

**UNITED STATES PATENT AND TRADEMARK OFFICE**

**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

**CERTIFIED COPY**

**INTELLIGENT WELLHEAD SYSTEMS, INC.,**

**Petitioner,**

**v.**

**DOWNING WELLHEAD EQUIPMENT, LLC,**

**Patent Owner**

**IPR2024-00300**

**Patent No. 11,560,770**

\*\*\*\*\*

**VIDEOTAPED / REALTIMED DEPOSITION OF**

**ROBERT A. DURHAM, Ph.D., P.E.,**

**AUGUST 15, 2024**

\*\*\*\*\*

**Reported By:**

**Pat English-Arredondo, CSR (TX), RMR, CRR, CLR**

**Job No: 24-140130**

**CM#57959.37US01**

 **THE SULLIVAN GROUP**  
**OF COURT REPORTERS**  
SULLIVANCOURTREPORTERS.COM  
PHONE 562.888.6488

Ex.2013 / IPR2024-00300

Intelligent Wellhead Systems, Inc. v. Downing Wellhead Equipment, LLC

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Petitioner,  
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DOWNING WELLHEAD EQUIPMENT, LLC,  
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VIDEOTAPED / REALTIMED DEPOSITION of  
ROBERT A. DURHAM, Ph.D., P.E., produced as a  
witness at the instance of the Patent Owner,  
and duly sworn, was taken in the above-styled  
and numbered cause on Thursday, the 15th day  
of August 2024, from 9:11 a.m. to 2:19 p.m.,  
before Pat English-Arredondo, CSR (TX), RMR,  
CRR, CLR, in and for the State of Texas,  
reported by machine shorthand in realtime  
translation, at the law offices of Osha  
Berman Watanabe & Burton, LLP, 1100 Louisiana  
Street, Suite 4900, Houston, Texas 77002  
Texas, pursuant to the Federal Rules of Civil  
Procedure and any agreed upon rules by  
Counsel under USPTO; that the Witness will  
read the deposition.

09:13

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**A P P E A R A N C E S**

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**VIDEOGRAPHER:**

Mr. Brian Smith

**ALSO PRESENT:**

Dr. John Hughett, Expert (via Zoom)  
Ms. Tracey Morris, Paralegal (via Zoom)

**COURT REPORTER:**

Ms. Pat English-Arredondo  
CSR (TX), RMR, CRR, CLR

|    |                                               |                   |
|----|-----------------------------------------------|-------------------|
| 1  | <b>EXAMINATION INDEX</b>                      |                   |
| 2  | <b>WITNESS: ROBERT A. DURHAM, Ph.D., P.E.</b> |                   |
| 3  | <b>EXAMINATION BY MS. COOKE</b>               | <b>PAGE<br/>8</b> |
| 4  |                                               |                   |
| 5  |                                               |                   |
| 6  | <b>SIGNATURE PAGE</b>                         | <b>203</b>        |
| 7  | <b>REPORTER'S CERTIFICATION</b>               | <b>205</b>        |
| 8  |                                               |                   |
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|----|-----------------------------------------|--------------------|-------------|
| 1  | <b>EXHIBITS</b>                         |                    |             |
| 2  | <b>EXHIBIT NO.</b>                      | <b>DESCRIPTION</b> | <b>PAGE</b> |
| 3  | EXHIBIT NO. 1001                        |                    | 28          |
| 4  | (Previously marked) US Patent           |                    |             |
| 5  | 11,560,770 dated 1-24-23 titled         |                    |             |
| 6  | Hydraulic Fracturing Plan and Execution |                    |             |
| 7  | of Same, Bates EX-1001_001 - 65         |                    |             |
| 8  | EXHIBIT NO. 1002                        |                    | 16          |
| 9  | (Previously marked) Declaration of Dr.  |                    |             |
| 10 | Robert Durham, Bates EX_1002_001 - 354  |                    |             |
| 11 | EXHIBIT NO. 1004                        |                    | 138         |
| 12 | (Previously marked) US Patent           |                    |             |
| 13 | 2019/0233275 dated 8-1-19 by Carr, et   |                    |             |
| 14 | al, Bates EX_1004_001 through 014       |                    |             |
| 15 | EXHIBIT NO. 1005                        |                    | 164         |
| 16 | (Previously marked) International       |                    |             |
| 17 | Application Published Under the Patent  |                    |             |
| 18 | Cooperation Treaty dated 7-16-20, by    |                    |             |
| 19 | Aaron Beuterbaugh, Bates EX_1005_001 -  |                    |             |
| 20 | 023                                     |                    |             |
| 21 | EXHIBIT NO. 1006                        |                    | 187         |
| 22 | (Previously marked) US Patent 8,490,685 |                    |             |
| 23 | dated 7-23-13 by Toman, et al, titled   |                    |             |
| 24 | Method and Apparatus Associated with    |                    |             |
| 25 | Stimulation Treatments for Wells, Bates |                    |             |
| 26 | EX_1006_001 - 18                        |                    |             |
| 27 | EXHIBIT NO. 1007                        |                    | 186         |
| 28 | (Previously marked) US Patent           |                    |             |
| 29 | 2007/0023184 dated 2-1-07 by Robert A.  |                    |             |
| 30 | Jackson, Bates EX_1005_001 - 015        |                    |             |
| 31 | EXHIBIT NO. 1009                        |                    | 56          |
| 32 | (Previously marked) Document titled     |                    |             |
| 33 | "The Shale Evolution: Zipper Fracture   |                    |             |
| 34 | Takes Hold" from Trent Jacobs, Bates    |                    |             |
| 35 | EX_1009_001 - 007                       |                    |             |
| 36 | EXHIBIT NO. 1027                        |                    | 103         |
| 37 | (Previously marked) Document titled "A  |                    |             |
| 38 | Continuous Multistage Fracing           |                    |             |
| 39 | Technique" by K.R. Webster, Bates       |                    |             |
| 40 | EX_1027_001 - 010                       |                    |             |

|    |                                               |     |
|----|-----------------------------------------------|-----|
| 1  | EXHIBIT NO. 1028                              | 106 |
| 2  | (Previously marked) SPE article titled        |     |
| 3  | "Continuous Pumping, Multistage,              |     |
| 4  | Hydraulic Fracturing in Kitina Field,         |     |
| 5  | Offshore Congo, West Africa" by               |     |
| 6  | Alberto Casero dated 2008, Bates              |     |
| 7  | EX_1028_001 - 20                              |     |
| 8  | EXHIBIT NO. 1029                              | 107 |
| 9  | (Previously marked) Document titled "A        |     |
| 10 | Look Into What Fractures Really Look          |     |
| 11 | Like," dated November 2018 by Stephen         |     |
| 12 | Rassenfoss, Bates EX_1029_001 - 006           |     |
| 13 | EXHIBIT NO. 1031                              | 122 |
| 14 | (Previously marked) SPE article titled        |     |
| 15 | "Methods and Apparatus for                    |     |
| 16 | Simultaneous Stimulation of Multi-Well        |     |
| 17 | Pads," Bates EX_1031_001 - 009                |     |
| 18 | EXHIBIT NO. 2008                              | 61  |
| 19 | Schlumberger Energy Glossary showing          |     |
| 20 | definition for "zipper manifold,"             |     |
| 21 | 1 page                                        |     |
| 22 | EXHIBIT NO. 2009                              | 63  |
| 23 | Schlumberger Energy Glossary showing          |     |
| 24 | definition for "missile," 2 pages             |     |
| 25 | EXHIBIT NO. 2010                              | 90  |
| 26 | Schlumberger Energy Glossary showing          |     |
| 27 | definition for "gate valve," 1 page           |     |
| 28 | EXHIBIT NO. 2011                              | 140 |
| 29 | Excerpt from Patent 2019/0233275 dated        |     |
| 30 | 8/1/19 to show highlights by Dr.              |     |
| 31 | Durham at deposition, Bates                   |     |
| 32 | EX_1004_006 and _005                          |     |
| 33 | (REPORTER'S NOTE: All quotations from         |     |
| 34 | exhibits are reflected in the manner in which |     |
| 35 | they were read into the record and do not     |     |
| 36 | necessarily denote an exact quote from the    |     |
| 37 | document.)                                    |     |

1 (Following commenced at 9:11 a.m.)  
2 THE VIDEOGRAPHER: Good  
3 morning. We are now on the record.  
4 Today's date is August 15, 2024, and  
09:12 5 the video time is 9:12 a.m. Central.  
6 This is the video deposition of  
7 Dr. Robert Durham in the matter of  
8 Intelligent Wellhead Systems,  
9 Incorporated versus Downing Wellhead  
09:12 10 Equipment, LLC, filed in the  
11 United States Patent & Trademark  
12 Office before the Patent Trial and  
13 Appeal Board.  
14 This deposition is taking place  
09:12 15 at 1100 Louisiana Street, Suite 4900,  
16 Houston, Texas, 77002.  
17 My name is Brian Smith. I'm  
18 the videographer representing The  
19 Sullivan Group.  
09:12 20 Would counsel on the conference  
21 please identify yourselves and state  
22 whom you represent, beginning with the  
23 questioning attorney.  
24 MS. COOKE: Good Morning. My  
09:12 25 name is Tiffany Cooke with Haynes and

1 Boone on behalf of Downing Wellhead  
 2 Equipment, LLC, and I'm joined by my  
 3 colleagues, Scott Jarratt and Andrew  
 4 Drott, who is on the Zoom line.  
 09:13 5 MS. MARGONIS: I'm Lisa  
 6 Margonis representing IWS with the  
 7 firm Osha Bergman Watanabe & Burton.  
 8 I'm joined by my colleagues Tammy  
 9 Terry, Kevin Szymczak. And I believe  
 09:13 10 Califf Cooper and Laura Witbeck are on  
 11 Zoom.  
 12 THE REPORTER: Sir, will you go  
 13 ahead and raise your right hand to be  
 14 administered the oath.  
 09:13 15 ROBERT A. DURHAM, Ph.D.,  
 16 being called as a witness, and having been  
 17 duly sworn, testified as follows:  
 18 THE WITNESS: I do.  
 19 THE REPORTER: Thank you.  
 09:13 20 EXAMINATION  
 21 BY MS. COOKE:  
 22 Q. Good morning, Dr. Durham. How  
 23 are you today?  
 24 A. Good morning. I'm well. Thank  
 09:13 25 you.

09:13 1 Q. You're being deposed today  
2 because you submitted a declaration in  
3 connection with Intelligent Wellhead Systems'  
4 Petition For Inter Partes Review of US Patent  
5 No. 11,560,770. Correct?

6 A. Yes.

7 Q. And throughout your deposition  
8 today I'm going to refer to this Inter Partes  
9 Review Proceeding as an IPR. Is that okay?

09:13 10 A. Sure.

11 Q. I may also refer to the  
12 United States Patent Trial and Appeal Board  
13 as "the Board." Is that okay with you?

14 A. Yes.

09:14 15 Q. You understand that the Board  
16 has granted institution and decided to review  
17 the '77 patent -- the '770 patent. Correct?

18 A. I understand that, yes.

19 Q. Now, I want to go over a couple  
09:14 20 of parties' names so that we can both  
21 understand shorthand that I will likely use  
22 today.

23 Is that okay with you?

24 A. Sure.

09:14 25 Q. Petitioner in this

1 investigation is Intelligent Wellhead  
2 Systems. Correct?

3 A. If I can look at my  
4 declaration, I can verify that. It sounds  
09:14 5 right.

6 Q. Is that who you're working for  
7 today?

8 A. IWS.

9 Q. Can I refer to Intelligent  
09:14 10 Wellhead Systems as "IWS" today?

11 A. Yes.

12 Q. And the Patent Owner in this  
13 case is Downing Wellhead Equipment, LLC.  
14 Right?

09:14 15 A. Yes.

16 Q. And are you okay if I refer to  
17 Downing Wellhead Equipment, LLC as "Downing"?

18 A. Yes.

19 Q. And the patent at issue today  
09:14 20 and in this IPR is Patent 11,560,770. Right?

21 A. Yes.

22 Q. Are you okay if I refer to that  
23 patent as the "'770 patent"?

24 A. Yes.

09:15 25 Q. Or "'770 patent"?

1 A. Yes.

2 Q. Have you been deposed before?

3 A. Yes, ma'am.

4 Q. How many times?

09:15 5 A. Northwards of 100, maybe 120.

6 Q. How many times have you been

7 deposed in connection with an IPR proceeding?

8 A. Maybe a dozen or thereabouts.

9 Maybe 15. I'm not real sure.

09:15 10 Q. Do you typically represent the

11 petitioner or the patent owner?

12 A. I don't think there is any

13 particular balance one way or the other.

14 Q. Have you represented both?

09:15 15 A. Yes, ma'am.

16 Q. Fairly equally?

17 A. Roughly. I don't keep track,

18 but...

19 Q. So if you've been deposed that

09:15 20 many times, I take it you understand the

21 ground rules; but let's do a quick refresher

22 so we are both starting on the same footing

23 today.

24 Is that okay?

09:15 25 A. Sure.

1 Q. If I ask you a question and you  
2 don't understand, will you agree to ask that  
3 I clarify the question for you?

4 A. I will.

09:15 5 Q. And if you do answer the  
6 question, is it fair for me to presume that  
7 you understood what I asked?

8 A. Yes.

09:15 9 Q. Will you agree to answer each  
10 question out loud?

11 We have a court reporter here  
12 today that is trying to take a good  
13 transcript for us and she cannot transcribe  
14 nods or nonverbal communications.

09:16 15 A. Yes.

16 Q. I'm also probably the worst  
17 offender at this, but our court reporter can  
18 only take the transcript and testimony of one  
19 person at a time; so I'm going to do my best  
09:16 20 not to talk over you if you will also agree  
21 to do the same.

22 A. Best I can.

23 Q. Will you agree that if you need  
24 to take a break for any reason that you will  
09:16 25 let me know?

1 A. Sure.

2 Q. You understand that you're

3 under oath today, giving testimony as if you

4 were in court?

09:16 5 A. Yes, ma'am.

6 Q. Are there any reasons, medical

7 or otherwise, that you cannot understand my

8 questions, remember facts, or answer any

9 questions to the best of your ability today?

09:16 10 A. Not that I know of.

11 Q. How many times -- strike that.

12 So you've been deposed many

13 times. In connection with those depositions,

14 how many times have you testified about

09:16 15 hydraulic fracturing technology?

16 A. I really wouldn't know without

17 having to go back over 20 years of history.

18 Q. Once?

19 A. No. Much more than that.

09:17 20 Maybe 20ish.

21 Q. More than once?

22 A. More than once, yes. Maybe 20.

23 It's just a wild guess.

24 Q. Today is not the first time?

09:17 25 A. No, ma'am.

1 Q. Have you reviewed your  
2 declaration since you signed it on  
3 December 15, 2023?  
4 A. I have.  
09:17 5 Q. When was the last time you  
6 reviewed your declaration?  
7 A. Yesterday evening.  
8 Q. Have you reviewed it in  
9 preparation for your deposition today?  
09:17 10 A. Yes.  
11 Q. Did you write your declaration?  
12 A. Yes. I prepared the first  
13 draft and the large bulk of the language.  
14 Q. Has anyone else helped you in  
09:17 15 the preparation of your declaration?  
16 A. Sure.  
17 Q. Who has helped prepare?  
18 A. Counsel has helped with certain  
19 sections in particular and with some of the  
09:17 20 editing. If you have a copy, I could  
21 probably go through sections I provided the  
22 most help on.  
23 Q. Do you recall just off the top  
24 of your head what sections counsel provided  
09:17 25 assistance with?

1           A.       I can remember some. The Legal  
2 Standards section, obviously they provided  
3 the bulk of that.

4           I think some of the file  
09:18 5 history stuff, they provided an awful lot of  
6 that, the prosecution history.

7           We went back and forth on  
8 priority analysis, so there was a lot of  
9 that. And then editing throughout.

09:18 10          Q.       Anything else you can remember?

11          A.       No. That is the most of it.

12          Q.       Do you consider yourself the  
13 primary author of your declaration?

14          A.       Absolutely.

09:18 15          Q.       Do you believe that the  
16 declaration submitted to the Board is  
17 complete and accurate?

18          A.       I found a couple of typos.

19          Q.       Other than that?

09:18 20          A.       Some words that were missed.  
21 Some bad habits I have in replacing one word  
22 with another showed up in one that I didn't  
23 catch.

24          Q.       If we go through your  
09:18 25 declaration today, will you point those out

1 for me?

2 A. Sure.

3 Q. And sitting here today, are

4 there any changes that you need to make to

09:18 5 your declaration?

6 A. I kind of wish I had added the

7 group of provisionals in the exhibit.

8 Q. Fair.

9 Are there any materials that

09:18 10 you considered that are not identified in

11 your declaration, sitting here today?

12 A. No, other than just my general

13 knowledge.

14 Q. Now, you signed your

09:19 15 declaration. Correct?

16 A. Yes, ma'am.

17 Q. The big moment I know you've

18 been waiting for. I'm going to hand you

19 what's been previously marked as

09:19 20 Exhibit 1002, which is a copy of Dr. Durham's

21 declaration.

22 (Previously marked was Exhibit No. 1002.)

23 Q. (By Ms. Cooke) Dr. Durham, is

24 what I have handed you and what has been

09:19 25 previously marked as Exhibit 1002 a copy of

1 your declaration?

2 A. Yes, it appears to be.

3 Q. If you can, take a look at the

4 signature page. It's what should be on

09:19 5 Page 329 for me.

6 A. My 329 or the Exhibit 329?

7 Q. The Document 339.

8 A. (Reviewing) 339? Okay.

9 I see that on Exhibit

09:20 10 Number -- Exhibit Page 339.

11 Q. Yeah. Now, if you look at the

12 like Word document page numbers, there is a

13 Page 329. Right? On the prior page.

14 A. It would have been 330. On the

09:20 15 prior page, it's 329. Yes.

16 Q. Yes. So the page that you

17 signed doesn't actually have a page number,

18 does it?

19 A. Correct.

09:20 20 Q. Why does that page not have a

21 page number?

22 A. I can't answer that. I don't

23 know.

24 Q. Did you sign your signature

09:20 25 page before your declaration was complete?

1           A.       No.

2           Q.       Were there any changes made by

3 you or anyone else after you signed the

4 signature page to your declaration?

