likely a pipeline.
15	Q. Is there a pipeline in place for that?
16	A. That's a yea or nay question?
17	Q. I will withdraw the question.
18	MR. AMES: Good.
19	MS. SHAHEEN: If you don't know, you can say you
20	don't know.
21	A. I don't know, but how solve that problem is you
22	tie both wells together with a pipeline. If one goes down,
23	that's how the other takes over. That's how we did it in
24	the Permian Basin.
25	Q. You don't know if that's being planned

Page 56 That's outside of my scope of -- I'm not in 1 Α. 2 charge of surface facilities. If I'm doing it, and I have two wells, I tie them. 3 4 0. Okay. So are you familiar with the Carlsbad 5 Brine Well? I've heard of this problem, and based on my 6 Α. experience with brine wells I did for Phillips Petroleum, in 7 8 the Houston, Texas area, Texas City, where we used it for L & G storage, yes, this would be most likely a problem. 9 10 How far away from the Carlsbad Brine Well is the Q. 11 proposed Rita Well? 12 THE WITNESS: 2.8, isn't it? 13 UNIDENTIFIED SPEAKER: 2.6. 14 MR. AMES: Doctor, you need to answer the question that's asked. You can't consult from the audience. 15 MS. SHAHEEN: If you don't know, you can say you 16 don't know. 17 I don't know, but if we sit here on the map, we 18 Α. 19 can measure it out. MS. BENNETT: I apologize. I really thought 20 these questions were appropriately directed at Mr. Fraim. 21 I'm not trying to ask questions that I didn't think he could 22 23 answer, so I apologize that maybe I should have asked these 24 of Mr. Wood. 25 It's certainly not my intention to ask questions

Page 57 of witnesses who don't have the information, and so I'm 1 2 feeling a little bit at a loss about who best to ask these 3 questions to. 4 BY MS. BENNETT: 5 Q. So I'm going to keep going, and if you don't 6 know, it's fine to say you don't know. 7 I did not measure that myself. Α. 8 MS. SHAHEEN: Can I clarify something for the record, and I don't know that it matters, but I understand 9 that Ms. Bennett is here on behalf of Marathon and on behalf 10 of NGL, and I don't know that it matters that we need to 11 12 know for which of her clients she is asking questions. I'm 13 curious. I don't know if the Division believes it's 14 important for the record, but I just wanted to make a 15 comment on that and --MR. AMES: Comment noted. Please continue. 16 17 BY MS. BENNETT: 18 Do you know how far away the fault of concern is Q. 19 that you identified from the Carlsbad Brine Well? 20 Α. Oh, my goodness. 21 MS. SHAHEEN: Slide 2. It's up here now. Carlsbad is sitting right there. For the exact 22 Α. 23 number, I'm not going to be able answer that, but I can give 24 you an approximate number based upon our scale right here. 25 So if I take my little scale here, so we are approximately

Page 58 plus or minus three to four miles, so that's more than 1 three, but probably not more over 4.2. 2 3 But when you say we, are you talking about the 0. 4 Rita Well or the fault of concern? 5 The cross here shows the Rita Well SWD 1, our Α. fault is 3800 feet, so that's little over a half a mile 6 7 away. Here is 285. Here is 285. We can actually count 8 here because these are nice one mile things. So let's just use our Mr. Pen here -- oh, my goodness, there's that. So 9 10 we are looking at approximately just a little over three miles. 11 12 From the fault of concern to the Carlsbad? 0. Yes, ma'am. That's right there at the 13 Α. 14 intersection. Is this the appropriate place we should be 15 putting our pen to? 16 It's appropriate. Thank you. Is it fair to say Q. 17 that before -- before just now you hadn't considered how close the Rita Well was to the Carlsbad Brine Well? 18 We had discussion. But this is -- that's all we 19 Α. had discussion over was that, how far was it, and that was 20 the end of our discussion. We have not had a technical 21 discussion on the hole that's there due to brine operations 22 23 and pulling out the salt and now replacing it with a fluid 24 which is most likely saturated salt brine. 25 So does your fault slip probability analysis 0.

Page 59 include any analysis of the potential from your, from the 1 2 proposed Rita Well on the Carlsbad Brine Well? 3 Α. That was really not our real concern because 4 right now we have active 2.5 events already happening. If they are already happening, and we are going to keep our 5 6 event less than 2.5, then I don't have a worry. 7 But I know the city has most likely received funding for this problem, and as soon as they call 8 Haliburton up, or their service company of choice -- sorry 9 10 for using the service company name -- that problem will be solved. You just have to fill up the void with a solid, 11 12 whether it's sand, mixture of sand and cement, I don't care 13 which one you use, but as soon as you fill it up, that event 14 will more subside that's happening here in Carlsbad will 15 cease to exist. 16 Did you know that the -- I'm asking a question on Q. 17 behalf of NGL. Did you know that the Division is 18 requiring -- are you familiar with NGL's proposed Quintana 19 Well? 20 Yes, ma'am. Α. 21 Did you know that the Division is requiring NGL Q. 22 to coordinate with the City of Carlsbad because of the brine 23 well situation? 24 Yes, ma'am. Α. 25 And has the OCD made a similar request for 0.