09:20 5           A.       No.

6           Q.       How do you know that?

7           A.       Well, I haven't seen any from

8 my review.

9           Q.       So this declaration you have in

09:20 10 front of you contains your opinions only.

11 Correct?

12          A.       Correct.

13          Q.       It does not contain the

14 opinions of anyone else?

09:21 15          A.       Well, I'm pretty sure counsel

16 shares most of my opinions.

17          Q.       But this declaration holds all

18 of your opinions?

19          A.       Correct.

09:21 20          Q.       And the declaration that you

21 submitted in connection with this IPR

22 provides your opinions regarding the validity

23 of one of Downing's patents. Right?

24          A.       Yes, that's correct.

09:21 25          Q.       Let's look at Paragraph 2 of

1 your declaration, please. Let me know when  
2 you're there.

3 A. (Reviewing) There is one of  
4 them.

09:21 5 Q. Typo?

6 A. Yes.

7 Q. Which is the typo?

8 A. The typos I referred to, US  
9 Patent 11,401,779, instead of 11,560,770.

09:21 10 Q. The '779 patent is not the  
11 patent the Board instituted the review of.  
12 Correct?

13 A. That's my understanding, yes.

14 Q. Any other typos or changes that  
09:21 15 we need to make today?

16 A. Yes, there are a couple.

17 Q. Point those out to me, please.

18 A. Sure. Paragraph 60, it's kind  
19 of a small one, but nevertheless, since we're  
09:22 20 going through the exercise.

21 Q. What's the change?

22 A. I say, "well completion may  
23 include running and production tubing  
24 strings."

25 THE REPORTER: Please slow down

1           when reading. I say...

2           THE WITNESS: When reading?

3           A.       "Well completion may include  
4 running and production tubing strings."

09:22 5           While that's accurate, my  
6 intent there was to say "production casing  
7 strings." So that's one.

8           Paragraph 347, even more minor,  
9 I have the comma on the wrong line, on  
09:23 10 Page 180, fourth line down.

11          Q.       Anything else?

12          A.       Yes. There's one more. It's  
13 actually substantive, a little bit  
14 substantive.

09:23 15                  Paragraph 553.

16          Q.       What's wrong with 553?

17          A.       Page 264, third full line from  
18 the end of the paragraph, I say, "The tree  
19 valve associated with the second valve," this  
09:23 20 is one of my bad habits, to type "valve" when  
21 I mean to say "well." That should say  
22 "second well."

23                  I thought I had caught all of  
24 those, but there is one I missed.

09:24 25          Q.       Anything else?

1           A.       Those are the ones I noticed.  
2       And, of course, the reference to the '779  
3       patent we've already discussed.

4           Q.       Can you take a look at  
09:24 5       Paragraph 18, please?

6           A.       Okay. I'm there.

7           Q.       Do you see the portion of  
8       Paragraph 18 where you refer to providing an  
9       explanation of how the challenge claims are  
09:24 10      unpatentable in the detailed discussion of  
11      Grounds 1 through 6?

12          A.       Yes, ma'am.

13          Q.       Is it your opinion that you're  
14      only offering an invalidity opinion as to  
09:24 15      Grounds 1 through 6?

16          A.       Oh. No. I definitely want to  
17      include Grounds 7 through 8 as well.

18          Q.       So is it your intention to have  
19      stated Grounds 1 through 8 in Paragraph 18?

09:25 20      A.       Yes, ma'am.

21          Q.       Any other typos?

22          A.       Not that I know of, but there  
23      is likely more.

24          Q.       Okay. So we went through a  
09:25 25      couple of the typos you mentioned just now.

1 Do any of those changes that  
2 you just described change the substance of  
3 the testimony set forth in your declaration?

4 A. No.

09:25 5 Q. Okay. At a high level can you  
6 please describe to me the steps that you take  
7 when determining whether you believe a patent  
8 is invalid?

9 A. Sure. First, obviously, I'm  
09:25 10 going to read the claims of the patent and  
11 read the specification and try to understand  
12 those claims in light of the specification,  
13 along with the file history, to understand  
14 what is being claimed, what is the claimed  
09:25 15 invention.

16 Then while I'm going through,  
17 I'm making notes on things that I think may  
18 have been known at the time of the priority  
19 date of the patent. Of course that requires  
09:26 20 an analysis to see what that priority date  
21 would be, so that's fairly early on.

22 And then I either go through my  
23 library or look for other references to  
24 verify or to challenge my memory, really, of  
09:26 25 what may have been known at the time and see

1 if what I remember is correct.

2 Q. Did you do that in this case?

3 A. Yes.

4 Q. Did you review any references

09:26 5 in trying to determine whether the '770

6 patent is invalid?

7 A. Yes.

8 Q. Did you find those references

9 yourself?

09:26 10 A. I found some myself. I think

11 counsel provided some as well.

12 Q. Which ones did counsel provide?

13 A. I couldn't tell you at this

14 point.

09:26 15 Q. You don't know which references

16 counsel provided?

17 A. It's way too long ago.

18 Q. Did counsel provide Krupa?

19 A. I don't recall.

09:26 20 Q. Did you find Krupa?

21 A. I don't recall.

22 Q. How about Carr?

23 A. Same answer.

24 Q. You don't recall one way or the

09:26 25 other any single reference in your

1 declaration, if you found it or if counsel  
2 found it?

3 A. Correct.

4 Q. Do you recall --

09:27 5 A. It really doesn't matter to me  
6 where it came from, only what it contains.

7 Q. Do you remember when you were  
8 retained by counsel in this case?

9 A. In summer of '23, I believe, if  
09:27 10 I get the year right. It was summer, because  
11 it was hot.

12 Q. Still warm. Well, it's still  
13 warm in Houston until about December.

14 But you recall being summer  
09:27 15 months?

16 A. Yes. I mean, I remember -- I  
17 remember the call and when I took it, and it  
18 was warm.

19 Q. Do you recall if the  
09:27 20 lawsuit -- like the underlying district court  
21 lawsuit had already been filed or not?

22 A. I don't recall the substance of  
23 that conversation except the general  
24 discussion of fracturing and my experience  
09:27 25 with that.

1 Q. I don't want to know what you  
2 talked about. Just generally when do you  
3 recall being retained?

09:27 4 A. No, just -- that's as far as I  
5 can remember.

6 Q. So is it your opinion that  
7 you've analyzed the claims of the '770 patent  
8 from the -- of a person of ordinary skill in  
9 the art?

09:27 10 A. Yes, that's the lens I would  
11 look through.

12 Q. Okay. And I can refer to a  
13 person of ordinary skill in the art as a  
14 POSITA?

09:28 15 A. Correct.

16 MS. COOKE: For the benefit of  
17 our court reporter, that's  
18 P-O-S-I-T-A.

09:28 19 Q. (By Ms. Cooke) Does that work  
20 for you, Dr. Durham?

21 A. Yes.

22 Q. And it's important to correctly  
23 define the skill of a POSITA, correct?

24 A. Yes.

09:28 25 Q. And the definition of a POSITA

1 needs to be evaluated at the time of the  
2 patent. Correct?

09:28 3 A. Correct. But a skilled artist  
4 or POSITA's knowledge at the time of a  
5 patent -- or that experience is what we would  
6 be looking -- the lens we would be looking  
7 through.

8 Q. And why is it important to  
9 correctly define the skill level of a POSITA?

09:28 10 A. Because, again, that's the lens  
11 I look through. That's what I'm trying to  
12 gather data around, is that knowledge.

13 Q. As of May 17, 2021, do you  
14 consider yourself meeting the definition of a  
09:28 15 POSITA?

16 A. Yes, ma'am.

17 Q. The technology at issue that  
18 we're going to be talking about today is  
19 hydraulic fracturing. Correct?

09:28 20 A. Well operations broadly. I  
21 would say well operations broadly.

22 Q. All well operations?

23 A. The ones claimed in the claims.

24 Q. Like water well operations?  
09:29 25 Any -- any well operations?

1           A.       Could be, the way the claims  
2 are written.

3           Q.       Are you an expert in water well  
4 drilling?

09:29   5           A.       There is not a significant  
6 difference between water well drilling in my  
7 experience. I've had a couple of water wells  
8 drilled. There is not a significant  
9 difference. Smaller, lighter weight  
09:29   10 equipment for sure.

11           Q.       So you don't agree that the  
12 technology of the '770 patent relates to  
13 hydraulic fracturing?

14           A.       A couple of the claims do. But  
09:29   15 several of the claims are much broader than  
16 that.

17           Q.       Do you disagree with me that  
18 the title of the '770 patent is "Hydraulic  
19 Fracturing Plan and Execution of Same"?

09:30   20           A.       That's correct.

21           Q.       And do you understand that the  
22 '770 patent abstract describes the invention  
23 as a hydraulic fracturing plan executable by  
24 a hydraulic fracturing system to  
09:30   25 hydraulically fracture a plurality of oil and

1 gas wells?

2 A. I can accept your  
3 representation, but I can't verify that  
4 without --

09:30 5 Q. Any reason to believe that's  
6 not correct?

7 A. -- the patent in front of me.

8 Q. Any reason to believe that's  
9 not correct?

09:30 10 A. I just can't verify one way or  
11 the other without looking at it.

12 Q. I hand you what's been  
13 previously marked as Exhibit 1001, the '770  
14 patent.

09:31 15 (Previously marked was Exhibit No. 1001.)

16 Q. (By Ms. Cooke) Now that you  
17 have the '770 patent in front of you, do you  
18 have any reason to dispute that the abstract  
19 states the invention is a hydraulic  
09:31 20 fracturing plan executable by a hydraulic  
21 fracturing system to hydraulically fracture a  
22 plurality of oil and gas wells?

23 A. You read that correctly.

24 Q. You consider yourself  
09:31 25 well-versed with oil and gas operations,

1 including well stimulation, completion, and  
2 hydraulic fracturing, right?

3 A. I do.

09:31 4 Q. And you're the principal of a  
5 company operating over 50 oil and gas wells  
6 in Oklahoma?

7 A. Correct.

8 Q. What kind of operations are  
9 being performed by your company?

09:31 10 A. I would say production  
11 operations, but we also, of course, on  
12 occasion, restimulate those wells, recomplete  
13 those wells. We don't drill new wells, but  
14 we do everything else.

09:32 15 Q. What type of operations are  
16 being used; conventional, zipper, simul-frac?

17 A. Small.

18 Q. Small?

09:32 19 A. Small, yeah. We call them a  
20 mini-frac or a small frac. These are mostly  
21 shallow wells in conventional formations,  
22 sandstones and limestones.

23 Q. Are any of your operations  
24 performing SUPERFRAC operations?

09:32 25 A. No.

1 Q. Are any of your operations  
2 capable of performing simul-frac?

3 A. We could, sure.

4 Q. Are they?

09:32 5 A. We don't use simul-frac, no.  
6 We could.

7 Q. But you're not currently doing  
8 that?

9 A. Correct.

09:32 10 Q. You've never done it in the  
11 past?

12 A. Not on our wells, no.

13 Q. What are the size of the  
14 hydraulic fracturing operations? You said  
09:32 15 it's small, but can you give me a little  
16 more --

17 A. Are you talking about our  
18 wells?

19 Q. Yes.

09:32 20 A. Couple thousand gallons of  
21 water at maybe 4- to 5,000 PSI.

22 Q. How deep are the wells?

23 A. 700 to 3,000 feet.

24 Q. How are you drilling them?

09:33 25 A. We don't drill.

1 Q. Who drills them?

2 A. Whoever drilled them.

3 Q. Do you know how they are

4 drilled?

09:33 5 A. Well, yes, each individual one

6 has a completion report and I can go look and

7 see how they were drilled.

8 Q. Are they directionally drilled?

9 A. No. All our wells are

09:33 10 vertical.

11 Q. What type of formations?

12 A. Sandstones and limestones.

13 Q. Permeability, high, low?

14 A. Some not as high as I would

09:33 15 like, that's for sure. As a comparison to

16 shale, high.

17 Q. Have you ever personally been

18 on a hydraulic fracturing site?

19 A. Yes.

09:33 20 Q. How many times?

21 A. Dozens.

22 Q. Have you ever personally

23 managed a hydraulic fracturing operation?

24 A. As the primary, no.

09:33 25 Q. Have you ever managed it at

1 all?

2 A. I've developed fracturing plans  
3 and witnessed them, but, no, I don't manage  
4 the hydraulic fracturing operations.

09:33 5 Q. How many times have you ever  
6 personally been on a site, managing an  
7 operation?

8 A. Well, I just said zero.

9 Q. Have you ever directed any  
09:34 10 aspects of an operation during a frac job?

11 A. Yes.

12 Q. Which portions?

13 A. Developing the plan.

14 Q. But while that plan was being  
09:34 15 executed, you never directed any of the  
16 operations?

17 A. No. The fracturing company  
18 does that. You stay out of the way.

19 Q. So you personally have not?

09:34 20 A. Correct. There's -- they  
21 manage their own equipment to fracture to the  
22 plan.

23 Q. In your declaration I think you  
24 also mentioned that you're familiar with an  
09:34 25 organization called the Occupational Safety

1 and Health Administration, or OSHA. Correct?

2 A. Yes.

3 Q. And it's the OSHA's

4 responsibilities with oil and gas locations.

09:34 5 Right?

6 A. Yes. That's part of it,

7 correct.

8 Q. Is it fair to say you're

9 familiar with the dangers involved with

09:34 10 hydraulic fracturing operations?

11 A. Yes, I would say that I am.

12 Q. And what are main risks

13 associated with hydraulic fracturing well

14 operations?

09:34 15 A. The main risk is pressurized

16 equipment and a rupture of the pressurized

17 equipment.

18 Q. Why is that?

19 A. That could cause injury or

09:35 20 death to personnel.

21 And past that you get to other

22 risks, such as silica inhalation, your normal

23 trip-and-fall hazards at a relatively

24 congested site, electricity, heat and those

09:35 25 kind of things.

09:35 1 Q. So with respect to the risks  
2 associated with pressurized equipment and the  
3 rupture of the pressurized equipment, can you  
4 explain or kind of expand on that a little  
5 bit more? What are the risks?

09:35 6 A. Yeah. So if a frac iron or a  
7 pump has a failure of a seal or the frac iron  
8 ruptures, then -- the fracturing operations  
9 today are several thousand pounds; and if  
10 that equipment ruptures, you could have a  
11 liquid stream that could cause injury,  
12 high-pressure liquid stream, high velocity.

09:35 13 Or you could equipment moving  
14 around and striking people, causing injury.  
15 It feels like an explosion, is the best way I  
16 can describe it.

17 Q. What might cause that type of  
18 failure?

09:36 19 A. Seals on pumps or the valves,  
20 or the iron itself -- the piping itself could  
21 rupture, or couplings. Any of the  
22 pressurized equipment could rupture.

23 Q. Are you familiar with a term  
24 called a red zone?

09:36 25 A. Yes.

1 Q. What is a red zone?

2 A. The red zone is

3 around the -- it's an area laid out around  
4 the wellhead and the pressurized equipment

09:36 5 that people -- during the pressurized  
6 operations personnel are instructed, for the  
7 large majority, to stay out of that red zone  
8 in order to minimize the risks of injury from  
9 pressure ruptures.

09:36 10 Q. For the well sites that your  
11 company operates -- I know you mentioned that  
12 they are kind of lower pressure, lower  
13 depth -- are there still red zones on your  
14 equipment?

09:36 15 A. Yes. Well, from the  
16 fracturing, yes.

17 Q. Why?

18 A. For the same reason, to keep  
19 people away from the pressurized equipment.

09:36 20 Q. And is there danger associated  
21 with switching from one well to another well?

22 A. Of course.

23 Q. Can you kind of explain that a  
24 little bit more for me, please?

09:37 25 A. Any time you're doing valve

1 operations, during pressurized operations  
2 there is a risk that if you don't coordinate  
3 that properly, you can close in on a  
4 pressurized flow. And the type pumps we use  
09:37 5 for fracturing don't -- they don't stall out  
6 on pressure. The pressure continues to rise  
7 until something gives.

8 Q. And why would that be  
9 dangerous?

09:37 10 A. Because you can exceed the  
11 pressure rating of the equipment.

12 Q. And so how do you mitigate the  
13 risk of danger when you're switching from one  
14 well to another well?

09:37 15 A. The first way is we keep people  
16 out of the red zone, and the second way is  
17 coordinate our operations.

18 Q. And what do you mean by  
19 "coordinate our operations"?

09:37 20 A. You take steps to verify that  
21 you're not moving valves during a high flow  
22 situation.

23 Q. With a sequence of events that  
24 have to happen?

09:37 25 A. Yes.

1 Q. And would you need to turn  
2 pumps off when you're switching between  
3 wells?

4 A. Not necessarily.

09:38 5 Q. In your operations that you  
6 perform with your company currently, are the  
7 pumps turned off between moving from one well  
8 to another well?

9 A. The pumps are turned off,  
09:38 10 stacked up on the truck or trailer, and  
11 driven down the road. So, yes.

12 Q. Between wells?

13 A. Between wells, yes.

14 Q. So explain to me a little bit  
09:38 15 more in detail about the dangers that are  
16 associated with leaving the pumps running  
17 when you're going between a well. It's the  
18 pressure that's created. Right?

19 A. Well, correct, because the  
09:38 20 pumps we use for hydraulic fracturing, for  
21 the vast majority, the only ones I've ever  
22 seen, are what's referred to as positive  
23 displacement pumps, usually plunger pumps,  
24 sometimes piston pumps. And those type pumps  
09:38 25 move the same volume of fluid every stroke.

1                   So if your pump is running  
2   against a deadhead situation, the pump will  
3   continue to move fluid until something gives,  
4   until the pump seals -- usually the pump  
09:38 5   seals, but it could also be a valve or valve  
6   body or coupling or something else.

7           Q.       So when something goes wrong,  
8   what is the typical cause of the catastrophic  
9   failure?

09:39 10          A.       I couldn't give you a typical  
11   cause of a catastrophic failure.

12          Q.       Some examples?

13          A.       Maybe clarify that question.

14          Q.       So when you're switching from  
09:39 15   one well to another well, you've left your  
16   pumps running, give me some examples of what  
17   goes wrong in the sequence.

18          A.       You could close in all the  
19   valves and not allow flow which would cause  
09:39 20   pressure to spike, then hopefully blow out a  
21   pump seal, because that tends to be the  
22   safe -- the less dangerous option. But if  
23   not, it can rupture a frac iron or a valve  
24   body.

09:39 25          Q.       Okay. So one scenario is you

1 would leave both valves closed. Are there  
2 any other scenarios?

3 A. I mean -- are there any other?  
4 Sure. I mean, you could have anything go  
09:39 5 wrong at a fracturing operation. You could  
6 get water on the electrical equipment and  
7 cause a shock hazard. People could be  
8 exposed to the shock hazard.

9 Q. More specifically with leaving  
09:40 10 the pumps running with two valves being  
11 switched between them?

12 A. Oh. Your main risk there is  
13 you're going to deadhead.

14 Q. What's that mean?

09:40 15 A. Have no flow path coming out of  
16 the pumps, so the pumps spike pressure.

17 Q. Are there any particular  
18 dangers associated with valves?

19 A. Well, yes.

09:40 20 Q. What would that be?

21 A. Well, we've just been talking  
22 about valves. And if you misapply the valve  
23 or misoperate the valve, you could have a  
24 pressure spike.

09:40 25 Valves could rupture. Valves

1 can leak either through the stem or through  
2 the body itself, causing a hazard.

09:40 3 As valves are moving, there is  
4 a pinch risk, a pinch hazard. Valves on the  
5 ground are a trip hazard. There's lots of  
6 hazards.

7 Q. And how can you mitigate that  
8 risk?

09:41 9 A. Mostly, on the fracturing side,  
10 the way we mitigate that risk is keep  
11 personnel out of the red zone during high  
12 pressurized operations.

13 Q. And ideally you would rather it  
14 not happen at all. Right?

09:41 15 A. Ideally.

16 Q. How do you mitigate it to the  
17 point of trying to avoid having it happen at  
18 all?

09:41 19 A. That's an engineering control  
20 and that's in coordination of your  
21 operations.

22 Q. So coordination is important?

23 A. Sure.

09:41 24 Q. What does it mean if a valve  
25 has a blowout?

09:41 1 A. It could mean two different  
2 things. One, it could mean the valve body  
3 has ruptured, and I think that's probably the  
4 most common meaning of the term. The valve  
5 body itself or the stem is ruptured, so it's  
6 leaking fluid into the environment.

7 The second, a valve blowout  
8 could mean the seals of the valve or the gate  
9 or ball, or whatever is stopping the flow,  
09:41 10 could blow out and allow uncontrolled fluid  
11 flow through the valve.

12 Q. And how might a valve blowout  
13 happen?

14 A. Again, you could have the seals  
09:41 15 on the stem that rupture, you could have the  
16 body fail, or you could have the control  
17 mechanism or the, virtually, gate or ball or  
18 plug, whatever is controlling, could fail and  
19 allow fluid flow through the valve.

09:42 20 Q. So these valves -- sequence in  
21 operation of the valves precisely is  
22 important?

23 A. Coordination of your operations  
24 is important, correct.

09:42 25 Q. Can you remotely command a

1 valve to function?

2 A. Yes. Been doing that for a  
3 hundred years, probably.

09:42 4 Q. And have you ever seen a valve  
5 not switch from an open position to a closed  
6 position when it's commanded remotely?

7 A. Yes.

8 Q. And can you explain that a  
9 little bit more?

09:42 10 A. I don't -- I mean, I don't  
11 understand the question, maybe. It just  
12 doesn't switch when it's told to.

13 Q. Okay. And what happens if a  
14 valve is told to switch closed and it  
09:42 15 doesn't?

16 A. Then you don't stop fluid flow.

17 Q. Okay. And what if it's  
18 commanded to be open and it's left closed?

19 A. Then you don't allow fluid  
09:42 20 flow.

21 Q. Could there be accidents  
22 associated with that?

23 A. If you don't catch it, yes.

24 Q. What happens if you don't catch  
09:42 25 it?

1           A.       Then you have uncontrolled  
2 fluid flow.

3           Q.       In the scenario that you're  
4 supposed to leave it open, then it's closed?

09:43   5           A.       What -- can happen?

6           Q.       Yes.

7           A.       Ultimately you can rupture the  
8 body of a valve or the piping or the seals on  
9 the pump, depending on if you're pumping.

09:43   10          Q.       Let's talk a little bit  
11 about -- strike that.

12                   So with all of this, safety is  
13 an important factor. Obviously OSHA is  
14 involved. Right? Can be involved?

09:43   15           A.       OSHA can be involved, yes.

16          Q.       And are there types of safety  
17 equipment that's available to prevent frac  
18 iron from exploding during pressure pumping  
19 operations?

09:43   20           A.       Well, your primary safety  
21 component is properly designing the frac iron  
22 to handle the pressures expected and properly  
23 coordinating your system to not exceed those  
24 pressures. That's your primary engineering  
09:43   25 controls.

1 But past -- I guess maybe I  
2 don't understand your question.

3 But, no, other than -- other  
4 than those things, I don't know of anything  
09:44 5 you put on the piping to increase its rating  
6 or prevent its failure.

7 Well, okay -- well, we do strap  
8 it down so in case it does have a  
9 movement -- or does have a problem, it  
09:44 10 doesn't move quite as much. You can do that.

11 Q. Okay. Is any sort of that  
12 safety equipment expensive?

13 A. Strapping it down? No, not  
14 particularly.

09:44 15 Q. You mentioned coordinating,  
16 too.

17 A. Coordinating is an engineering  
18 control, correct.

19 Q. Expensive?

09:44 20 A. It's part of the job.

21 Q. Is it expensive?

22 A. I don't know what you mean by  
23 "expensive," but it's part of the cost of  
24 doing business in fracturing.

09:44 25 Q. I mean, it has a cost

1 associated with it?

2 A. Of course.

3 Q. Does implementing some sort of  
4 coordination system remotely make the project  
09:44 5 more complicated?

6 A. It can make it  
7 less -- depending on what you mean by  
8 "remotely." If you're talking about on-site  
9 remote, it could make it less complicated and  
09:45 10 fewer personnel involved and more  
11 coordination. If you allow the automation to  
12 do it -- you're talking about remote from a  
13 control center -- it can make it more  
14 complicated.

09:45 15 Q. Even on-site would be more  
16 equipment, correct?

17 A. More equipment -- correct. You  
18 replace personnel with equipment.

19 Q. And those things have to work  
09:45 20 precisely in a coordinated fashion, right?

21 A. Well, they have to work in a  
22 coordinated fashion. "Precise" is not a word  
23 used very often in the oil field.

24 Q. Well, if it doesn't work  
09:45 25 precisely, somebody might die. Right?

1           A.       No. If it doesn't work  
2 properly, somebody could die, yeah.  
3 "Precisely" is -- again, it's not a term we  
4 usually use.

09:45 5           Q.       So let's talk about early  
6 hydraulic fracturing. I think in your  
7 declaration you mention that early hydraulic  
8 fracturing was something that started in the  
9 1940s. Right?

09:46 10          A.       Again, do you have that  
11 section?

12          Q.       I'm just asking you based on  
13 your experience, do you remember when early  
14 hydraulic fracturing began?

09:46 15          A.       Hydraulic fracturing, yes, I  
16 can agree that was the 1940s.

17          Q.       What is something called plug  
18 and perforate?

09:46 19          A.       Plug and perforate, or plug and  
20 perf I may refer to it, is a process of  
21 fracturing where you fracture, for example,  
22 the toe first.

23                    You isolate that section of the  
24 wellbore and then you -- you perforate it,  
09:46 25 and then you typically -- you fracture it at

09:46 1 that point, bring your equipment up the hole,  
2 set a plug to keep the pressure from going  
3 into that area you've already perforated and  
4 fractured, perforate another zone, and follow  
5 that process all the way up the wellbore.

6 Q. Were these original  
7 conventional methods efficient?

8 A. Well, which area are you  
9 particularly talking about? I mean, we've  
09:47 10 talked about 1940s. We've talked about plug  
11 and perf, which was not for another 40 years  
12 or 50 years.

13 Q. Okay. So when did plug and  
14 perf come into play?

09:47 15 A. Largely with the admin of  
16 horizontal drilling in the 1980s, really,  
17 when horizontal drilling became a big deal.

18 Horizontal drilling -- I think  
19 I talk about it in here -- goes back to -- or  
09:47 20 deviated drilling goes back to maybe 1930s,  
21 but 1980s when it became kind of a bigger  
22 deal in the South Texas area.

23 And so -- we did some plug and  
24 perf probably before that -- of course that  
09:47 25 was a little bit before my time -- but really

1 became a big deal in horizontal wells.

2 Q. Okay. So these kind of  
3 pre-2000s methods of hydraulic fracturing,  
4 would you consider them efficient?

09:47 5 A. Compared to what was done  
6 previous to that, yes. Compared to what was  
7 done after that, no.

8 Q. So are you familiar with a term  
9 called "nonproductive time"?

09:48 10 A. Yes, ma'am.

11 Q. And what do you call the time  
12 between when fracturing is performed and then  
13 not being performed? Is that what  
14 nonproductive time is?

09:48 15 A. Not -- not really.

16 Q. How would you explain what  
17 nonproductive time is?

18 A. Nonproductive time is when you  
19 have equipment and personnel waiting.

09:48 20 Q. Waiting for what?

21 A. For anything. If they are  
22 waiting for anything, that's nonproductive  
23 time.

24 Q. Give me some examples of when  
09:48 25 personnel and equipment might be waiting.

1           A.       On a hydraulic fracturing site  
2 particularly?

3           Q.       Yes.

4           A.       Okay. You could be waiting for  
09:48 5 perforation options or wireline operations to  
6 be complete so that you can begin pumping.

7                   Wireline personnel could be  
8 waiting on a fracturing stage to be complete  
9 so that they can perform wireline operations.

09:48 10                  You could be waiting for  
11 delivery of materials, proppants, chemicals,  
12 water or other fluids that prevent you from  
13 pumping.

14                   There is just a variety of  
09:48 15 things that could cause waiting time.

16           Q.       So at least --

17           A.       Equipment.

18           Q.       -- with respect to performing  
19 hydraulic fracturing, one time you might  
09:49 20 encounter nonproductive time would be between  
21 stages in a single well?

22           A.       Could be, yes.

23           Q.       And then another time you may  
24 encounter nonproductive time would be the  
09:49 25 time taken between one well being fractured

1 and another well being fractured?

2 A. Could be, sure.

3 Q. With these conventional methods  
4 we were just talking about -- so, again, kind  
09:49 5 of just to orient pre-2000s -- how much  
6 nonproductive time was there with respect to  
7 the well hydraulic fracturing themselves, not  
8 waiting for supplies, et cetera, but the  
9 actual well process?

09:49 10 MS. MARGONIS: Objection, form.

11 A. I don't think I undertook a  
12 study of those numbers. Unless you can point  
13 me to a place in my declaration that I have  
14 it, I don't think I undertook a study of  
09:50 15 those numbers for to declaration.

16 Q. (By Ms. Cooke) So if you were  
17 performing hydraulic fracturing of a well  
18 with multiple stages, how much nonproductive  
19 time would you have between the stages --  
09:50 20 each stage?

21 A. Again, I don't think I -- with  
22 regards to this declaration, I don't think I  
23 undertook a study of that and looked at the  
24 literature to see what that might have been  
09:50 25 at any given point in time.

1 Q. It wasn't something that was  
2 important to you for this purpose?

3 A. Well, it wasn't necessary for  
4 me to understand the claims.

09:50 5 Q. And if you were transitioning  
6 from fracturing one well to fracturing  
7 another well, what would be the nonproductive  
8 time between each well?

9 A. Same answer. I don't think I  
09:50 10 undertook a study of that with regard to this  
11 declaration. It wasn't necessary for me to  
12 understand the claims.

13 Q. Are you familiar with a term  
14 called "zipper fracturing"?

09:50 15 A. Yes, ma'am.

16 Q. What is zipper fracturing?

17 A. Zipper fracturing kind of has  
18 two definitions depending on who is using it.

19 Zippering fracturing to a  
09:51 20 geologist or petroleum engineer may mean  
21 performing fracturing operations so that you  
22 create zipper-like fractures in the  
23 formation, more tortuous fractures that allow  
24 easier fluid flow into the wellbore.

09:51 25 Zipper fracturing to a frac

1 hand, for example, may be the process of  
2 simultaneous or sequential fracturing  
3 operations on multiple wells at a single pad.

4 Q. What is a frac hand?

09:51

5 A. A frac hand is just a term of  
6 art, really, we use for any personnel that  
7 are operating the fracturing equipment.

8 Q. Do you recall why zipper  
9 fracturing was developed?

09:51

10 A. Yeah, I think I did talk about  
11 that in my declaration. Let me see if I can  
12 find it.

13 It came out of the knowledge of  
14 creating the zipper fractures largely, I  
09:52 15 think, out of some Alaska work that was done.  
16 I think Jacobs reference contains that  
17 information. And then -- that was in the  
18 late '80s, early '90s time frame.

19 And then once they realized  
09:52 20 that pressurizing multiple wellbores that are  
21 close to each other creates zipper  
22 fracturing, maybe in the late '90, 2000s time  
23 frame, fracturing companies began  
24 experimenting and developing processes to  
09:52 25 create these fractures by sequentially or

1 simultaneously fracturing the wells.

2 Q. What do you mean by  
3 "sequentially or simultaneously fracturing  
4 wells"?

09:52 5 A. Sure. So, again, I think it's  
6 the Jacobs reference talks about creating the  
7 zipper fractures. And the way those  
8 fractures are created is by having pressure  
9 in two different wellbores at the same time.

09:53 10 And the pressure in the -- one  
11 wellbore impacts the fracturing formation in  
12 the other wellbore and they create these  
13 tortuous fractures.

14 And so what practitioners found  
09:53 15 out is that in shale formations, you don't  
16 have a lot of leak-off. The fluid, once  
17 you've -- fracture a zone, that pressure  
18 stays in the wellbore or near the wellbore  
19 for a long time as opposed to like a

09:53 20 sandstone. When you fracture a sandstone,  
21 then you have leak-off into the formation.

22 So the process of sequential  
23 fracturing is they would fracture a zone or a  
24 well, plug it or seal it off in order to  
09:53 25 maintain pressure in that wellbore, and then

1 fracture the next well that's in close  
2 proximity in order to create the zipper-like  
3 fractures.

09:53 4 Q. So that's sequential. What  
5 about simultaneous?

6 A. A simultaneous fracturing,  
7 generally when the term is used -- it could  
8 have a broader implication. But generally  
9 when the term is used, it means intentionally  
09:54 10 pressurizing two or more wells, typically on  
11 the same drill pad, at the same time.

12 Q. Can you describe the benefits  
13 of zipper fracturing and what it provides  
14 over some of the conventional methods like  
09:54 15 plug and perf?

16 A. Well, plug and perf -- maybe I  
17 should just say plug and perf is still often  
18 part of zipper fracturing. The techniques  
19 are not incompatible.

09:54 20 But the benefits of zipper  
21 fracturing is two-fold. One is downhole, the  
22 creation of the zipper-like or more tortuous  
23 fractures that allow for higher permeability  
24 in the formation and easier flow of the  
09:54 25 hydrocarbons into the wellbore.

1                   And the second benefit is on  
2                   the surface where you can have the equipment  
3                   and personnel operating more continuously,  
4                   lower nonproductive time.

09:54   5           Q.       So zipper fracturing would  
6           reduce some of the nonproductive time?

7           A.       Yes, it would.

8           Q.       How?

9           A.       Well, because it allows for the  
09:55   10          pumping equipment, for example, to move from  
11          Well 1 to Well 2 to Well 3 to Well 4 and back  
12          to Well 1 on -- using, for example, the  
13          four-well drill pad and not have to wait.

14                   And at the same time they are  
09:55   15          pumping, the wireline operations are taking  
16          place in the well that they just completed so  
17          that you're not waiting for wireline  
18          operations to be completed in a single well  
19          when you're fracturing multiple stages.

09:55   20          Q.       How much did zipper fracturing  
21          reduce nonproductive time?

22          A.       I think some of the references  
23          may have those numbers. But, again, for this  
24          declaration, I didn't -- I don't believe I  
09:55   25          included any of that quantification.

1 Q. All right. I think you  
2 mentioned a Jacobs article. Let's take a  
3 look at that. It was previously marked as  
4 Exhibit 1009.  
09:56 5 (Previously marked was Exhibit No. 1009.)  
6 Q. (By Ms. Cooke) Let me know  
7 when you have that in front of you.  
8 A. Okay. I've got it in front of  
9 me.  
09:56 10 Q. Do you recognize Exhibit 1009  
11 that I just handed you as the Jacobs article  
12 you've been referencing?  
13 A. Yes, that's one of the  
14 references in my Technical Background  
09:56 15 section.  
16 Q. Okay. And you relied on the  
17 Jacobs article to form the opinion about  
18 zipper fracturing in your declaration, right?  
19 A. That's one of the references I  
09:56 20 used.  
21 Q. Do you believe Jacobs to be an  
22 accurate description of zipper fracturing?  
23 A. Yes, in general terms.  
24 Q. I want you to turn to Page 61  
09:56 25 of the Jacobs article, which is a little bit

1 confusing because it's the second page.

2 A. Sure. Okay.

3 Q. Do you see at the top of the

4 second column where it says, "Clifford

09:56 5 Phillips, an advanced drilling engineer at

6 Marathon, said 'when doing zipper fracturing,

7 the break in stimulation operations may only

8 last 15 minutes as workers switch from one

9 well to another'?"

09:57 10 A. Yes, I see that.

11 Q. Did I read that correctly?

12 A. Yes.

13 Q. Do you know Clifford Phillips?

14 A. I don't.

09:57 15 Q. Do you know what Mr. Phillips  
16 means when he says "the break in stimulation  
17 operations may only last 15 minutes as  
18 workers switch from one well to another"?

09:57 19 A. Well, taken in context with the  
20 rest of the article, and particularly the  
21 preceding paragraph where it talks about two  
22 to three hours, I understand he's talking  
23 about the break in pumping operations,  
24 inactively pumping.

09:57 25 Q. Meaning that the pumps would be

1 stopped during the break in the stimulation  
2 operations when the workers switched from one  
3 well to the next. Right?