Page 60 Overflow to coordinate with the City of Carlsbad? 1 No, ma'am. Unless you all start something here. 2 Α. 3 HEARING EXAMINER COSS: Not to my knowledge. 4 MS. SHAHEEN: You can sit down. THE WITNESS: Oh, sorry. 5 6 BY MS. BENNETT: 7 A minute ago when you were looking at one of the Q. slides that you were talking about -- oh, I see here, it's 8 9 on this slide that has the fault of concern --10 Yes, ma'am. Α. 11 -- identified on it, and it says 1 NS fault at Q. 12 3800 feet from the proposed SWD location. Is that what you 13 are just discussing a moment ago, that would be --Well, we call it north-south, but it's tilted --14 Α. 15 ours was more north-south but Marathon has changed the direction to more this direction which is more northeast-16 southwest. Our inline view of ours we had lower, lower 17 resolution, so it made it more north-south, but Marathon's 18 19 view is more this way. 20 And what I understand is that the proposed Rita Q. 21 SWD location is approximately 3800 feet from the fault? From our inline view of the seismic that's common 22 Α. 23 to both the Marathon dataset and our dataset, the closest 24 point will be 3800 feet. 25 So just over a half mile? 0.

Page 61 Α. 1 Yes, ma'am. 2 Q. Have you done any work with Overflow for the Rose 3 SWD? 4 Α. Are you talking about this one right here? Uh-huh. 5 Q. The effect of this fault combined with this well 6 Α. 7 here? 8 Well, no. What I was really going to ask you is Q. 9 how close that Rose SWD is to the Rita SWD. Do you know? 10 MS. SHAHEEN: If you don't know. Α. I don't know. All I know it was 4.2 miles away, 11 12 and that's what I was worried about, you know, it it that 13 far away. I didn't check it with the fault. But if it's 14 over 3800 feet, then I'm pretty much not going to worry 15 about it because it declines off pretty natural here, so if it's over that, then by definition we will not have to worry 16 about it because it will be a lower pressure. 17 18 But right now you don't know how close it is to Q. 19 the fault, the Rose well? No, it's four miles away. So it's going to be 20 Α. over 3800 foot away, so that exceeds that, so we are not 21 going to have to worry about interference at this time. 22 23 0. On this slide that's the summary of seismic 24 observations. 25 Α. Yes, ma'am.

Page 62 1 I'm asking this question on behalf of Marathon. 0. 2 Does Marathon, and I'm just literally asking, it's not a 3 trap or trick or anything, I'm just curious, did Marathon 4 give you, Overflow, permission to use their data as a public exhibit in this matter? 5 6 Α. They sent it to me. 7 They didn't ask you to keep it confidential? Q. Α. No, ma'am. 8 9 Okay. Q. 10 They said, "Use this." They even circled it on Α. here and said, "This is where you need to put it." So I 11 said, "Yes, sir." 12 13 Okay, great. On this next slide called seismic Q. 14 evaluation, when you were testifying about this slide, you 15 said you were talking about the peaks that would be at the 16 top, if the top was shown. Oh, yeah. That's just -- they usually cut this 17 Α. off because most people will -- do not look -- want to 18 observe the actual interference of each one of the actual --19 where they actually take the data itself, it will do 20 destructive and constructive interference, so they usually 21 start taking data where it's no longer constructive and 22 destructive interference. 23 24 Who is the "they"? Q. 25 Α. That would probably be Western Digital. Thev

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1 just whack it off for you.

2 Q. Who is Western Digital? 3 Α. That would be the people who do the recording of 4 the seismic. 5 Q. Okay. On --6 Α. It's usually not that important unless you are 7 looking for karst topography to drill through, and I don't 8 see this being a case out here in New Mexico. 9 HEARING EXAMINER COSS: Karst? 10 THE WITNESS: Topography at the first 600 feet. HEARING EXAMINER COSS: At times in this region 11 12 that is a consideration. 13 THE WITNESS: All right. So that's the reason 14 why they usually get rid of it, because it's -- you don't 15 get any useful seismic data out of it. It's too -- it has -- the data that you do get cannot be used analytically 16 for calculating reservoir properties or properties that it 17 went through. Is that -- did I answer your question? 18 19 ο. Really I only wanted to know who the they was. Ι 20 was just just curious who the they was that cut it off. All right. 21 Α. 22 So the next two slides that you talked about were ο. 23 the -- and these slides I'm talking about start with this 24 one, Fault Slip Mitigation for Rita SWD 1 geomechanics. 25 Α. Yes, ma'am.