4 A. Yes.

09:57 5 Q. And so you agree that even with  
6 zipper fracturing, there is still  
7 nonproductive times when the pumps are  
8 stopped?

9 A. There can be.

09:57 10 Q. There is here, in Jacobs?

11 A. At the time of the Jacobs  
12 article at -- for Marathon's operations, yes,  
13 there were.

14 Q. What is the date on the Jacobs  
09:58 15 article?

16 A. This would have been October  
17 2014.

18 Q. Specialized equipment is also  
19 needed for zipper fracturing, right?

09:58 20 A. As composed -- as compared to  
21 what?

22 Q. Any other types of operations  
23 or conventional methods.

24 A. No, not really.

09:58 25 Q. Use the exact same equipment?

1           A.       Conventional fracturing  
2 equipment used in a different method, yes.

3           Q.       Did conventional fracturing  
4 equipment use a zipper manifold?

09:58 5           A.       Yes. I mean, it -- that's  
6 conventional equipment. A zipper manifold is  
7 still conventional equipment, I would say.

8           Q.       So in the 1940s, 1960s, when  
9 they were doing single-well productions, you  
09:58 10 were using zipper manifolds?

11          A.       You were using manifolds,  
12 certainly.

13          Q.       I'm asking if they were using  
14 zipper manifolds.

09:58 15          A.       Well, I -- there's no  
16 difference between -- necessarily between a  
17 zipper manifold and any other manifold. It's  
18 just whether it's used -- manifolds are used  
19 to either collect fluid flow from multiple  
09:59 20 sources into one source or to distribute  
21 fluid flow from a single source to multiple  
22 destinations.

23                   Basically a zipper --  
24 colloquially a zipper manifold is a frac  
09:59 25 missile turned sideways.

|       |    |                                               |
|-------|----|-----------------------------------------------|
|       | 1  | So, again, I would just                       |
|       | 2  | describe that as using conventional equipment |
|       | 3  | in a different method.                        |
|       | 4  | Q. So you're just saying pipes and            |
| 09:59 | 5  | valves are conventional?                      |
|       | 6  | A. Pipes and valves and manifolds             |
|       | 7  | are certainly conventional, yes.              |
|       | 8  | Q. People in the 1940s regularly              |
|       | 9  | referred to these things as zipper manifolds? |
| 09:59 | 10 | A. No. I think that term came                 |
|       | 11 | -- again, that's a surface term -- a surface  |
|       | 12 | frac hand term used for a manifold used to    |
|       | 13 | distribute fluid to multiple wells.           |
|       | 14 | Q. A zipper manifold has                      |
| 10:00 | 15 | particular meaning to people of ordinary      |
|       | 16 | skill in the art. Right?                      |
|       | 17 | A. Manifold used in fracturing                |
|       | 18 | operations -- or zipper fracturing            |
|       | 19 | operations.                                   |
| 10:00 | 20 | Q. Are you familiar with the                  |
|       | 21 | Schlumberger Energy Glossary?                 |
|       | 22 | A. Yes.                                       |
|       | 23 | Q. Is that a reputable resource?              |
|       | 24 | A. It can be, yes.                            |
| 10:00 | 25 | Q. In what scenarios can it be?               |

1           A.       It often provides definition of  
2 terms that are used colloquially that may not  
3 have an academic definition.

10:01 4           Q.       All right. I'm going to hand  
5 you what we've marked as Exhibit 2008. Let  
6 me know when you've got that in front of you.

7           (Marked was Exhibit No. 2008.)

8           A.       (Reviewing.) Okay.

10:01 9           Q.       (By Ms. Cooke) So do you  
10 understand what I've handed you as Exhibit  
11 2008 to be the dictionary definition of  
12 "Zipper Manifold" from the Schlumberger  
13 Energy Glossary?

10:01 14          A.       Yes, that's what it appears to  
15 be.

16          Q.       And the definition that this  
17 energy glossary provides for zipper manifold  
18 is "a system of frac valves that directs  
19 treatment fluid from the missile to multiple  
10:01 20 frac trees. The zipper manifold facilitates  
21 quick redirection of fracturing pressure from  
22 one well to another enabling pump trucks to  
23 run nearly continuously to minimize  
24 downtime."

10:02 25                   Did I read that correctly?

1           A.       Yes, ma'am.

2           Q.       Do you agree that that

3 definition is consistent with how a POSITA

4 would understand the meaning of zipper

10:02 5 manifold?

6           A.       That could be one definition,

7 yes.

8           Q.       Do you have a different one?

9           A.       I think colloquially that's

10:02 10 right, but I would say a person of ordinary

11 skill would understand a zipper manifold to

12 be a manifold used in zipper frac operations.

13           Q.       So you're disagreeing with the

14 Schlumberger Energy Glossary definition?

10:02 15           A.       No. I'm saying that's a fine

16 definition.

17           Q.       And would the Schlumberger

18 energy definition of zipper manifold be

19 consistent with the understanding of a POSITA

10:02 20 also in May of 2021?

21           A.       Yes, that could be one

22 definition a POSITA would understand. Yes.

23           Q.       Has it changed over time, in

24 the last three years?

10:02 25           A.       In the last three years,

1     probably not.

2             Q.     All right.  What is a missile?

3             A.     A missile, again, is a -- it's  
4     a colloquial term.  It's used to describe the  
10:03 5     manifold that at least gathers  
6     equipment -- I'm sorry, gathers fluid flow  
7     from the fracturing pumps and delivers it to  
8     the wells.

9                     And oftentimes, at least in the  
10:03 10    last maybe 15 to 20 years, it also contains a  
11    fluid path to supply fluid from the blender  
12    to the fracturing pumps.

13            Q.     I have another exhibit for you.  
14    We've marked this as 2009.

10:03 15            (Marked was Durham Exhibit No. 2009.)

16            Q.     (By Ms. Cooke) Let me know when  
17    you have that in front of you.

18            A.     (Reviewing.)

19                     MS. COOKE:  (Tendering.) The  
10:04 20    table is not nearly slippery enough.

21            A.     Okay.  I've got that in front  
22    of me.

23            Q.     (By Ms. Cooke)  So I've just  
24    handed you another excerpt from the  
10:04 25    Schlumberger Energy Glossary for definition

1 of "Missile." Correct?

2 A. Yes.

3 Q. And that definition for missile  
4 is "a flow control unit used in the  
10:04 5 pressurization of fluid employed in hydraulic  
6 fracturing. Fracturing fluid enters the  
7 missile at low pressure and is directed to  
8 the pump trucks for pressurization. High  
9 pressure fluid returns to the missile and is  
10:04 10 directed to the well or, in the case of a  
11 multi-well pad, to the frac manifold."

12 Did I read that correctly?

13 A. Yes.

14 Q. Do you agree with that  
10:04 15 definition of missile?

16 A. Yes. I think that's consistent  
17 with what I said.

18 Q. Do you agree that the meaning  
19 of missile is different than the meaning of  
10:05 20 zipper manifold?

21 A. In this definition, of  
22 course -- they have different descriptions in  
23 Schlumberger's glossary, but they also refer  
24 to a frac manifold -- both refer to a frac  
10:05 25 manifold.

1                   And I would say that they are  
2                   used differently in some cases. In some  
3                   cases they are used as a similar thing. In  
4                   other words, you could refer to a missile as  
10:05 5                   a frac manifold and you could refer to a  
6                   zipper manifold as a frac manifold and they  
7                   would both be accurate.  
8                   Q.       Okay. Well, let's back up a  
9                   little bit.  
10:05 10                   The Schlumberger Energy  
11                   Glossary provides two different definitions.  
12                   One is for a zipper manifold and the other is  
13                   for missile. Correct?  
14                   A.       Correct.  
10:05 15                   Q.       So in theory, at least  
16                   according to Schlumberger, missile and zipper  
17                   manifold are two different things?  
18                   A.       Yes, they can be two different  
19                   things.  
10:05 20                   Q.       Are you saying they can also be  
21                   the exact same thing?  
22                   A.       Yes, you can use the term "frac  
23                   manifold" to refer to both, particularly if  
24                   you're not using a zipper frac operation.  
10:06 25                   Q.       Different question. Do you

1 understand the word "missile" and the word  
2 "zipper manifold" to be the same thing? Not  
3 frac manifold.  
4 "Zipper manifold" and  
10:06 5 "missile."  
6 A. It's a little bit limiting to  
7 not use the term "frac manifold" because  
8 that's term is used in the field, as well, to  
9 refer to both.  
10:06 10 But a missile generally gathers  
11 fluid from the pumps into one location, and  
12 what can be called a zipper manifold  
13 distributes in a zipper frac operation fluid  
14 from one source to multiple wells.  
10:06 15 Q. I think this is a little more  
16 simple question than we end up going to.  
17 So --  
18 A. Well, it's -- it's not.  
19 Q. -- I just want to start with me  
10:06 20 on a high level.  
21 You agree with me that a  
22 missile and a zipper manifold are not the  
23 same thing?  
24 A. They are both frac manifolds,  
10:06 25 but they are used differently.

1 Q. I just want you to answer the  
2 question.

3 I understand that you think a  
4 frac manifold covers, as an umbrella,  
10:07 5 missiles and zipper frac manifolds. Right?

6 A. Yes.

7 Q. But under that umbrella we have  
8 a missile and a zipper manifold?

9 A. Correct.

10:07 10 Q. Those two things are not the  
11 same?

12 A. Not all the time. They  
13 are -- they are -- and the reason I say that  
14 is they are often -- or not often but  
10:07 15 sometimes combined into a single structure.

16 Q. So you think a single structure  
17 can be both a missile and a zipper manifold?

18 A. Yes. So it's not as simple a  
19 question as you want it to be.

10:07 20 Q. But at least in the instance of  
21 Schlumberger, we are provided two different  
22 definitions?

23 A. Correct.

24 Q. What does it mean that the  
10:07 25 manifold directs treatment fluid from the

1 missile to the multiple frac trees?

2 A. It's just like I said earlier.  
3 In the way that Schlumberger defines it, the  
4 zipper manifold is the manifold that gathers  
10:07 5 it from one source, the missile, and  
6 distributes that fluid to multiple wellheads  
7 which have frac trees on them, during a  
8 fracturing operation.

9 Q. Is it correct that the zipper  
10:08 10 manifold is downstream from the missile?

11 A. When they are separate  
12 structures, yes. Well, the portion of the  
13 structure would be, yes.

14 Q. In what scenario would you have  
10:08 15 the missile and the zipper frac manifold be  
16 the same structure?

17 A. In the situation where you've  
18 mounted the equipment together to allow for  
19 ease of installation at the fracturing site.

10:08 20 Q. Explain that a little more.  
21 I'm not at the level of expertise that you  
22 are.

23 So you are mounting it  
24 together. What are you mounting together?

10:08 25 A. You mount it together in a more

1 permanent configuration, such as on a  
2 trailer, so that you have only have to drag  
3 one trailer to the site and connect to it  
4 rather than build the frac manifold or build  
10:08 5 the iron at the site.

6 Q. And so if it's all on a truck,  
7 in that instance a zipper manifold is going  
8 to be the same structure as missile?

9 A. Yes.

10:08 10 Q. And that's even in multi-well  
11 scenarios?

12 A. Sure. Yeah.

13 Q. So I want to make sure we're  
14 looking back at the Schlumberger definition  
10:09 15 for zipper manifold. It talks about quick  
16 redirection of fracturing pressure from one  
17 well to another. What does that mean?

18 A. It's just that. You don't have  
19 to connect iron in between stages -- or  
10:09 20 moving from one well to the next well, you  
21 don't have to move over -- disconnect the  
22 iron -- and by "iron," I mean piping,  
23 primarily, and valves -- disconnect the iron  
24 from one well, swing it over in place and  
10:09 25 connect it to the second well.

1                   Instead of doing that, you just  
2 perform a sequence of valve operations to  
3 change fluid flow from one well to the other.

10:09 4           Q.       So as fluid is flowing through  
5 a zipper manifold, you can redirect it to a  
6 different well?

7           A.       Correct, by only valve  
8 operations rather than having to physically  
9 move iron.

10:09 10          Q.       Got it. In other words -- so  
11 if you have, for example, two wells and a  
12 zipper manifold, you're able to redirect  
13 fluid traveling through the zipper manifold  
14 from one well -- Well 1 to Well 2 with  
10:09 15 valves?

16          A.       Yes.

17          Q.       And that would mean that the  
18 wells are sharing a common fluid flow?

19          A.       Yes. Well, multiple common  
10:10 20 fluid flows, but, yes, at least one.

21          Q.       At least through the zipper  
22 frac manifold?

23          A.       And at least through the  
24 missile.

10:10 25          Q.       Okay. I want you to flip back

1 to the '770 patent. We're looking at  
2 Exhibit 1001. And please turn to Figure 1A  
3 and let me know when you're there.

4 A. Okay. I've got 1A.

10:10 5 Q. Do you understand Figure 1A of  
6 the '770 patent to be describing a system  
7 that is used for zipper fracturing  
8 operations?

9 A. Yes, I understand it to be one  
10:10 10 embodiment described in the patent.

11 Q. For zipper fracturing  
12 operations?

13 A. Yes, I would say so.

14 Q. I want you to take a look. Do  
10:11 15 you see a Zipper Manifold 145?

16 A. I do.

17 Q. Is the Zipper Manifold 145 a  
18 traditional zipper manifold, as a POSITA  
19 would understand it?

10:11 20 A. From a high level  
21 diagrammatically, I would agree that would be  
22 one understanding of a zipper manifold.

23 Q. On Figure 1A, can you show me  
24 where the missile is?

10:11 25 A. Yes. It's the structure that

1 contains the suction manifold and the  
2 discharge manifold. It appears in this case  
3 that the missile contains both flow paths.

10:11 4 So it doesn't have a number --  
5 maybe it's 130, it contains, but I'd have to  
6 look at the specs.

7 Q. So at least in the instance of  
8 Figure 1A, the zipper manifold and the  
9 missile are two separate structures?

10:11 10 A. I would need to dig through the  
11 spec and see that. This just shows a high  
12 level of the flow paths.

13 Q. That's what it shows in  
14 Figure 1A. Right? It shows them -- it shows  
10:11 15 the zipper manifold and the missile as being  
16 two separate structures?

17 A. It just shows the flow paths.  
18 But maybe you can read that into 1A.

19 Q. Well, zipper manifold is 145.  
10:12 20 Right?

21 A. Correct.

22 Q. And then you identify the  
23 missile as being within the box labeled 130,  
24 right?

10:12 25 A. Again, I think we would need to

1 go to the spec to see exactly what the  
2 structure is for 130.

3 It looks like it probably  
4 contains both the discharge and suction  
10:12 5 manifold. But in order to give a solid  
6 answer, I would really want to dig through  
7 the spec.

8 Q. There is a Box 125.

9 A. There is a Box 125.

10:12 10 Q. That's got both suction  
11 manifold and discharge manifold in it. Would  
12 that meet your definition of missile?

13 A. No. Reading the section of the  
14 spec, I don't think you can read those to be  
10:12 15 necessarily a single structure, 125 and 130  
16 together.

17 Q. So where would you point me to  
18 if I wanted to know where the missile was on  
19 Figure 1A?

10:12 20 A. The discharge manifold.

21 Q. 130?

22 A. 130, yes. Without a  
23 description in the spec that shows those are  
24 on the same structure, then I would say the  
10:13 25 missile would be the discharge manifold.

1 Q. Is the Zipper Manifold 145 a  
2 traditional zipper manifold as a POSITA would  
3 understand it?

10:13 4 A. It's a Zipper Manifold 145  
5 adapted to communicate the pressurized  
6 hydraulic fracturing fluid from the Discharge  
7 Manifold 130 to a plurality of hydraulic  
8 fracturing legs, and goes on from there.

9 So I think that's the  
10:13 10 definition in the spec for zipper manifold,  
11 and that's at least consistent with the  
12 Schlumberger definition.

13 Q. So you agree with me that  
14 Zipper Manifold 145 is a traditional zipper  
10:13 15 manifold as a POSITA would understand it at  
16 the time?

17 A. Yes. I don't --

18 MS. MARGONIS: Objection, asked  
19 and answered.

10:13 20 A. I don't see that what '770 has  
21 redefined zipper manifold away from its plain  
22 and ordinary meaning.

23 THE REPORTER: Can you repeat  
24 that?

25 THE WITNESS: Sure.

1           A.       I don't think the specification  
2 of the '770 patent redefines zipper manifold  
3 away from its plain and ordinary meaning.

10:14 4           Q.       (By Ms. Cooke) So looking at  
5 Figure 1A, there is one flow path of fluid  
6 coming from this Discharge Manifold 130  
7 through the zipper manifold to the plurality  
8 of wells labeled 150A through 150C+n. Right?

9           A.       I would agree with that, yes.

10:14 10          Q.       And wells 150A through 150C+n,  
11 those share the one common fluid flow through  
12 the zipper manifold. Right?

13          A.       The fluid flow from the  
14 discharge manifold to the zipper manifold is  
10:14 15 shared. It would break up from then.

16          Q.       After the zipper manifold?

17          A.       In the zipper manifold.

18          Q.       There is a valve somewhere that  
19 would divert it?

10:14 20          A.       Yes.

21          Q.       Are those typically on the  
22 manifold or after the manifold?

23          A.       They can be before, on, or  
24 after.

10:15 25          Q.       But I would say, at least as

1 the fluid enters the zipper manifold, there  
2 is a sharing of and overlapping of the fluid  
3 flow. Correct?

10:15 4 A. In this -- yes, in this picture  
5 there is, sure.

6 Q. And that's common among zipper  
7 frac operations. Right?

8 A. Yeah, that's one way to do it.  
9 There's also manifolds that have multiple  
10:15 10 fluid paths through them. So that's another  
11 way to do it.

12 Q. So in the instance of this  
13 Figure 1A, there is only one fluid path  
14 through that zipper manifold, right?

10:15 15 A. There is only one fluid path  
16 shown to the zipper manifold. And I don't  
17 see anything in, for example, Column 5 or 6  
18 that says anything differently.

19 But I don't think you can say  
10:15 20 definitively there is only one fluid path  
21 through.

22 Q. Figure A is a fluid path  
23 diagram. Right?

24 A. Yes.

10:16 25 Q. And according to Figure 1A,

1 there is only one fluid flow path through the  
2 Zipper Manifold 145. Right?

3 A. I disagree.

10:16 4 Q. Okay. Where do you see  
5 multiple fluid flow paths through 145?

6 A. Well, you see multiple frac  
7 legs out, so that would define multiple fluid  
8 paths. In other words, inside the manifold,  
9 the fluid would flow in different directions  
10:16 10 depending on which frac leg you may be  
11 operating simultaneously or isolated.

12 So there is -- if there is only  
13 one input to the zipper manifold -- and,  
14 again, this is a fluid flow diagram, not a  
10:16 15 structure diagram -- then there is at least  
16 four different fluid paths inside that zipper  
17 manifold.

18 Q. Out of the zipper manifold?

19 A. Well, through the zipper  
10:16 20 manifold, too.

21 Q. So there is not a zipper  
22 manifold that just goes straight from the  
23 discharge manifold into the four wells?

24 A. That would be four different  
10:16 25 fluid paths.

1 Q. Right. But there is going to  
2 be a commonality. Right?

3 We're looking at the Discharge  
4 Manifold 130. Right? Follow me on 1A.

10:17 5 A. Uh-huh.

6 Q. That fluid will go into a  
7 zipper manifold. Correct?

8 A. Correct.

9 Q. At that point, it's all  
10:17 10 overlapped. It has not been diverged into  
11 four different wells yet?

12 A. You're talking about all four  
13 wells closed?

14 Q. Even if they are open?

10:17 15 A. No. If they are open -- well,  
16 you have some overlap between fluid paths,  
17 but you have four different fluid paths -- if  
18 there is only one input and it's the middle,  
19 then you have overlap on two of the wells on  
10:17 20 each side.

21 Q. Let's back up a little bit. So  
22 we've got Discharge Manifold 130. We are  
23 looking at 1A.

24 There is single outlet on that  
10:17 25 diagram into the zipper manifold. Right?

1           A.       From the discharge manifold,  
2       there is one fluid path to the zipper  
3       manifold.

4           Q.       So all the fluid is entering in  
10:17 5       one fluid path into the zipper manifold?

6           A.       Correct.

7           Q.       Okay.

8           A.       Above the zipper manifold.

9           Q.       And then in the zipper manifold  
10:17 10       or after the zipper manifold, depending on  
11       where the valves are, it will split off into  
12       whatever number of valves you have that are  
13       open to the wells?

14          A.       I agree with that.

10:18 15          Q.       If you wanted to direct fluid  
16       flow from Well 150A as opposed to the other  
17       wells, how would you do that?

18          A.       In this diagram?

19          Q.       Yes.

10:18 20          A.       Then you would open valves  
21       associated with the zipper manifold and the  
22       well tree to allow fluid to flow into the  
23       well.

24          Q.       What would you do to prevent  
10:18 25       fluid from going to the other wells?

1           A.       You would close at least some  
2 of those valves.

3           Q.       Which valves would close?

4           A.       That would depend on the  
10:18 5 operator's -- operations, the operations  
6 preference.

7           Q.       Show me on 1A, which ones would  
8 you close.

9           A.       Well, there is really no valves  
10:18 10 shown on 1A.

11          Q.       So, in your expertise, if you  
12 wanted to divert fluid from -- not divert.  
13 Strike all that.

14                   In your experience, if we want  
10:19 15 fluid to flow into one well and we want it to  
16 not go into other wells, what valves would we  
17 need to close to prevent fluid from going  
18 into the other wells?

19          A.       Any of the valves in series  
10:19 20 between the manifold and the well itself.

21          Q.       And what might some of those  
22 valves be?

23          A.       Valves on the zipper manifold,  
24 maybe on the discharge of the zipper  
10:19 25 manifold, or between the zipper manifold and

1 the well tree or valves on the well tree.

2 Q. Any one of those would achieve  
3 the purpose of stopping fluid going into the  
4 well?

10:19 5 A. Assuming the valve is operating  
6 as designed, yes.

7 Q. Are you familiar with a term  
8 called a zipper valve?

9 A. Yes.

10:19 10 Q. Why is a valve called a zipper  
11 valve?

12 A. It would be a valve used in the  
13 zipper fracturing operation as part of that  
14 sequential or simultaneous flow.

10:19 15 Q. Is it your position that any  
16 valve on a zipper fracturing operation, no  
17 matter its position or function, is a zipper  
18 valve?

19 A. No matter it's location, I  
10:20 20 would agree with. Function is used to direct  
21 fluid flow between the wells. So it would  
22 have to have that function to be a zipper  
23 valve.

24 Q. Are there any valves on a  
10:20 25 zipper frac operation that do not have the

1 function of directing fluid between wells?

2 A. Yes.

3 Q. Which valves do not have the  
4 function of directing fluid between wells?

10:20 5 A. Well, I probably couldn't give  
6 them all from memory. But there would be  
7 valves on the pump trucks that would not be  
8 used as part of that process to switch  
9 between wells or to simultaneously flow  
10:20 10 between wells. There valves at the blender.  
11 There's valves at the fluid storage, gates  
12 and the proppant storage that function as  
13 valves for solid material. So there are a  
14 bunch.

10:20 15 Q. So as long as it's a valve  
16 that's not on the truck, it's a zipper valve?

17 A. No.

18 Q. Okay.

19 A. No.

10:21 20 Q. Help me dig down on that one.

21 A. Well, it would be any valve  
22 that would be used to move fluid flow from  
23 one well to another or to direct fluid flow  
24 to an individual well.

10:21 25 In other words, a valve that is

1 not used to direct fluid flow to an  
2 individual well would not be a zipper valve,  
3 as valves in the truck would not be -- trucks  
4 don't know where the fluid is going. They  
10:21 5 only pump the fluid.

6 Q. So a valve that's between the  
7 zipper manifold and the frac tree is going to  
8 be a zipper valve. Right?

9 A. That would be, yes, one  
10:21 10 example.

11 Q. I want you to look at 191 --  
12 Paragraph 191 in your declaration. It's an  
13 annotated image of Figure 2A from the '770  
14 patent.

10:21 15 You can look at either one, but  
16 I like the annotated version from your  
17 declaration.

18 Let me know when you're there.

19 MS. MARGONIS: And, Tiffany, if  
10:22 20 we come up close to a break --

21 MS. COOKE: I was just going to  
22 ask you that. It's a mutual meeting  
23 of the minds.

24 Let's take a break.

10:22 25 THE VIDEOGRAPHER: The time is

1 now 10:22 a.m. We are now off the  
2 record.

3 (Recess taken at 10:22 a.m.,  
4 resuming at 10:42 a.m.)

10:42 5 THE VIDEOGRAPHER: The time is  
6 10:42 a.m. We are now back on the  
7 record.

8 Q. (By Ms. Cooke) All right.  
9 Welcome back, Dr. Durham.

10:42 10 MS. MARGONIS: And, Tiffany,  
11 before we start questioning, I just  
12 want to get on the record that it  
13 appears Downing's expert, Dr. Hughett,  
14 is also on the Zoom call.

10:43 15 MS. COOKE: Yes, that's  
16 correct.

17 Q. (By Ms. Cooke) Welcome back,  
18 Dr. Durham. During the break, did you speak  
19 with anyone?

10:43 20 A. Yes. I had conversations with  
21 counsel.

22 Q. What did you speak with -- or  
23 what did you speak about with your counsel?

24 A. Most of it was about gym  
10:43 25 habits.

1 Q. Did you discuss the substance  
2 of your testimony at all with counsel?  
3 A. No.  
4 Q. What is a frac tree?  
10:43 5 A. Generally a frac tree would be  
6 a wellhead tree used during a fracturing  
7 operation.  
8 Q. Is a frac tree also called a  
9 well tree, a Christmas tree, or a wellhead  
10:43 10 assembly?  
11 A. I've heard all of those terms  
12 and seen all those terms, yes.  
13 Q. Can I refer to a frac tree by  
14 any of those terms interchangeably and you  
10:44 15 would know what I mean?  
16 A. I hope so.  
17 Q. What is a flowback valve?  
18 A. A flowback valve would be a  
19 valve that would direct fluid from the well  
10:44 20 to a flowback manifold or a flowback choke  
21 used during the -- during flowback.  
22 Q. Is a flowback valve on a tree?  
23 A. Sometimes.  
24 Q. In what instances would a  
10:44 25 flowback valve be on a tree?

1           A.       Well, I mean, not to be trite,  
2 when it's on a tree. When it's installed on  
3 the tree.

10:44   4           Q.       In what instances would it not  
5 be installed on a tree?

6           A.       When the decision is made to  
7 direct that flow at a different location.

8           Q.       You will have to help me out a  
9 little more on that.

10:44   10          A.       Well, so you can either -- I  
11 mean, it's just a valve that creates a branch  
12 flow, and you can either put it on the tree,  
13 you could put it a different location that  
14 would be upstream in the flow path during  
10:45   15 fracturing or downstream during flowback.

16                    You can put that valve anywhere  
17 as long as the function of it was to divert  
18 the fluid flow to the frac -- I'm sorry, to  
19 the flowback manifold.

10:45   20          Q.       I think it would be good if we  
21 slow down just a little bit just to help our  
22 court reporter out.

23                    THE REPORTER: Please.

24                    MS. COOKE: Let's just try that  
10:45   25 question again.

1 Q. (By Ms. Cooke) So help me out  
2 a little bit more in understanding what a  
3 flowback valve is and what it does.

10:45 4 A. So a flowback valve would be a  
5 valve used in the chain of valves, and there  
6 typically is more than one, that is used to  
7 flow back fluid from the formation to the  
8 flowback system during flowback operations.

10:46 9 Q. And how does the flowback valve  
10 work?

11 A. They are typically standard  
12 valves that open and close on command.

10:46 13 Q. And in a traditional zipper  
14 frac operation, a flowback valve is going to  
15 be on a tree?

16 A. Not necessarily, because  
17 flowback occurs after fracturing in a lot of  
18 cases, so there would be -- it's not  
19 necessarily -- I'm sorry -- not necessarily  
10:46 20 on the tree. Let me back up a second. Not  
21 all of the flowback valves may be on the  
22 tree.

23 Q. Is there going to always be at  
24 least one flowback valve on the tree?

10:46 25 A. Yes, at least one valve that

1 would qualify as a flowback valve would  
2 always be on the tree.

3 Q. Okay. And now --

10:46 4 A. And that would be the valve  
5 closest to the well.

6 Q. Now, fluid is -- I want to talk  
7 about the fluid flow in connection with the  
8 flowback valves.

9 So when we're talking about a  
10:46 10 flowback valve, fluid is not communicated to  
11 the well through a flowback valve. Right?

12 A. No, I don't think you can make  
13 that statement, because a flowback valve is  
14 any of the valves in the flow path from the  
10:47 15 well to the flowback system.

16 So there are going to be  
17 overlaps between a flowback valve and a  
18 fracturing valve if they don't replace the  
19 tree, which, I mean, would be kind of silly  
10:47 20 to replace the tree. There is going to be  
21 overlaps.

22 Q. I thought we just talked about  
23 the flowback valve being the valve where  
24 fluid is communicated from the well through  
10:47 25 the flowback valve.

1           A.       Could you rephrase that?

2           Q.       Sure. So I thought we just

3 talked about when a well is producing and

4 fluid is directed from the well through a

10:47 5 flowback valve.

6           A.       Right. Often more than one.

7           Q.       And that would be the opposite

8 of when you're doing a stimulation, where

9 you're directing the other direction from a

10:48 10 pump into the well?

11          A.       Correct.

12          Q.       So typically with a -- I'm just

13 trying to understand what a flowback valve

14 is.

10:48 15                   Typically a flowback valve is

16 going to be the flow path coming from the

17 well to somewhere else?

18          A.       Yes.

19          Q.       Thank you.

10:48 20                   I want you to take a

21 quick -- strike that.

22                   What is a gate valve?

23          A.       Okay. A gate valve is a

24 particular structure of a valve where the

10:48 25 fluid flow is controlled by a sliding gate

1 vertically into the valve body (indicating).  
2 Assuming the valve is mounted in a horizontal  
3 position, the gate would be vertical.

10:49 4 Q. I'm going to hand you what  
5 we've marked as Exhibit 2010.

6 (Marked was Exhibit No. 2010.)

7 Q. (By Ms. Cooke) Let me know  
8 when you have that in front of you.

9 A. (Reviewing.) Okay.

10:50 10 Q. Do you agree with me that a  
11 gate valve can be a type of zipper valve?

12 A. Yes, particularly in light of  
13 the '770 patent.

10:50 14 Q. Can you explain to me how a  
15 gate valve functions?

16 A. Well, it's just as I said. The  
17 fluid flow is controlled by a sliding gate  
18 that if a valve is mounted in a horizontal  
19 position, the valve -- the gate is typically  
10:50 20 vertically operated up and down into the  
21 seals.

22 Q. And a gate valve can't be used  
23 to, like, throttle or restrict flow. Right?

10:50 24 A. I disagree. Gate valves are  
25 one of the type valves that are specifically

1 designed to throttle operations.

2 Q. How so?

3 A. It's just the function of the  
4 valve. For example, you would not want to  
10:50 5 throttle with a ball valve because you're  
6 going to wear the seats.

7 But a gate valve is one of the  
8 types of valves that, along with maybe a  
9 butterfly valve or a globe valve, that are  
10:51 10 used to throttle and control flow.

11 Q. You consider yourself a person  
12 of ordinary skill in the art. Right?

13 A. Yes.

14 Q. I want to shift a little bit  
10:51 15 and discuss the differences -- and we talked  
16 a little bit about this briefly, but between  
17 zipper fracturing and simul-frac.

18 Okay. Can you turn to  
19 Paragraph 87 of your declaration? Let me  
10:53 20 know when you're there.

21 A. 87?

22 Q. 87.

23 A. Yes, I'm there.

24 Q. Okay. Do you see where you  
10:53 25 say, "whether part of a zipper fracturing

1 operation and/or continuous pumping  
2 operation, a hydraulic fracturing operation  
3 includes operational parameters such as fluid  
4 flow and pressure that are specific to the  
10:54 5 operation"?

6 A. Yes, you read that sentence  
7 correctly.

8 Q. Can you explain this sentence  
9 in a little more detail?

10:54 10 A. I guess the import of the  
11 sentence is there are specific flow rates and  
12 pressures that a frac design has in it.

13 Regardless of what you're doing  
14 on the surface, the fluid flows and pressures  
10:54 15 downhole are specific to that operation --  
16 specific to the formation and the location.

17 Q. And what do you mean by  
18 "operational parameters"?

19 A. Operational parameters such as  
10:54 20 fluid flow and pressure. It's just  
21 conditions of the frac job itself.

22 Q. And those would be conditions  
23 that are specific to the well during a  
24 stimulation, right?

10:54 25 A. Well, in this sentence, yes.

1 We're talking about the wellbore in this  
2 sentence, in the downhole.

3 Q. And so when you say a specific  
4 joint operation, at least in this sentence  
10:55 5 it's talking about well conditions?

6 A. Right, it's the conditions in  
7 this case that you're trying to create or  
8 want to create in the wellbore, in this  
9 particular sentence in this particular  
10:55 10 paragraph.

11 Q. Why would operational  
12 parameters such as fluid flow and pressure  
13 vary from operation to operation?

14 A. Mostly because of the  
10:55 15 formation -- well, the formation, the  
16 location of the formation, the depth of the  
17 formation, the size and orientation of the  
18 wellbore, friction in the piping system are  
19 some examples of things that go into those  
10:55 20 decisions.

21 Q. Can the physical attributes of  
22 the wellbore affect the fluid flow and the  
23 pressure?

24 A. Yes.

10:55 25 Q. Would the fluid -- strike that.

1                   Would the well conditions also  
2                   affect the fluid conditions in the well tree?

3                   A.       Yes. I mean, the condition of  
4                   the fluid in the well certainly affects  
10:56 5                   upstream operations. If the well is full and  
6                   pressurized, that's going to slow down the  
7                   flow, for example.

8                   Q.       And that would affect the well  
9                   tree?

10:56 10                  A.       And that would certainly affect  
11                  the pressures at the well tree and the fluid  
12                  flow through the well tree.

13                  Q.       And can two independent wells  
14                  have different pressures even if the pumps  
10:56 15                  are operating at the same speed?

16                  A.       Yes. Are you -- maybe I should  
17                  back up?

18                               Certainly if they are in  
19                  isolated operations, but I assume your  
10:56 20                  question meant during a simultaneous pumping  
21                  operation.

22                  Q.       Let's do both.

23                  A.       Okay.

24                  Q.       So let's do an isolated  
10:56 25                  operation. You have two isolated flow paths

1 to two separate wells.

2 A. Uh-huh.

3 Q. Would different pressures be

4 present in the wells if the pumps are

10:56 5 operating at the same speed?

6 A. Could be.

7 Q. Different well conditions.

8 Right?

9 A. It depends on the impedance of

10:57 10 the formation.

11 Q. I mean, most likely almost

12 every formation is going to have some

13 difference. Right?

14 A. Well, what we've found over the

10:57 15 years, that a particular formation, for

16 example, the Barnett Shale, in a particular

17 geographic region where it's at similar

18 depths has similar characteristics, so we can

19 reuse the frac design to a large extent.

10:57 20 Q. Say you have a reading on

21 pressure in a situation that we're talking

22 about, two independent paths, two different

23 wells, you're pumping at the exact same

24 speed, surely the pressure readings are not

10:57 25 going to be identical in the wells -- not

1 similar, but identical?

2 A. Identical at any given point in  
3 time, there's no reason they -- there's no  
4 reason to say they couldn't be, but --

10:57 5 Q. Statistically speaking, they  
6 wouldn't be?

7 A. I mean, statistically saying,  
8 there may be some differences, yes.

9 Q. Now let's talk about the other  
10:57 10 scenario where you're doing a common fluid  
11 path and then splitting into two wells and  
12 you're applying pressure before the split,  
13 would different pressures be present even if  
14 the pumps were operating at the same speed?

10:58 15 A. They could be if the wells are  
16 different.

17 Q. Same reasons. Right?

18 A. Well, this is a little bit  
19 different because now you're talking about  
10:58 20 friction in the wellbore itself as your  
21 primary pressure loss. So if you're talking  
22 about the trees, they are going to be at the  
23 same pressure.