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1	Q. And these slides, and by these, I mean the next
2	one, so the one, two, three, fourth.
3	A. Do you want me to flip through for the audience
4	to understand which slides you are talking about?
5	Q. Not necessarily, because I wanted to not talk
6	about this slide right now, which is Fault Slip Mitigation
7	for Rita SWD Number 1 Offset Hydrology at 25 Years, so I
8	don't want to talk about that one for a second. So can we
9	put that one aside?
10	A. Yes, ma'am.
11	Q. Talking about the rest of your study.
12	A. Yes, ma'am.
13	Q. The rest of your study, as I understand it from
14	this slide, which is Fault Slip Mitigation for Rita SWD
15	Number 1 Geomechanics.
16	A. Yes, ma'am.
17	Q. You assumed an average injection of 25,000
18	barrels per day for this well?
19	A. Yes, ma'am.
20	Q. Did you assume injection from any other wells in
21	this part of your study?
22	A. Yes, ma'am. At this point in time we put the
23	influence of the radial flow from Patriot SWD Number 8, SWD
24	Number 1 and Top Gun Federal. This gives us an extra 158
25	psi, which will, if we look at this curve right here, if we

1 draw the curve and make it nice and smooth going down here
2 to zero and coming back up to here, then it will be near
3 parallel to this blue curve right here.

Q. And I understand that you did that with this
5 slide and the following slide, that those have the offset
6 wells --

7 A. Yes, ma'am.

8 -- data information in it, but these slides Q. 9 immediately preceding that don't have the offset well data? 10 Α. That's correct, because if you are doing less than five years, you don't have an influence. It takes a 11 12 while, just like my voice takes time to get to you, and 13 yours takes time to get to me, in five years I'm not going to have to worry about their influence. But at 25 years I 14 15 do have to worry about it.

16 Q. So the 25-year slide, it says 20, hydrology at 17 year 25?

18 Yes, ma'am. So if you are looking at the Α. 19 influence of this, what you are going to see is this curve comes up, and it will have 2.5, it will actually come up and 20 have another 158 psi overlay on this. So what we will end 21 up doing, if you're using 158 psi going over the whole thing 22 23 right here, approximately, of course as you get closer to 24 one of the other wells, it's going to go up because we 25 have -- we have two circles, this circle and something way

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Page 66 over here I have another circle, and it's going to overlay 1 2 in that region. 3 And just so I'm clear, though, on this slide, the 0. 4 one you're looking at and the one I'm looking at, it says 5 Key Points, 25,000 barrels per day rate. 6 Α. Yes. That's how you are going to generate this 7 color diagram right there. 8 But this slide only takes into consideration the Q. 9 proposed Rita Well, this particular slide. That's all I'm 10 talking about. That's correct. And if you want to have the 11 Α. other wells' influence, just add 158 psi. That's done, you 12 13 just have the curve up. 14 And were you here earlier when Mr. Wood testified 0. 15 that his area of review did not include proposed SWDs? You mean, was I sitting right there? 16 Α. 17 0. Yes. 18 Yes, I was sitting there. Α. 19 ο. Does your -- when I look at your slide, this 20 slide, Fault Slip Mitigation for Rita SWD Number 1 --All right. Let's get this for our audience, too. 21 Α. 22 So that one identifies three, what I'm assuming, ο. 23 are three existing wells? 24 Α. They have been drilled. 25 They have been drilled. But you didn't include 0.

Page 67 in your analysis any proposed wells then? 1 2 Α. No, I have not. This is what's been drilled. I 3 can pull that off the public dataset, and this is what's 4 available to the Commission. 5 Q. Okay. You talked a lot about a microseismic 6 monitoring system. 7 Yes, ma'am. Α. 8 I may have missed this, but is Overflow proposing Q. 9 to install one at this area? 10 Α. Yes, ma'am. 11 And would you be the -- would you be assisting Q. Overflow with that process? 12 13 Α. That and the USGS is available, and it's tied 14 into their global dataset for the United States. MS. BENNETT: Those are all the questions I have. 15 Thank you. 16 17 THE WITNESS: Thank you, ma'am. 18 HEARING EXAMINER COSS: Would you like to redirect? 19 MS. SHAHEEN: I thought I should wait until after 20 you were done with your questions, but I can do some 21 redirect now, but then again I may have more after you have 22 a discussion. 23 24 HEARING EXAMINER COSS: I will quickly give you 25 the opportunity, but we will go ahead and pursue our

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1 questions now and allow you to redirect afterwards.

2 EXAMINER McCLURE: I guess my first question for 3 you, if we do start detecting .51 on the Richter scale, what 4 would be your proposed plan, I guess, at that particular 5 juncture?