24 Q. Right.

10:58 25 A. If you're talking about at the

1 toe of the well, depending on the length of  
2 the bore, the tortuosity, deviations of the  
3 bore and how that goes, your pressure at the  
4 toe may be different from well to well.

10:58 5 Q. Okay. But that would also  
6 apply in the scenario with two different flow  
7 paths. The toe of the well would most likely  
8 have different pressures?

9 A. Correct.

10:58 10 Q. I get it. Okay. Thank you.  
11 So I backed up and then jumped  
12 to a little bit different topic, but I want  
13 to switch back to the difference between  
14 simul-frac and zipper frac.

10:59 15 I think you mentioned in your  
16 declaration that simul-fracking is an  
17 expensive process and requires a lot more  
18 coordination and logistics and a larger  
19 location. Correct?

10:59 20 A. Correct, except I would correct  
21 and say in my opinion simul-frac is a subset  
22 of zipper fracturing. So there's not  
23 really -- you can't really say there are  
24 differences.

10:59 25 You can say there's differences

1 between sequential zipper fracturing and  
2 simultaneous zipper fracturing.

10:59 3 Q. If you're doing a simul-frac,  
4 that increases expense, coordination,  
5 logistics, location size, et cetera?

6 A. I would agree with that.

7 Q. And why?

8 A. First of all, you need to have  
9 the pumping capacity to do two wells at the  
10:59 10 same time.

11 Second, if you're operating  
12 more equipment, there is more -- at any given  
13 point in time, there is more complexity. So  
14 that adds to the complexity and -- I don't  
10:59 15 know if I agree it adds to the cost. I don't  
16 know if you asked -- did you ask that?

17 Q. Cost would be more expensive,  
18 so, yes.

19 A. No, because of the benefits of  
11:00 20 simul-frac in terms of time. If you're doing  
21 simul-frac -- yes, it can be an expensive  
22 operation compared to -- if you compare one  
23 well at a time. But if you compare the  
24 system as a whole, it can be cheaper.

11:00 25 Q. So you would still, though,

1 agree with your statement that simul-fracs  
2 are expensive?

3 A. Yes.

4 Q. And simul-fracs require more  
11:00 5 coordination and logistics?

6 A. Yes, definitely.

7 Q. And simul-fracs require a  
8 larger location?

9 A. Generally speaking, yes. All  
11:00 10 else being equal, it would require a larger  
11 location.

12 Q. Have you ever heard of the  
13 phrase "continuous pumping"?

14 A. Yes.

11:00 15 Q. And prior to being retained by  
16 IWS, have you ever heard of the word  
17 "continuous pumping"?

18 A. Yes.

19 Q. Prior to being retained by IWS,  
11:01 20 have you ever had experience with a fracking  
21 operation that was able to run continuously  
22 for days straight without stopping?

23 A. I think I can safely say I have  
24 not seen a frac operation that's run for days  
11:01 25 straight without stopping for some problem or

1 some wait.

2 Q. And is it your opinion that  
3 continuous pumping, as you understand the  
4 term, has been around since the 1960s?

11:01 5 A. Did I -- if I made that  
6 statement, can you point it to me?

7 Q. Yeah, if you want to take a  
8 look at Paragraph 85.

9 A. Sure. (Reviewing.)  
11:01 10 Yes, at least the 1960s.

11 Q. Can you describe the types of  
12 continuous pumping that were occurring around  
13 the 1960s?

14 A. Well, I briefly describe it in  
11:01 15 that Paragraph 85, the Webster reference. It  
16 talks about continuous pumping for fracturing  
17 multiple zones in a single well was kind of  
18 the advent, just like in hydraulic fracturing  
19 in general started in one well and then went  
11:02 20 to multiple wells.

21 So I think that's a very high  
22 level summarization of what Webster was  
23 talking about.

24 Q. So when we're talking about  
11:02 25 continuous pumping circa 1960s, we're talking

1 about pumping multiple stages in a single  
2 well continuously without stopping the pumps?

3 A. Without stopping the pumps,  
4 yes.

11:02 5 Q. Now, I want you to, also in  
6 Paragraph 85, look where we talk about, "By  
7 2007, continuous pumping equipment techniques  
8 were well-known."  
9 Do you see that part?

11:02 10 A. Yes.  
11 Q. Do we know which it is? Was it  
12 continuous pumping from the 1960s or was it  
13 from the 2000s, or is there a difference  
14 between what you are talking about in the  
11:03 15 '60s versus 2007?  
16 A. Yes, there are differences in  
17 how it was -- how it was completed. I think  
18 Casero talks about -- if I'm remembering  
19 right, Casero is talking about ball and  
11:03 20 sleeve operations, which made it even faster,  
21 and skipping the plug and perf steps.  
22 Q. Generically, we're still  
23 talking about the same concept of multiple  
24 stages being fracked continuously without  
11:03 25 stopping the pumps in a single well?

1           A.       Right. This was about the time  
2       that zipper fracturing as a surface technique  
3       was being developed, so they were being  
4       developed around the mid-2000s.

11:03   5           So, yeah, probably  
6       Cassenfoss [phonetic] -- I'm sorry, Casero;  
7       wrong reference -- Casero was talking about  
8       single wells, as I recall. I'm not sure  
9       exactly, without looking at the references,  
11:04   10       that that's 100 percent accurate, but that's  
11       what I recall.

12           Q.       I just want to make sure I got  
13       a clean answer to that. I want to walk you  
14       through the references.

11:04   15           But from what your recollection  
16       is, what you're talking about in Paragraph  
17       85, from the 1960s, early 2000s was a process  
18       of being able to continuously pump in  
19       multiple stages without stopping the pumps in  
11:04   20       a single well?

21           A.       That's my recollection of  
22       Casero.

23           Q.       I don't think you talk about  
24       just Casero in Paragraph 85.

11:04   25           A.       Well, the Webster, which we

1 talked about.

2 Q. Right. You agreed with me that  
3 it was the single well, multistage?

4 A. Correct. Certainly.

11:04 5 Q. Let's look at that Webster  
6 article.

7 While we're pulling that out,  
8 would you agree with me that continuous  
9 pumping was a predecessor method to zipper  
11:05 10 fracking?

11 A. Yes.

12 Q. Okay. I'm going to hand you  
13 Webster, which is previously identified as  
14 1027.

11:05 15 (Previously marked was Exhibit No. 1027.)

16 Q. (By Ms. Cooke) Let me know  
17 when you have that in front of you.

18 A. (Reviewing.) Okay. I have,  
19 yes, 1027 in front of me.

11:05 20 Q. Is that the Webster article you  
21 refer to in Paragraph 85 of your declaration?

22 A. Oh, it's stapled backwards.  
23 Yes, it is.

24 Q. Now, Webster was a paper that  
11:05 25 was presented to the Society of Petroleum

1 Engineers in 1964. Right?

2 A. Yes.

3 Q. And Webster contrasts the  
4 proposed continuous multistage fracking  
11:06 5 technique with the more common technique of  
6 treating one zone or one stage at a time.  
7 Right?

8 A. I think that's a good general  
9 description of Webster.

11:06 10 Q. Meaning that prior to this  
11 time, you would be stopping your pumps  
12 between stages, and Webster describes being  
13 able to continue your pumps and continue  
14 operations between stages in a single well?

11:06 15 A. Broadly speaking, yes.

16 Q. I want you to take a peek at  
17 Page 2 to Page 3 of Webster. It starts with  
18 a heading that says "General Method."

19 Do you see that?

11:06 20 A. Yes.

21 Q. And there are six steps listed?

22 A. Yes, there are.

23 Q. And is it your understanding  
24 that the six steps listed in Webster is the  
11:06 25 general process described for the continuous

1 multistage fracking in a single well we've  
2 been discussing?

3 A. The general method is what  
4 Webster calls it, yes.

11:06 5 Q. You agree as a POSITA?

6 A. Yes.

7 Q. And what Webster doesn't  
8 describe is treating additional wells after  
9 the continuous multistage fracking is  
11:07 10 performed in one well. Right?

11 A. Can you repeat that question?

12 Q. Sure. Webster isn't talking  
13 about transitioning from the multistage  
14 fracking in one well and then switching to a  
11:07 15 second well. Correct?

16 Webster is directed about how  
17 you perform continuous pumping from stage to  
18 stage in a single well?

19 A. Yes, that's generally -- I --  
11:07 20 if your question is intended to mean he can  
21 only do it in one well and not another, then  
22 I would disagree with that.

23 Q. The continuous aspect of  
24 Webster is between stages in a single well,  
11:07 25 not the continuous aspect of going from one

1 well to the next?

2 A. I would agree with that.

3 Q. And you also mentioned a Casero

4 article. Let's talk about that one just

11:08 5 briefly, also.

6 This one was previously marked

7 1028.

8 (Previously marked was Exhibit No. 1028.)

9 Q. (By Ms. Cooke) Let me know

11:08 10 when you have that in front of you.

11 A. (Reviewing.) I have it.

12 Q. And is this the Casero article

13 that you mentioned in Paragraph 85 of your

14 declaration?

11:08 15 A. Yes. It has the same SPE

16 number.

17 Q. And Casero was presented at the

18 Society of Petroleum Engineering

19 International Symposium in 2008. Correct?

11:08 20 A. Correct.

21 Q. And take a peek at the second

22 page. And the Continuous Pumping Multi-Stage

23 System, CPMSS, technique that's described in

24 Casero involves the same treating of

11:09 25 multistages in a single well. Right?

1           A.       Well, it is multistages in a  
2       single well on three different wells. It's a  
3       different technique than Webster was.

11:09

4           Q.       But what we're still talking  
5       about is the continuous nature of it being  
6       from stage to stage within one well?

7           A.       Yes.

11:09

8           Q.       But, again, Casero does not  
9       describe the process of transitioning from a  
10      first well to a second well to a third well.  
11      It's all about what's happening in each of  
12      the individual wells?

13          A.       Yes, I agree with that.

11:09

14          Q.       I don't think we talked about  
15      it already, but another article you reference  
16      is called Rassenfoss. Do you recall  
17      Rassenfoss?

18          A.       Yes, I do.

11:10

19          Q.       Let's take a peek at Rassenfoss  
20      also. The Rassenfoss article was previously  
21      marked 1029.  
22      (Previously marked was Exhibit No. 1029.)

23          Q.       (By Ms. Cooke) Let me know  
24      when you have that in front of you.

11:10

25          A.       (Reviewing.) Okay.

1 Q. And this Rassenfoss article is  
2 also referenced in Paragraph 85 of your  
3 declaration. Right?

4 A. No. I disagree.

11:10 5 Q. Where is it referenced?

6 A. Paragraph 86.

7 Q. 86. Thank you.

8 And this Rassenfoss article is  
9 a 2009 article in the Journal of Petroleum  
11:11 10 Technology. Right?

11 A. Yes.

12 Q. Is that Journal of Petroleum  
13 Technology a reputable journal?

14 A. Yes, I believe so.

11:11 15 Q. And Let's look at Page 6 on  
16 Rassenfoss. I think it's actually the very  
17 last page.

18 A. Okay.

19 Q. And it similarly describes the  
11:11 20 simultaneous fracturing of a group of wells.  
21 Right?

22 A. It does.

23 Q. And the process described in  
24 Rassenfoss, the pumping doesn't continue when  
11:11 25 transitioning between the treatment of the

1 groups of wells. Right?

2 A. I don't see that in Rassenfoss.

3 Q. Let's look at page -- we're on

4 Page 6.

11:11 5 A. Uh-huh.

6 Q. And do you see -- it's the

7 first paragraph beginning at the bottom of

8 the first column. It starts, "Simultaneous

9 fracturing is likely to create stronger

11:11 10 connections because the time between stages

11 is relatively short, allowing fluid pumped in

12 one stage to stimulate 'induced unpropped

13 fractures that have not closed over the short

14 time' from the previous stage."

11:12 15 Do you see that?

16 A. Yes. You read that paragraph

17 correctly.

18 Q. And so Rassenfoss, again, is

19 not talking about the process of switching

11:12 20 from one well to the next well. It's stages

21 within wells?

22 A. I disagree.

23 Q. Okay. Show me where you're

24 seeing that.

11:12 25 A. It's the second paragraph at

1 the top of the column on the left on Page 6.  
2 So it talks about continuous pumping on  
3 zipper fracturing and then goes on to  
4 describe some of the downhole conditions:  
11:12 5 "And now zipper fracturing is used to  
6 fracture even more wells at once."  
7 Q. Sure. So it's kind of like the  
8 scenario that you were talking before, how  
9 you can simul-frac within a zipper frac?  
11:12 10 A. I don't see him limiting it to  
11 that. That's not what it says.  
12 It says (as read): "Zipper  
13 fracturing speeds work by allowing continuous  
14 pumping and then reduces frac hits because of  
11:13 15 some of the geological conditions."  
16 Q. And then continue on, it says,  
17 "Now zipper fracturing is used to fracture  
18 even more wells at once"?  
19 A. Correct, with continuous  
11:13 20 pumping.  
21 Q. Which we've talked about as  
22 being multiple stages within a single well.  
23 You're just doing it over multiple wells?  
24 A. I don't know that -- no, I  
11:13 25 don't agree that Rassenfoss is limited to

1 that. That's not how a POSITA would read  
2 that.

3 Q. So how do you read Rassenfoss?

11:13 4 A. I read -- you're fracturing  
5 multiple wells with continuous pumping.

6 Q. And we just talked about  
7 continuous pumping being, as you understood  
8 it at this time, 2009, being -- continuing  
9 the pumping and fracturing of multiple stages  
11:13 10 within a single well without stopping the  
11 pumps and Rassenfoss is talking about how you  
12 can do that simultaneously in more than one  
13 well.

14 A. No, I disagree completely.  
11:14 15 First of all, your time frame is wrong.

16 Q. Okay. Let's start there.  
17 When was Rassenfoss described?

18 A. November 2018.

19 Q. Okay. 2018. So what do you  
11:14 20 understand Rassenfoss to teach?

21 A. Continuous pumping for  
22 fracturing multiple wells in a zipper  
23 fracturing operation.

24 Q. Okay. I want you to define  
11:14 25 continuous fracturing for me -- or

1 "continuous pumping" for me.

2 A. Well, it's right there,  
3 allowing continuous pumping. And I  
4 understand continuous pumping means operating  
11:14 5 pumps without a break -- or without a  
6 scheduled break, I should say.

7 Q. You have to be more specific  
8 than that to me. In one well? Between  
9 wells? Between stages? Between multiple  
11:14 10 wells? Break it down.

11 A. Well, the term "continuous  
12 pumping" is not limited to any of those  
13 scenarios, as we've seen in the literature.

14 Q. Where does Rassenfoss tell me  
11:14 15 that I can switch from fracturing multiple  
16 stages in one well and then switch to  
17 fracturing multiple stages in a separate well  
18 without stopping? Where does it say that?

19 A. That's not what Rassenfoss is  
11:15 20 talking about. Rassenfoss is talking about,  
21 yes, doing multiple stages; but it also says  
22 that you have continuous pumping in a zipper  
23 fracturing operation as well.

24 So you would not fracture  
11:15 25 multiple stages in a well and then move over

1 and fracture multiple stages in another well.  
2 You would fracture a stage, typically -- I'm  
3 not saying you never would, because Webster  
4 and Casero teach that -- you would fracture  
11:15 5 one stage in a typical operation, and then go  
6 to a different well, fracture a stage, go  
7 down the line and then come back and fracture  
8 a stage.

9 Q. Okay.

11:15 10 A. But Rassenfoss is telling us  
11 you can do that with continuous pumping.

12 Q. I'm not seeing where it says  
13 that.

14 A. Okay.

11:16 15 Q. Obviously, based on your  
16 understanding of person of ordinary skill in  
17 the art, the word "continuous pumping" is not  
18 a unitary word. It has a different meaning  
19 in Webster and throughout time.

11:16 20 A. I disagree.

21 Q. Okay.

22 A. Now, it's applied differently.

23 But the term "continuous pumping" simply

24 means operating your pump without scheduled

11:16 25 stops. So continuous pumping is not limited

1 to one well, two wells, or even well  
2 operations at all. We have continuous  
3 pumping at refineries and power plants and  
4 et cetera. That term is not unique.

11:16 5 Q. I would like you to point me to  
6 the part in Rassenfoss where it talks about  
7 how there is no pumping that stopped when  
8 you're switching from one to the next well.

9 A. Uh-huh. Okay. Well, a POSITA,  
11:16 10 in my opinion, would read --

11 MS. COOKE: Strike that as  
12 nonresponsive.

13 Q. (By Ms. Cooke) I want you to  
14 point me in Rassenfoss where. Start -- show  
11:16 15 me where, and then we will go from there.

16 A. Okay. Page 6 of the  
17 reference --

18 Q. Okay.

19 A. -- taken as a whole, in  
11:16 20 particular the first two paragraphs, and then  
21 the rest talks mostly about the downhole  
22 conditions.

23 Q. Okay. So we're looking at the  
24 first paragraph, the 11 wells.

11:17 25 Where -- starting there, where are we talking

1 about going from one well to another well?

2 A. "The 11 wells at the hydraulic  
3 fracturing test site were fractured in 2015  
4 using what was then a fairly new method,  
11:17 5 zipper fracturing."

6 Q. Okay.

7 A. "Rather than pumping one well  
8 at a time, wells were fractured in groups,  
9 four pairs, plus three wells together in the  
11:17 10 middle of the pattern."

11 So in this case we're talking  
12 about traditional zipper fracturing operation  
13 where you are moving between multiple wells  
14 in a pattern.

11:17 15 And then the next sentence,  
16 "Zipper fracturing speeds work by allowing  
17 continuous pumping and it reduces the risk of  
18 frac hits, et cetera."

19 So that's pretty clear that  
11:17 20 we're talking about traditional zipper  
21 fracturing and may be combined with some  
22 simultaneous fracturing, and then that zipper  
23 fracturing is done with continuous pumping.

24 Q. What do you mean by  
11:17 25 fracturing -- strike that.

1                   What does Rassenfoss mean when  
2   he says "wells were fractured in groups"?  
3           A.       He says "four pairs, plus three  
4   wells together in the middle of the pattern."  
11:18 5                   So it was combining traditional  
6   zipper fracturing with some simultaneous  
7   fracturing.  
8           Q.       Where do you see that?  
9           A.       In those two para- -- in that  
11:18 10   paragraph.  
11           Q.       So "four pairs" means some are  
12   simultaneous and some are not?  
13           A.       Correct. Well, four pairs,  
14   plus three wells together in the middle of  
11:18 15   the pattern. So you have one, two, three,  
16   four, five different sets of wells, if you  
17   will, that were fractured in a zipper  
18   fracturing pattern.  
19           Q.       So we're talking four pairs,  
11:18 20   three in the middle, zipper frac pattern?  
21           A.       Uh-huh.  
22           Q.       That's what you get from  
23   Paragraph 1?  
24           A.       That's right.  
11:18 25           Q.       Okay. Let's go on to

1 Paragraph 2.  
2 "Zipper fracturing speeds work  
3 by allowing continuous pumping."  
4 A. Correct.  
11:18 5 Q. And it "reduces the risk of  
6 frac hits"?  
7 A. Correct.  
8 Q. What is a frac hit?  
9 A. A frac hit, if you're  
11:18 10 fracturing into an area where you  
11 have -- already been producing, then you're  
12 fracturing job can impact negatively the  
13 production in the existing well. And that's  
14 referred to as a frac hit to that existing  
11:19 15 well.  
16 Q. Now, when it says -- and it  
17 continues on, "Now zipper fracturing is used  
18 to fracture even more wells at once."  
19 So instead of doing, like, two  
11:19 20 wells simultaneously, he's talking about  
21 these four pairs and three in the middle.  
22 Right?  
23 A. Well --  
24 MS. MARGONIS: Objection,  
11:19 25 speculation.

1           A.       Yeah, even more wells at once.  
2   I would read Paragraph 1 to say three wells  
3   at once and one other sets of patterns. So  
4   that would be more than two.

11:20 5           Q.       (By Ms. Cooke) Can you explain  
6   that a little bit more? I guess I don't  
7   fully understand.

8                    So by more than one well at a  
9   time, you say it's three. And then the other  
11:20 10   sets of patterns would be more than two. I  
11   don't understand your answer. Try again for  
12   me.

13           A.       Well, you know, zipper  
14   fracturing is used to fracture even more  
11:20 15   wells than one at once. So your minimum  
16   wells you can fracture at once,  
17   simultaneously, would be two, or else it's  
18   not simultaneous. And --

19           Q.       It wouldn't be zipper frac?

11:20 20           A.       What's that?

21           Q.       It wouldn't even be zipper  
22   frac?

23           A.       Two? Sure, it would.

24           Q.       Less than two.

11:20 25           A.       Oh, less than two? No, right.

1 Right. It wouldn't make sense to zipper frac  
2 less than two. It doesn't make sense.

3 Q. Okay.

4 A. So you have two, and now you  
11:20 5 have three, and now -- or you could even read  
6 that sentence to say 11.

7 Q. So we're all at once fracturing  
8 11 wells?

9 A. In a pattern, correct. Not  
11:21 10 simultaneous pumping 11 wells. I don't  
11 think -- I can't even imagine the size of  
12 pumping equipment you would need for that.

13 That's not what he's talking  
14 about, in my opinion. He's talking about  
11:21 15 four pairs, two at a time, four times. So  
16 two wells, two wells, three wells, two wells,  
17 two wells in a zipper pattern.

18 Q. And he's talking about  
19 simultaneous fracturing. Right?

11:21 20 A. Right. Two wells, two wells,  
21 three wells, two wells, two wells.

22 Q. So you're saying that the  
23 Rassenfoss would have zero nonproductive  
24 time?

11:22 25 A. No, that would be -- in an

1 ideal world, yes. Nonproduction time for the  
2 pumping units, I would say that's the ideal  
3 of Rassenfoss.

11:22 4 Q. Is that what it says that it's  
5 performed, that there is zero nonproductive  
6 time during pumping all of the wells?

7 A. No, it's says continuous  
8 pumping, and continuous pumping for  
9 fracturing those 11 wells ideally would be  
11:22 10 zero nonproductive time for the pumping  
11 units.

12 Q. Throughout every single well at  
13 every single stage?

14 A. That would be the ideal result  
11:22 15 of what Rassenfoss is describing.

16 Q. And where do you see that?

17 A. Well, if you're continuously  
18 pumping, fracturing these 11 wells, then  
19 ideally you don't have any breakdowns or any  
11:23 20 other reasons to stop the equipment, and  
21 ideally that would be zero nonproductive time  
22 for the pumping units.

23 Q. Is the pumping unit associated  
24 with each individual well or pair of wells?

11:23 25 A. No.

1 Q. So it's one pumping -- one set  
2 of a pumping equipment for, say, all 11?  
3 A. That's the way I read  
4 Rassenfoss, particularly in light of the rest  
11:23 5 of the article, yeah.  
6 Q. Where do you see that all wells  
7 are treated with one set of pumps?  
8 A. Well, that's -- again, I keep  
9 going back to the same sentence, but it's an  
11:23 10 important sentence: Fractured in groups,  
11 four pairs, plus three wells together, in the  
12 middle of the pattern using continuous  
13 pumping.  
14 Q. So how -- we know how it did it  
11:23 15 with Webster and Casero, the other article  
16 you mentioned in Paragraph 85.  
17 How is Rassenfoss describing  
18 the ability to switch from one well to  
19 another?  
11:24 20 We know how the other articles  
21 talk about going from to stage to stage  
22 without shutting down. How is Rassenfoss  
23 talking about going from well to well without  
24 shutting pumps down?  
11:24 25 A. He doesn't provide any details.

1 He just describes the overall result of the  
2 technique.

3 Q. So he doesn't describe the  
4 technique. He's -- you're saying he  
11:24 5 describes an ideal?

6 A. No, that's not what I said.

7 Q. Okay. Where is the technique  
8 described?

9 A. Continuous pumping of four  
11:24 10 pairs, plus three wells together in the  
11 middle of the pattern.

12 Q. He doesn't tell you how to do  
13 it?

14 A. That's the technique. But, no,  
11:24 15 he doesn't describe the details of how you  
16 would operate the equipment to do that.

17 Q. Now, I know we have a Tolman  
18 prior art reference that's being asserted.  
19 We also have a Tolman article, right?

11:25 20 A. That's my recollection, yes.

21 Q. I'm going to hand you what was  
22 previously identified as Exhibit 1031.  
23 (Previously marked was Exhibit No. 1031.)

24 Q. (By Ms. Cooke) I believe this  
11:25 25 is the Tolman article referenced in your

1 declaration.

2 Let me know when you have that  
3 in front of you.

11:25 4 A. (Reviewing.) Okay. I have  
5 that.

6 Q. And this is an article that's  
7 called "Method Apparatus for Simultaneous  
8 Stimulation of Multi-Well Pads." Right?

9 A. Yes.

11:26 10 Q. And the Tolman article was  
11 presented to a Society of Petroleum  
12 Engineering conference in 2009. Right?

13 A. Yes.

14 Q. And on Page 2 there is a  
11:26 15 heading that says "JITP Stimulation Method."  
16 Do you see that?

17 A. Yes.

18 Q. And this describes continuous  
19 pumping during sequential treatment of  
11:26 20 individual zones in a single well. Right?

21 A. This paragraph is, yes.

22 Q. Okay.

23 A. It looks like.

24 Q. And that paragraph says, "A  
11:26 25 well is stimulated using the JITP method by

1 sequentially treating individual zones via  
2 the combination of selectively perforating  
3 single intervals and promoting the isolation  
4 of these intervals through the deployment of  
11:27 5 ball sealers.  
6 "A single continuous pumping  
7 operation allows uninterrupted operations as  
8 well as positive pressure on the ball sealers  
9 to facilitate and maintain effective fluid  
11:27 10 diversion."  
11 Did I read that correctly?  
12 A. Yes.  
13 Q. And this paragraph is  
14 describing the continuous pumping within one  
11:27 15 well. Correct?  
16 A. Yes, this paragraph is  
17 describing that.  
18 Q. And the Tolman article is not  
19 describing the continuous pumping while  
11:27 20 transitioning between wells. Right?  
21 A. I think I would disagree with  
22 that.  
23 Q. Okay. Where do you see that?  
24 A. If we look at Page 3, as I  
11:27 25 recall -- yes, "Simultaneous Operations" --

1 it says -- talks about the location and says,  
2 "More specifically, the technology enables  
3 sequential pumping operations on multiple  
4 wells without suspending fracturing  
11:28 5 operations while waiting for nonpumping  
6 events."

7 So I think that at least  
8 suggests continuous pumping of the fracturing  
9 equipment going between at least up to nine  
11:28 10 wells.

11 Q. So, first of all, tell me where  
12 you're reading.

13 A. On Page 3, the paragraph right  
14 after "Simultaneous Operations," starting  
11:28 15 about the middle of the paragraph, "More  
16 specifically..."

17 Q. I want you to take a look on  
18 Page 3 -- Page 4.

19 A. Page 4?

11:29 20 Q. Second paragraph, under  
21 "Operations Integrity."

22 A. Okay.

23 Q. "Opening a valve to begin  
24 pumping into a well while another well was  
11:29 25 still being treated --"

1           A.       I'm sorry. I went to Page 2.  
2 I went backward. You said Page 4. I  
3 apologize.

4           Q.       Let's turn to Page 4 --

11:29 5           A.       Page 4, under?

6           Q.       -- under "Operations  
7 Integrity."

8           A.       Okay. Got it.

9           Q.       You would agree with me that

11:29 10 Tolman describes that opening a valve and  
11 beginning pumping into a well while another  
12 well is still being treated would not have  
13 been permitted under the safety restrictions  
14 described in Tolman. Right?

11:29 15           A.       I still don't see where you're  
16 reading. I'm sorry.

17           Q.       I want you to read that second  
18 paragraph under "Operations Integrity."

19                    It says, "A key element" --

11:29 20           A.       Okay.

21           Q.       -- "of ensuring operation  
22 integrity was a Simultaneous Operations  
23 Hazard Identification and Mitigation Matrix.  
24 In summary, this matrix identified potential  
11:30 25 hazards, mitigators, and actions required and

1 more specifically identified activities that  
2 were restricted from occurring at the time  
3 (i.e., CAN NOT OCCUR activities).

4 "As an example, if the  
11:30 5 operations on a well involved high pressure  
6 pumping or JITP ball sealing pressure events,  
7 the manipulating manifold well valves and  
8 wellhead tree valves on another well were not  
9 allowed to be performed concurrently."

11:30 10 Did I read that?

11 A. Yes, under those conditions  
12 identified in that sentence, then it said do  
13 not manipulate the wellhead tree valves, for  
14 example, if you're doing high-pressure  
11:30 15 pumping on another well.

16 Q. Okay. So if we're doing  
17 hydraulic fracturing, you would agree with me  
18 hydraulic fracturing is high pressure?

19 A. Not all the time, no.  
11:30 20 High-pressure pumping is a particular  
21 stage of -- is a particular section of  
22 hydraulic fracturing. It's not always  
23 hydraulic -- high-pressure pumping.

24 Q. We're going to flip back and  
11:31 25 forth between Page 2 and Page 4.

1                   So the piece that I read to you  
2 earlier that, in your opinion, you think  
3 means you can switch between one well and  
4 another well without stopping pressure  
11:31 5 operations, that paragraph on Page 2 is  
6 talking about a well stimulating using the  
7 JITP method, right?  
8           A.       Page 2 is talking about -- yes,  
9 that paragraph on Page 2 is talking about the  
11:31 10 overall JITP method.  
11           Q.       And it's talking about treating  
12 individual zones via a combination of  
13 selectively perforating single intervals,  
14 right?  
11:31 15           A.       That paragraph, yes.  
16           Q.       With ball sealers.  
17                   Right?  
18           A.       That paragraph, yes.  
19           Q.       And I asked you if that  
11:32 20 paragraph was referring to the continuous  
21 pumping in a single well and multi stages,  
22 right? And you disagreed with me?  
23                   MS. MARGONIS: Objection.  
24           A.       I don't recall that being your  
11:32 25 question. No. I disagree.

1 Q. (By Ms. Cooke) So under that  
2 heading, the JITP Stimulation Method,  
3 Tolman's describing continuous pumping during  
4 sequential treatment of an individual zone in  
11:32 5 a single well, right?

6 A. Yes.

7 Q. Tolman is not describing  
8 continuous pumping between wells?

9 A. In that paragraph.

11:32 10 Q. Correct. And that's because  
11 Tolman tells you that when you're performing  
12 stimulation using the JITP method,  
13 sequentially treating individual zones, you  
14 actually can't open valves that would allow  
11:32 15 you to switch to another well, correct?

16 A. No, that's not what --

17 MS. MARGONIS: Objection, form.

18 A. I'm sorry. That's not what --  
19 that's not what that paragraph on Page 4  
11:33 20 says.

21 Q. (By Ms. Cooke) Do you disagree  
22 with me that it says on Page 4 that (as  
23 read): "As an example, if the operations on  
24 a well involved high pressure pumping or JITP  
11:33 25 ball sealing pressure events, the

1 manipulating manifold well valves and well  
2 trees on another well were not allowed"?

3 A. Correct. During high-pressure  
4 pumping or during ball sealing events, you  
11:33 5 would not manipulate wells, valves in the  
6 other well, yes.

7 Q. And what we're talking about on  
8 Page 2 was well stimulation using a JITP  
9 method with ball sealers, right?

11:33 10 A. Correct. But I think the piece  
11 you're missing is the ball sealing events are  
12 discrete periods of time. Just like  
13 high-pressure pumping is a discrete period of  
14 time.

11:33 15 My water bottle says we're  
16 getting close to 11:30 or so. Finding a good  
17 time for a break soon would be great.

18 MS. COOKE: Do you need a  
19 break? Would you like a break?

11:34 20 THE WITNESS: Sure.

21 MS. MARGONIS: When you can.

22 THE WITNESS: When you get to a  
23 spot.

24 MS. COOKE: Now's good if you  
11:34 25 would like a break.

1 THE WITNESS: Okay.

2 THE VIDEOGRAPHER: The time is

3 11:34. We are now off the record.

4 (Recess taken for lunch at

12:17 5 11:34 a.m., resuming at 12:17 p.m.)

6 THE VIDEOGRAPHER: The time is

7 12:17 p.m. We are now back on the

8 record.

9 Q. (By Ms. Cooke) All right.

12:17 10 Welcome back, Dr. Durham. I'll ask you just

11 again, did you speak with anyone over your

12 break?

13 A. Not about the substance.

14 Q. Okay. Are you familiar with

12:17 15 the term "claim construction"?

16 A. Yes.

17 Q. Okay. And did you apply any

18 claim construction in this -- in this case?

19 A. I did not.

12:17 20 Q. Okay. Are you aware of the

21 need to construe any claim terms at this

22 time?

23 A. No.

24 Q. You agree with me you're not a

12:18 25 patent attorney, right?

1 A. That's right.

2 Q. You're not an attorney at all?

3 A. Correct.

4 Q. And in part of your declaration

12:18 5 there's -- it appears to be a suggestion that

6 the '770 patent may have been allowed because

7 a new examiner reviewed it.

8 Do you recall making that

9 suggestion?

12:18 10 A. If you could point me to that,

11 I would be glad to read -- look at it.

12 Q. Do you recall making that

13 suggestion?

14 A. I recall there being a change

12:18 15 in examiners in the -- in the prosecution

16 history.

17 Q. Did that have any impact on

18 your opinion as to whether the '770 patent

19 claims were allowed?

12:18 20 A. No.

21 Q. You're not offering any opinion

22 in this case on the qualifications of any

23 USPTO examiners. Right?

24 A. That's correct.

12:18 25 Q. Okay. Are you aware that

1 patent claims can have -- or excuse me,  
2 strike that.

3 Are you aware that patents can  
4 have different types of claims?

12:18 5 A. Yes.

6 Q. Okay. And those would be  
7 method claims and system claims, right?

8 A. Okay. Yes.

9 Q. And in performing the  
12:18 10 invalidity analysis in your declaration, did  
11 you perform any different analysis with  
12 respect to the method claims as opposed to  
13 the system claims?

14 A. Not really. The science, if  
12:19 15 you will, is the same between them. It's  
16 just whether you build a system that can do  
17 it or that you actually do it, is my  
18 understanding.

19 Q. And so in performing your  
12:19 20 analysis, you did not consider the  
21 distinction between any particular method  
22 claim and system claim?

23 A. Not if they had the same  
24 language.

12:19 25 Q. Are you aware that the law

1 requires that the steps of method claims be  
2 performed in a particular order?

3 A. Yes.

4 Q. And arriving at the conclusions  
12:19 5 in your declaration, did you consider that  
6 the prior art systems must perform the steps  
7 of the '770 patent method in the claim order?

8 A. Right, it must teach or suggest  
9 at least the same order.

12:19 10 Q. And you applied that concept?

11 A. Yes, I did.

12 Q. Are you also familiar with the  
13 concept of inherency?

14 A. Yes.

12:19 15 Q. And in your declaration did you  
16 also offer opinions that certain information  
17 may be inherent for a reference even if it's  
18 not explicitly described?

19 A. I don't think I used the word  
12:20 20 "inherent." I used the word "necessarily,"  
21 which has a similar meaning, in a couple of  
22 places.

23 Q. What does "necessarily" mean to  
24 you?

12:20 25 A. Necessarily means that in a

1 particular circumstance whatever I say is  
2 necessary, necessarily included would have to  
3 be included for the system to operate as  
4 described.

12:20 5 My best example is a motor  
6 driving a pump, if the motor is driving the  
7 pump, then it necessarily has to have  
8 electrical connections back to an electrical  
9 source.

12:20 10 Q. Okay. Can you give me any  
11 specific examples, you know, in terms of the  
12 validity of the claims where you argue that  
13 an element was necessarily present in a  
14 reference but was not explicitly present?

12:20 15 A. I recall that there were, but I  
16 can't -- I couldn't point to them right now  
17 without a word search.

18 Q. How do you prove something is  
19 inherent or necessarily present in a prior  
12:21 20 art reference?

21 A. Well, it's just an element that  
22 a POSITA would have understood had to be  
23 there.

24 Well, I think I can think of  
12:21 25 one, and I don't remember which claim

1 limitation it might be. But if you're going  
2 to be simultaneously pumping fluid in two  
3 wells, then necessarily the valves to those  
4 wells have to be open.