6 THE WITNESS: All right. Let's go back to our 7 picture. Obviously we have some other injection wells in 8 the area here. Let's say we started detecting .5 to 1 in 9 this particular part of the fault. Because we are going to 10 do microseismic array out there, we can start saying, hey, 11 not only is it here, but it's within so many cubic meters of 12 this event happening.

13 Then you will start looking at the closest 14 injection well, and we'll actually say, "Decrease your 15 injection rate, and does the event disappear?"

Just like I did in California for steam, we would look at the closest injection well to that point. So you draw your circle around it and see which one comes into play first. Now if you know there's a permeability anisotropy in the system, which I don't think there is for this particular formation, then you would draw an elipse.

22 But right now we are going to assume, unless we 23 have cross -- cross wellbore physical testing there to prove 24 that, I would choose a circle, sir.

25 EXAMINER McCLURE: I'm with you. So say then the

main reason why this is of concern is obviously the issue Oklahoma has had in regards to this. Theirs is a little bit different situation. Obviously we have them going on in Carlsbad right now, as you just finished pointing out.

5 I guess the thing that I would make sure that 6 you're aware of is we are looking at like a spacing of say a 7 mile and a half, so at 1.5 five years from now there very 8 well -- may very well be many more additional SWDs in this 9 particular area.

10 THE WITNESS: Then you will, with microseismic 11 array, you will start being able to detect even at a mile. 12 First thing, the data, if we choose fiber optic, it's one-13 foot spacing. So if he we put the array in, we should be 14 able to get down to three- to four-foot spacing, even at 15 14,000 foot. So we should be able to see not only --

16 EXAMINER McCLURE: -- well on your thought
17 process.

18 THE WITNESS: Obviously this doesn't have all the 19 faults on it, but when you get a real map that has a lot of 20 faults, your are going to start seeing microseismic events 21 not only at the big fault that you are interested in, but 22 you will see something in between. And when you start 23 seeing movement in between, then that gives you your trend 24 of which well is the bad guy actor.

25 You may have a couple of them, but most likely

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Page 70 it's usually one that's the bad actor, and then you can 1 start dealing with it specifically. And if events continue 2 to spread out, then you will spread out your radius of 3 concern and stop the events from happening. 4 5 EXAMINER McCLURE: I'm with you. Are you aware of which direction the maximum horizontal stress is in 6 regards to all the faults of concern? You may have said and 7 8 I may have missed it if you did. THE WITNESS: Well, now, if the -- feel like, 9 10 what is on Star Trek, he was talking to the computer, and he kept saying to it. And then the lady talks to him and says, 11 12 "That's not a voice-activated computer." 13 All right. The stress is up here, obviously, or 14 been in this fault over, but I feel for this particular zone 15 and our basement, maximum is this way. Minimum is this way. EXAMINER McCLURE: You think the max is lined up 16 17 with your fault? Is that what you are saying? THE WITNESS: I don't think it's changed since 18 this original vertical fault came through. This part 19 probably hasn't changed, but all this stuff up in here has 20 changed. 21 22 EXAMINER McCLURE: And you are reasonably confident of the direction of this fault from Marathon's 23 24 data? 25 THE WITNESS: Yes. They have -- they have very

Page 71 good 3D seismic in the area, and they have actually -- this 1 2 is a line that we drew, but they actually have it going up, and then it changed a little more over here. 3 4 So you can tell that the stress has actually changed, and you can see, based upon this right in here, as 5 6 it's going through you can see it actually tracing what's going through this area here. 7 8 So if we did a detailed analysis, yes, we could 9 find it, and then you can look at -- or the Commission, or 10 whoever your geophysicist is, can start looking at how did it rotate in space through here at the basement. 11 12 EXAMINER McCLURE: I hear you. So that at the 13 point of this well that we are interested in, we have a 14 pretty good idea of what we are getting at. 15 THE WITNESS: Yeah. EXAMINER McCLURE: I am with you there. 16 Maybe 17 changing topics just a little bit, this -- your maximum pressure at surface, did you go to the fracture gradient, 18 the same fracture gradient and then backtracked from your --19 or did you just go with the .2 that we have been 20 administratively requiring? 21 22 THE WITNESS: All right. I used administrative 23 for what's happening right next to the wellbore. And 24 actually -- so administratively we would be looking at .65 25 right near the wellbore.

Page 72 1 If you are, you know, at 25 years, you are 2 putting your maximum in, and assuming we still have 35 millidarcies of average permeability. But if it's lower, 3 4 it's going to jack a little bit up, but if it's higher, then it's going to go a little bit farther down. 5 6 EXAMINER McCLURE: At the wellbore? THE WITNESS: At the wellbore. 7 8 EXAMINER McCLURE: It goes up as the fault -- if the permeability is higher than what we projected, then the 9 10 pressure at the fault would actually be increased at that point. 11 12 THE WITNESS: No, it actually dissipates. You 13 are going to get a bigger circle here and it's gonna push 14 that fluid out farther, and you will have a lower value. 15 EXAMINER McCLURE: I was picturing that your pressure gradient would propagate a little further --16 17 THE WITNESS: It will propagate --MR. AMES: Time out. Time out. One at a time, 18 19 for the court reporter's sake. THE WITNESS: Certainly. All right. Go ahead, 20 21 sir. EXAMINER McCLURE: The only thing I was saying is 22 23 I was just picturing that -- I have not run the model, 24 obviously, sitting here, I just pictured that your pressure 25 would propagate out further, which would increase the
Page 73 pressure higher further and lower it closer. Obviously, you 1 2 are saying I'm mistaken in that regards. Is that correct? 3 THE WITNESS: If the porosity is --EXAMINER McCLURE: If the permeability is higher. 4 THE WITNESS: If the permeability is higher, but 5 6 that's also going to be that your porosity has to be higher, 7 too, at the same time. So those two cancel each other. So 8 it should dissipate the wave, not only will it go out there faster, but it will be a lower one. 9 10 EXAMINER McCLURE: And if the porosity were to be the same, we are just misinterpreting what the permeability 11 12 is, what would be the result of that, if the porosity stays 13 constant. 14 THE WITNESS: If the porosity stays constant, and 15 we are actually dealing with something heterogenous, if the porosity stays constant, yes, you can get your -- let's say 16 17 the pressure wave does go out there -- I don't have a slide on this, but let's say a thin zone, let's give it 100 18 millidarcies, 10 percent porosity, will the pressure wave go 19 out there? The answer is yes, but the problem is it's 20 dissipating itself in the lower porosity, lower permeability 21 zone as it is trying to touch the fault. 22 23 So we have a little thin lens, and yes, it may be 24 higher permeability, but on its way there it lost its 25 pressure to the other zones or the other strata that's next

Page 74 to it that's lower permeability and lower porosity. 1 2 EXAMINER McCLURE: I guess my concern at that 3 point, if we are spreading on a radius, then you would have 4 an additional area of the fault that's exposed to the 5 pressure. Is that correct? 6 THE WITNESS: But it will be a thin, just a 7 little thin zone. 8 EXAMINER McCLURE: You don't think we would be 9 increasing our chance of a fault slip potential? 10 THE WITNESS: No. Actually you will be decreasing your chances, because you are leaking off fluid, 11 12 or out here, too. So you are decreasing your chances -- if 13 this permeability goes up, you are going to decrease your 14 chances. 15 EXAMINER McCLURE: Okay. THE WITNESS: But we can run the scenarios if you 16 so desire. 17 18 EXAMINER McCLURE: Not at this time I'm not going to put that request out there. Obviously we may request 19 further information later on. I think on that side of 20 things, I don't have any more questions. 21 22 The only statement I might make, I guess, is we 23 will end up requiring cement be ran to surface on your 24 production casing. 25 THE WITNESS: Excellent. I mean, that's --

Page 75 1 EXAMINER McCLURE: No problem. Just letting you 2 know. 3 THE WITNESS: No problem. 4 EXAMINER McCLURE: Yeah. The only other question I had -- I'm sorry -- on your surface pressure not related 5 to this --6 7 THE WITNESS: Yes? 8 EXAMINER McCLURE: -- how did you calculate that? 9 THE WITNESS: Well --10 EXAMINER McCLURE: Surface pressure for your injection pressure. 11 12 THE WITNESS: Yes. So surface pressure -- well 13 you've got to take the hydraulic -- let me see if I've got 14 something that will show that. There we go. 15 EXAMINER McCLURE: Maybe I can direct your question better. Did you backtrack it from our base 16 fracture gradient, or did you go with 0.2 at the surface 17 times the feet? 18 THE WITNESS: I went from 12,000 and went back 19 20 up. 21 EXAMINER McCLURE: And then you subtracted your fluid? 22 THE WITNESS: Yes, that's correct. And that's 23 24 your average density as in the -- based upon the fluid 25 mixture here that's in the -- all right, let me -- I'm

Page 76 not going to sit here and -- there is an average fluid 1 2 that's going to be coming here and that's what we took. 3 EXAMINER McCLURE: I can understand how you come 4 to it in that regard. I'm asking if that's the way you did The only statement that I was going to make is we may 5 it. 6 request that you change that slightly because we have been running with a different metric and it's 2.2 times the feet. 7 8 THE WITNESS: That's fine. 9 EXAMINER McCLURE: Your method is -- I'm not 10 going to go there. I think that's all the questions I have for this witness. Thank you. 11 12 THE WITNESS: Thank you, sir. 13 HEARING EXAMINER COSS: Okay. And good 14 afternoon. I want to thank you for your presentation and its honesty in the way its all laid out. 15 So but in that, I had a few questions. So on 16 your -- your faults that you have mapped on the proposed 17 18 well location, how much throw would you say that fault has? THE WITNESS: I suspect that is probably around 19 100 foot at the Barnett Shale. 20 HEARING EXAMINER COSS: And do you have reason to 21 believe -- I guess we call it Woodford here. 22 23 THE WITNESS: What, sir? 24 HEARING EXAMINER COSS: The Woodford Shale. 25 THE WITNESS: All right.

Page 77 HEARING EXAMINER COSS: You keep throwing me off, 1 2 I'm sorry. And so just 100 feet, would you call that large, medium, small amount of throw? Just in, in your opinion, do 3 you think that's a lot or a little? 4 5 THE WITNESS: If I'm in the Middle East we wouldn't even look at it, but since I'm here in America I 6 7 would say it's medium. 8 HEARING EXAMINER COSS: Fair enough. Would you say that's on order with the other fault mapped in the 9 10 initial site, Page 3? THE WITNESS: No, those, for those to be 11 12 detected, it has to be a much greater throw in order to pick 13 it up on -- these things were generated through these 14 seismic shots. Back when I was with Phillips Petroleum, we 15 used this original fault map to look for faults in the Fruitland Coal, and it has to be a pretty good throw, and 16 17 that's probably on the order of 300 foot to actually pick this up off 2D seismic that was used to generate this map 18 19 here. HEARING EXAMINER COSS: Okay. So there is many 20 larger faults in the area. This one that's mapped by 21 Marathon is smaller, didn't come up on the earlier datasets. 22 23 And I guess, would you agree that faults often kind of fall 24 off logarithmically at 300 foot throws, and with 300 foot 25 throws, you see three times as many with a 30-foot throws.

Page 78 1 THE WITNESS: Yes, sir, that's the general 2 correlation. 3 HEARING EXAMINER COSS: Okay. 4 THE WITNESS: Did it specifically happen in this area, I cannot testify to that. But if I'm an engineer then 5 6 I'm going to assume that. 7 HEARING EXAMINER COSS: So it's probable there 8 are additional faults not mapped below seismic resolution 9 near this wellbore, if it was smaller fractures less than 10 100. THE WITNESS: We know there was because we picked 11 12 them up and they were all tilted. So I chose, because they 13 didn't have enough length, and they were over 70 degrees 14 tilt, then that -- that meant I was not going to be --15 shoot, let's just go look at it. There is actually one right in here. There is 16 one -- there is also one in here that's tilted. 17 And I remember seeing another one, if I go flip this stuff around 18 there is couple more over in here. But they are all tilted, 19 so that means it's going to be -- we are already approaching 20 .65 before we are going to get a slip because now you are at 21 70 degrees or more on the tile, or 30 degrees or more on the 22 23 tilt. So now you have the actual ground stress mashing that 24 thing down, so we are going to be approaching the .65 25 gradient to even get a slip out of that one.

Page 79 HEARING EXAMINER COSS: But so -- but with that 1 2 we are going to assume -- is it safe to assume that the 3 Devonian is probably fractured in this area? 4 THE WITNESS: Well, we know it is. HEARING EXAMINER COSS: But we modeled the flow 5 6 as if it weren't fractured; is that correct? We modeled it 7 as --8 THE WITNESS: We modeled it as the aggregate would be -- sorry. We modeled it as an aggregate of 30 9 10 millidarcies for the average to come over, so whether it's a 100 millidarcy fracture or 100 millidarcy thin zone, then it 11 will dissipate trying to go to this, this point. 12 13 All right. This is what we are trying to talk 14 to. All right. We have other faults going around like 15 this. All right, yes, they will have stringers of high pressure running along the fault, because let's just give 16 17 them 100 millidarcies. That's usually a pretty good one. If you are 30 and you do not have closure on that fracture, 18 100 millidarcies is a pretty good answer for that. 19 So you have a high pressure -- you have high perm 20 streaks that are less than a foot, and you also have natural 21 fractures in this region, so you will have thin stringers of 22 23 what I'm going to call high pressure radiating out from 24 this. Now, you are not going to see it on this resolution, 25 but you would see it if you are physically doing some very

Page 80 high resolution seismic. Is that your question? 1 2 HEARING EXAMINER COSS: Uh-huh. THE WITNESS: Now, if one of these high pressure 3 4 points touch the fault, would it be able to cause a fault slip, and the engineering answer would be, the answer would 5 6 be no, because it's going to dissipate that pressure with 7 area that doesn't have the pressure there in the first 8 place. 9 So you do have lower permeability, low pressure 10 that will absorb that little tiny high-pressure strip that's going to leak off into it, even though that little high 11 12 pressure strip, whether it's a thin zone or fracture that's 13 tilted going towards that big fracture. 14 Did I answer your question? 15 HEARING EXAMINER COSS: Yes. I quess you --THE WITNESS: You have to have the whole plate 16 17 being separated in order to get a slip. You can't just do little bitty strip here and little bitty strip there and 18 19 say, "Hey, you are going to move." It ain't going to happen because the other two 20 pieces of plate are there and they're locked. So if you get 21 little void spaces that are separated, you still have these 22 23 other pieces of the plate contacting each other. 24 HEARING EXAMINER COSS: I guess in my mind 25 though, we are not going to -- there might not be radial

1 flow like that. Instead the flow will be mostly focused on 2 those high pressure strips and nevertheless will be 3 lubricating the fault.

4 THE WITNESS: These faults are not going to move because they are tilted, even though they have high pressure 5 6 running down through them, they are still at probably the 7 .65, which is what you normally run with as your Commission, 8 you are going to put the .2 or .4 or however you would like to call that, that's going to keep you safe because most of 9 10 the area, if it wasn't, you would see this place light up. HEARING EXAMINER COSS: I guess so -- I will move 11 on to my next question then. What's the explanation for the 12 13 seismicity? 14 THE WITNESS: 1974. 15 HEARING EXAMINER COSS: That's right now at this time? 16 THE WITNESS: For this? 17 HEARING EXAMINER COSS: All of them. 18 THE WITNESS: 1974 had to be something before oil 19 20 and gas got there. 21 HEARING EXAMINER COSS: So there could be natural stress fluctuations in this area. 22 THE WITNESS: Well, the answer yes. But over 23 24 here, this is -- this probability, as you can see, look at 25 the rest of the map, this is an oil field. And I suspect,

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Page 82 but you can go to your own conclusions, but I know man is 1 2 over there doing something. HEARING EXAMINER COSS: Okay. I quess the only 3 other point of clarification that, could you describe the 4 5 lower confining unit again in this area? 6 THE WITNESS: You mean the --7 HEARING EXAMINER COSS: Uh-huh. 8 THE WITNESS: It's, you are going to a lower 9 porosity section, and that means your permeability is going to go into the microdarcies. And that means, yeah, you 10 might get a cup full of water to go through it, but it's 11 going to be in inches per year. 12 13 HEARING EXAMINER COSS: I quess most applicants state that they will stop before the Montoya -- Silurian 14 Montoya Formation, and they have a plan for where they are 15 16 going to encounter that, and I just wanted to know if that 17 was taken care of in this. 18 THE WITNESS: We don't plan on drilling into it. 19 But if we do encounter it, then we are going to cement it. 20 HEARING EXAMINER COSS: That's what I wanted to 21 hear. Thank you. 22 THE WITNESS: Cement will solve that problem. 23 HEARING EXAMINER COSS: I pass the witness. Thank you, sir. 24 25 We are going to -- would you like to redirect at

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1	this point?
2	MS. SHAHEEN: I would.
3	REDIRECT EXAMINATION
4	BY MS. SHAHEEN:
5	Q. Just briefly. Ms. Bennett asked you about the
б	brine well and whether you had considered the impacts of the
7	Rita Well on the Carlsbad Brine Well, and you mentioned that
8	we had discussed that. Would the microseismic array that
9	you described assist the City of Carlsbad in addressing any
10	issues relating to the brine well?
11	A. All right. Just like it is for the steam
12	injection in California, we are looking for steam migrating
13	out of zone, it will make noise. And for Phillips
14	Petroleum, as they are watching their platform as
15	documented, it's already sunk 60 foot into the sea floor and
16	it's actually made a cavern.
17	And I suspect this, since we were injecting, and
18	I will say we because I worked for Phillips Petroleum
19	Company, we intentionally did this. We get 10 percent extra
20	oil if we mash the rock and turn it into toothpaste. That's
21	literally what we were doing. We end up getting near zero
22	porosity as we smashed the bottom of the reservoir and
23	squeezed oil into our production wells.
24	I suspect, as this will fail at some point, and I
25	suspect that it will fail in a nice little circular fashion,

Page 84 you can actually watch it all. Now whether we have the 1 array over here, it will start picking it up. 2 3 And if the City of Carlsbad wants to watch their 4 thing collapse over a period of time, yes, but before then I would actually pump the sand and cement into the void so you 5 6 would avoid that. But yes, you can actually detect where it 7 is and what part of it is failing as it starts working, the 8 fractures start working up through the strata. 9 Same question with respect to the Quintana Well, Q. 10 would the microseismic array also provide data reflecting 11 impacts, the cumulative impacts of the Rita Well and the 12 Ouintana Well? 13 Yes, ma'am. And it doesn't have to necessarily Α. 14 be this fault; it will start detecting anything that's in 15 the area. So if we have something that's tilted over or not so tilted over, then we can pick that up, too. 16 MS. SHAHEEN: With that, I have no further 17 18 questions. HEARING EXAMINER COSS: Would you like to move 19 Exhibit 4, or have we done that already? 20 MS. SHAHEEN: I thought it had been done, but I 21 will do it again. I wanted to move -- I will move that 22 Exhibits 3 and 4 be admitted to the record with the caveat 23 24 that we will be submitting to the hearing unit a revised 25 updated Exhibit 4, which is what was presented here on the

Page 85 1 TV screen. 2 HEARING EXAMINER COSS: Okay. 3 MR. AMES: Subject to the objection that was 4 sustained regarding the pages in one of those exhibits. 5 MS. SHAHEEN: That was Exhibit 1, which has 6 already been admitted. 7 MR. AMES: Thank you. 8 HEARING EXAMINER COSS: We will admit Exhibits 3 and 4, and we'll take case Number 209 --9 (Exhibits 3 and 4 admitted.) 10 11 MR. AMES: Hold on. 12 HEARING EXAMINER COSS: Oh. Oh. 13 MR. AMES: Ask her if that's the last of her 14 witnesses. 15 HEARING EXAMINER COSS: Is that the last of your witnesses? 16 17 MS. SHAHEEN: That is my last witness, and I know that I promised Ms. Bennett that Ms. Hearon would, would be 18 asked to come back to the stand to address the contract 19 question, but now after further thought, I will make an 20 objection to those questions because I don't believe that's 21 within the scope of the authority of the Division, that 22 being contracts and the non-existence, the negotiation of 23 24 contracts, I don't believe, is within the scope of the 25 Division authority. So that's my objection with respect to

Page 86 Ms. Bennett's request to ask that question of Ms. Hearon. 1 2 MR. AMES: So you are declining to recall your 3 witness? 4 MS. SHAHEEN: Yes. MR. AMES: All right. 5 6 MS. SHAHEEN: And I apologize on the record to 7 Ms. Bennett. 8 MR. AMES: Thank you. 9 MS. BENNETT: Before we take the case under 10 advisement, is now the appropriate time it for me to make my statements about hydrologic connection affirmative 11 12 statement, or would you feel like I need to do it again? 13 HEARING EXAMINER COSS: Proceed. 14 MS. BENNETT: Thank you. The C-108 requires that 15 applicants make an affirmative statement that they have examined available general geologic available data, 16 17 Paragraph 12 of the C-108. And because those pages of Exhibit 1 were superceded by Mr. Fraim's testimony, and his 18 testimony doesn't include that affirmative statement, I 19 would just ask -- I'm not trying to be an obstructionist 20 here -- that Mr. Fraim be allowed the opportunity to 21 supplement their record with an appropriate affirmative 22 23 statement. Because, as is, in my opinion and this is 24 something that the Division obviously will have to consider, 25 but as is, the C-108 is incomplete, in my opinion, and so

Page 87 that's my request or my statement about the affirmative 1 2 statement. MS. SHAHEEN: Overflow is happy to supplement the 3 4 record with Dr. Fraim's affirmative statement regarding the lack of hydrological relationship to an underground water 5 6 source. 7 HEARING EXAMINER COSS: All right. Thank you. 8 Please do that. 9 MS. SHAHEEN: We will. And with that I ask that 10 you take Case Number 20964 under advisement. HEARING EXAMINER COSS: Case Number 20964 will be 11 12 taken under advisement. Thank you. 13 At this time I believe we will take a ten-minute 14 recess, and prepare to hear case Number 20965, COG for gas 15 injection project. 16 (Case Number 20964 concluded, taken under advisement.) 17 18 19 20 21 22 23 2.4 25

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1	STATE OF NEW MEXICO
2	COUNTY OF BERNALILLO
3	
4	REPORTER'S CERTIFICATE
5	
6	I, IRENE DELGADO, New Mexico Certified Court
7	Reporter, CCR 253, do hereby certify that I reported the
8	foregoing proceedings in stenographic shorthand and that the
9	foregoing pages are a true and correct transcript of those
10	proceedings that were reduced to printed form by me to the
11	best of my ability.
12	I FURTHER CERTIFY that the Reporter's Record of
13	the proceedings truly and accurately reflects the exhibits,
14	if any, offered by the respective parties.
15	I FURTHER CERTIFY that I am neither employed by
16	nor related to any of the parties of attorneys in this case
17	and that I have no interest in the final disposition of this
18	case.
19	Dated this 12th day of December 2019.
20	
21	Irene Delgado NMCCR 253
22	License Expires: 12-31-19
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