12:21 5 Q. And so if something is  
6 necessarily present in a prior art reference,  
7 it's basically because you say so?

8 A. Well, no, it's because a POSITA  
9 would understand that is part of the physics  
12:21 10 of the system.

11 Q. But other than your statement  
12 to that effect, there is no evidence that you  
13 provide?

14 A. I don't know that that's always  
12:21 15 true.

16 Q. An example of the wells, is  
17 there evidence that you provided for that  
18 statement other than your own knowledge?

19 A. I think I talk about fracturing  
12:21 20 operations and valve movement in general.  
21 And I think I do explain that a valve  
22 has -- for order for fluid to flow through a  
23 valve, the valve has to be open.

24 Q. Your own statements, right?

12:22 25 A. Well, I make the statement,

1 yes.

2 Q. Are you familiar with a  
3 reference called Carr?

4 A. Yes.

12:22 5 Q. What type of system is Carr?

6 A. Carr is a system directed  
7 towards well operations in general, and some  
8 of the details have to do with fracturing  
9 systems and simultaneously treating multiple  
12:22 10 wells from a single location -- or  
11 centralized location, I should say.

12 Q. So Carr is a simul-frac two  
13 wells in a central location, right?

14 A. That teaches -- that's one --

12:23 15 Q. Two or more wells?

16 A. Yeah, two or more wells,  
17 multiple wells are from a centralized  
18 location is kind of a broad overview of Carr.  
19 There's a lot of details in Carr.

12:23 20 Q. Carr is not simul-frac, right?

21 A. It has -- it teaches  
22 simultaneously fracking operations as well as  
23 sequential fracking operations.

24 Q. Here is Carr. I think we  
12:23 25 previously had this marked as Exhibit 1004.

1 (Previously marked was Exhibit No. 1004.)

2 Q. (By Ms. Cooke) Let me know when

3 you have Carr in front of you.

4 A. I have Carr.

12:23 5 Q. I want you to take a look at

6 Figure 5 of Carr.

7 A. (Reviewing.) Okay.

8 Q. Just go through a little

9 nomenclature here. Carr Figure 5 shows two

12:24 10 wells, right? It's 140 and 142.

11 A. I believe at least two well

12 locations. But yes, Carr refers to 140 and

13 142 as first well and second well.

14 Q. Can you walk me through the

12:24 15 flow path of fluid as it makes its way to

16 Well 140?

17 A. In the specific embodiment of

18 Figure 5?

19 Q. Yeah.

12:24 20 A. All right. Well, fluid starts

21 at Water Supply 104 and Chemicals 106. It

22 goes through the hydration blender into the

23 mixing blender through -- I believe that's a

24 mistake in Carr, that first valve should be

12:24 25 Proportion Valve 474, it's marked 470.

1 And we're going to 140?

2 Q. Uh-huh.

3 A. So in this particular

4 embodiment, it goes through Valve 470 through

12:25 5 Flow Element 150 -- or Flow Meter 150 through

6 Manifold 120, via Flow Path 122. And then

7 off to the well pad 140 or well -- first

8 Well 140.

9 Q. I have a really hard time

12:25 10 tracking this. Can you draw it for me?

11 Would you rather a pen or a --

12 A. A highlighter is probably best.

13 Talking about fluid flow?

14 Q. Yeah, fluid flow into Well 140.

12:25 15 A. (Highlighting.)

16 Q. Can I see it --

17 A. Sure.

18 Q. -- for a second?

19 A. That's this particular

12:25 20 embodiment.

21 Q. And the one correction on this

22 Figure is 470, that first valve before it

23 splits off to 470 and 472 should be labeled

24 474?

12:26 25 A. That's my understanding of the

1 teachings of Carr.

2 Q. Would you make that annotation  
3 on --

4 A. Sure.

12:26 5 Q. -- Figure 5 for me?

6 And I've been told since we're  
7 marking on this, we're going to make this a  
8 new exhibit.

9 We're just going to relabel  
12:26 10 what was put in the record as Exhibit 1004,  
11 and I'm going to mark this as Depo Exhibit  
12 2011.

13 (Marked was Exhibit No. 2011.)

14 Q. (By Ms. Cooke) All right. I'm  
12:27 15 going to hand you back Carr with the sticker  
16 added for 2011.

17 A. Yeah, and I do need to make one  
18 correction or at least one clarification.

19 It's that the fluid will also  
12:28 20 go into each of the Pumping Units 130.

21 Q. Fair. When it's in Isolated  
22 Path 122, right? It would go on the top --

23 A. Right, those top row of pumps.

24 Q. Got it. Okay.

12:28 25 Will you mark for me but with a

1 different color, I want you to do the flow  
2 path for me of how you get to Well 142.

3 A. It would actually overlap a  
4 little bit, although I'm going to put them to  
12:28 5 the side. Just so we don't mix up colors.

6 And also clarification to also  
7 go to that bottom row of pumps, 130 through  
8 Lines 132 and 134.

9 Q. Can I see that back just  
12:28 10 briefly?

11 A. (Tendering.)

12 Q. Okay. So make sure I  
13 understand your annotations here. Before we  
14 hit Valve 474, there's an overlap in the flow  
12:28 15 path, right?

16 A. Correct.

17 Q. And then once we divert past  
18 474 into Valve 470 and 472, the fluid paths  
19 split?

12:29 20 A. Yes. Those are isolated fluid  
21 paths inside Manifold 120.

22 Q. To their respective wells?

23 A. Right. There would actually be  
24 four fluid paths to be technical.

12:29 25 Q. And respectively each of the

1 separate fluid paths would go to their  
2 respective pumps?

3 A. Correct.

4 Q. Thank you.

12:29 5 So on that Carr

6 Figure 5 -- strike that.

7 Can you explain to me what an  
8 isolated manifold path is?

9 A. It's simply a manifold -- it  
12:29 10 teaches a manifold that has multiple fluid  
11 paths where the fluid paths are in different  
12 portions of the manifold, if you will, and so  
13 the fluid doesn't mix.

14 For example, a zipper -- I'm  
12:29 15 sorry, a missile that has both suction fluid  
16 paths and discharge fluid paths would have  
17 two isolated fluid paths.

18 In this case, there is not only  
19 that, there are two sets inside Manifold 120.

12:30 20 Q. Two sets of what?

21 A. Fluid paths. So there's four  
22 fluid paths in total at least.

23 Q. And is that because there are  
24 fluid paths coming out of the well as well?

12:30 25 A. No. Suction -- suction for the

1 top -- so suction for Well 140, Discharge  
2 Well 140. Suction for 142, discharge for  
3 142.

4 Q. I see. Okay.

12:30 5 And I just want to back up a  
6 little bit. I think the question was about  
7 what is an isolated manifold path. Like,  
8 what do you mean by "isolated"?

9 A. It just means they don't blend.  
12:30 10 Carr teaches those fluid paths don't mix  
11 together inside the manifold.

12 Q. So on the diagram that we just  
13 looked at, once fluid enters into, let's just  
14 say the yellow path, which we have designated  
12:30 15 as Isolated Manifold Path 122, it's not  
16 redirected to Well 142.

17 A. Correct. That fluid, once it  
18 enters 122, would go in this diagram only to  
19 140.

12:31 20 Q. Cannot be redirected?

21 A. Not in this embodiment, no.

22 Q. What factors might affect the  
23 fluid conditions in, for example, Isolated  
24 Manifold Path 122?

12:31 25 A. Can you clarify that question a

1 little bit?

2 Q. Sure.

3 Do you know what a fluid

4 condition is?

12:31 5 A. I can give you some examples of

6 fluid conditions; but as far as the

7 definition of fluid condition, no.

8 Q. Is pressure a condition of

9 fluid?

12:31 10 A. It could be.

11 Q. Flow rate?

12 A. Could be.

13 Q. Okay. How could those types of

14 conditions of the fluid, for example, in

12:31 15 Isolated Manifold Path 122 be affected?

16 A. The easiest way would be

17 changing your valve operations or your pump

18 operations.

19 Q. Speed of the pumps?

12:31 20 A. Speed of the pumps could affect

21 that certainly.

22 Q. How about the geological

23 features of the well?

24 A. Yes.

12:32 25 Q. Anything else?

1 A. Yes.

2 Q. Other examples you can give me?

3 A. Viscosity, density, friction,

4 slick water versus gel. The list could go on

12:32 5 and on.

6 Q. Okay. Now, I think we're

7 backing up to what you were saying just a

8 second ago, but you mentioned an integrated

9 manifold, right?

12:32 10 A. Possibly.

11 Q. Okay. Carr teaches that there

12 is an integrated manifold, correct, at least

13 in Figure 5?

14 A. Whether or not Carr uses the

12:32 15 term "integrated," it's a combined manifold

16 that has multiple fluid paths.

17 Q. Okay. And even in an instance

18 of an integrated manifold, Carr teaches that

19 there are still -- a first isolated manifold

12:32 20 path and a second isolated manifold path

21 within that integrated body, right?

22 A. Yes.

23 Q. What is an integrated body?

24 A. Where does that -- where does

12:33 25 Carr use that term?

1 Q. Let's look at Paragraph 26 of  
2 Carr.  
3 I guess what I'm getting at is,  
4 like, so we have these two isolated manifold  
12:33 5 paths. Are they just like glued together or  
6 welded together?  
7 A. My recollection is Carr doesn't  
8 provide that level of detail.  
9 Q. Okay. Let's look at 26 in  
12:33 10 Carr.  
11 A. (Reviewing.)  
12 Q. If you see at least in the  
13 second half of paragraph, "In some  
14 embodiments the manifold 120 is an integrated  
12:33 15 manifold that defines a first isolated  
16 manifold path, 122, and a second isolated  
17 manifold path, 124, within an integrated  
18 body."  
19 Do you see that?  
12:33 20 A. Yes.  
21 Q. Do you know what that means?  
22 A. I just understand that to mean  
23 it's the same structure.  
24 Q. How do you have isolated paths  
12:33 25 within a single structure?

1           A.       Based on the construction.  
2   Based on the --  
3           Q.       So you have multiple types?  
4           A.       -- structure.  
12:33 5                    Maybe pipes, maybe cast.  
6   There's a variety of ways you construct that.  
7           Q.       What do you mean pipes versus  
8   cast?  
9           A.       Well, a series of pipes is a  
12:34 10   series of rolled steel tubing typically that  
11   you would connect together to make a path or  
12   you could cast molten form, if you will, a  
13   metal body that contained an isolated path.  
14           Q.       With a divider down the middle  
12:34 15   or something like that?  
16           A.       There is tons -- tons of ways  
17   you construct that.  
18           Q.       How would that typically be  
19   done as a POSITA?  
12:34 20           A.       I don't know that you can say  
21   typically. I've seen missiles, for example,  
22   with multiple fluid paths, suction and  
23   discharge, that on appearance look like a  
24   series of network of pipes. Even though it  
12:34 25   may be welded as one, it looks like a series

1 of pipes. I've seen them when they're --

2 THE REPORTER: Looks like what?

3 THE WITNESS: Network of pipes.

4 A. Or I've seen them where they

12:34 5 look kind of square from the outside and you

6 can't see the fluid path inside.

7 Q. (By Ms. Cooke) Okay. Even in

8 this "integrated body" description, you

9 understand that there is an isolated fluid

12:34 10 path?

11 A. Yes, that's correct.

12 Q. Can you tell me which valve

13 communicates fluid to Well 140?

14 A. In a particular embodiment?

12:35 15 Q. And you can look at any of

16 them. I don't know that it's different, but

17 we can look at Figure 5.

18 A. Okay. In Figure 5 it shows at

19 least two valves that communicate fluid to

12:35 20 140.

21 Q. Which valves communicate fluid

22 to 140?

23 A. 474 and 470.

24 Q. Okay. So in Valve 470, that's

12:35 25 located on the first Isolated Manifold Path

1 122, right?

2 A. Correct. In this embodiment,  
3 yes.

4 Q. I will ask you the same  
12:35 5 question for Well 142. Which valves  
6 communicate fluid to Well 142?

7 A. In Figure 5 there are two  
8 again, 474 and 472, that are shown.

9 A POSITA would understand that  
12:36 10 there's a lot of other valves not shown in  
11 this diagram.

12 Q. And 472, Valve 472, is located  
13 on the second Isolated Manifold 124, right?

14 A. It's associated with that  
12:36 15 Manifold Flow Path 124. Carr teaches it can  
16 be outside, inside, attached to or separate  
17 from. There are a variety of places you  
18 could put that valve.

19 Q. Okay. But you agree 142 valve  
12:36 20 is associated with the second isolated  
21 manifold path?

22 A. Yes, I would.

23 Q. Can you describe to me what are  
24 the pressure pumping system units that are  
12:36 25 labeled as 130?

1 I think you can look at  
2 Paragraph 22.

3 A. 22? Okay.

4 Carr in Paragraph 22 calls  
12:37 5 those Pumps 130.

6 Q. Okay.

7 A. So it's an array of pumps.

8 Q. And each isolated manifold  
9 path, 122 and 124, has its own separate array  
12:37 10 of pumps, right?

11 A. That's the way I understand  
12 Carr, yes.

13 Q. Why would each well need to  
14 have its own array of pumps?

12:37 15 A. If you're going to maintain  
16 isolated flow paths, as Carr describes, then  
17 you would necessarily need to keep the pumps  
18 separate.

19 Q. Oh, because they're -- because  
12:37 20 you're only pumping to each individual well,  
21 right?

22 A. Well, each flow path is -- and  
23 each set of pumps is connected to an  
24 individual well, correct.

12:38 25 Q. So each individual flow path

1 would need its own pressure source?

2 A. Yes.

3 Again, we're talking about the  
4 embodiment of Figure 5.

12:38 5 Q. And do you understand that Carr  
6 would teach a different embodiment?

7 A. Carr teaches a bunch of  
8 different embodiments and a lot of teachings  
9 that may exceed the embodiments in the  
12:38 10 figures.

11 Q. Are you aware of an embodiment  
12 in Carr that individual manifold paths would  
13 not need their own pumping array?

14 A. I don't recall looking for  
12:38 15 that, so I think I would want to read Carr  
16 again.

17 Q. Not important to your analysis?

18 A. I disagree. It wasn't  
19 necessary for me to understand Carr's  
12:38 20 relationships to the claims, for sure.

21 Q. Do you agree that the fluid  
22 conditions -- we talked about those; you  
23 mentioned a few examples -- associated with  
24 each isolated manifold path could be  
12:39 25 different between 122 and 124?

1           A.       Well, yes, pressure and flow  
2 rate can be different at any given point in  
3 time.

4           Q.       And are you aware that the  
12:39 5 Board agreed with that concept when it made  
6 its initial determination?

7           A.       I don't recall that section of  
8 the ID, but I would be glad to look at it.

9           Q.       Did you ever review the  
12:39 10 determination, initial determination  
11 decision?

12          A.       The institution decision?

13          Q.       Yes.

14          A.       Yes, I did.

12:39 15          Q.       Okay. When was the last time  
16 you would have read that?

17          A.       I read through portions of it  
18 yesterday.

19          Q.       So if the fluid conditions in  
12:40 20 each of these isolated manifold paths could  
21 be different, is that why you need a  
22 different flow meter on each of the paths?

23          A.       Carr teaches a different --  
24 Carr teaches a different flow meter on each  
25 of the paths so that you can measure the flow

1 independently.

2 THE REPORTER: Sorry. Can you  
3 repeat that answer?

4 THE WITNESS: Sure.

5 A. Carr teaches a different flow  
6 meter associated with each path so that you  
7 can measure fluid flow separately and  
8 independently, as opposed to having a single  
9 meter upstream of valve 474, for example.

12:40 10 Q. (By Ms. Cooke) Why would that  
11 be important?

12 A. So that you can measure flow  
13 independently.

14 Q. Because the fluid conditions  
12:40 15 can be different, right?

16 A. Sure. So that you have more  
17 information.

18 Q. Can you take a look back at  
19 Figure 5 of Carr, please? We're going to  
12:41 20 spend a lot of time there.

21 Can you point out for me where  
22 the missile in Carr is?

23 A. I don't know that Carr uses the  
24 term "missile," but the broad term "missile"  
12:41 25 may be -- may include Manifold 120.

1 Q. So your understanding is a  
2 POSITA would -- you would label Manifold 120  
3 as the missile?

12:41 4 A. It at least contains what would  
5 historically be called a missile.

6 Q. And what are the requirements  
7 for what it needs to contain?

8 A. Discharge paths from the pumps  
9 to the well.

12:42 10 Q. So do you agree that the flow  
11 meter -- Flow Meter 150 can be used to  
12 control the position of Valve 470, right?

13 A. Yes. That's in Paragraph 35,  
14 at least Paragraph 35 of Carr.

12:42 15 Q. And adjusting Valve 470 would  
16 affect the flow into the first well, 140,  
17 right?

18 A. It would.

12:42 19 Q. And then kind of similar on the  
20 other half of Carr, the second flow meter,  
21 152, can be used to control the position of  
22 Valve 472, right?

23 A. It can be.

12:42 24 Q. And that would affect the flow  
25 into the second well, 142, right?

|       |    |    |                                             |
|-------|----|----|---------------------------------------------|
|       | 1  | A. | And -- and the first well                   |
|       | 2  |    | because they're going to interact with each |
|       | 3  |    | other.                                      |
|       | 4  | Q. | How would adjusting the second              |
| 12:43 | 5  |    | flow meter impact the first well?           |
|       | 6  | A. | Can you rephrase that question,             |
|       | 7  |    | please?                                     |
|       | 8  | Q. | So this Carr Isolated Manifold              |
|       | 9  |    | Path 122, can you look at that, please?     |
| 12:43 | 10 | A. | Yes.                                        |
|       | 11 | Q. | I think you did it in yellow.               |
|       | 12 |    | That path does not direct fluid             |
|       | 13 |    | to more than just Well 140, right?          |
|       | 14 | A. | Correct.                                    |
| 12:43 | 15 | Q. | Okay. And the Carr Isolated                 |
|       | 16 |    | Manifold Path 122 also doesn't direct fluid |
|       | 17 |    | to multiple frac trees, right?              |
|       | 18 | A. | Correct. In this particular                 |
|       | 19 |    | description of embodiment, correct.         |
| 12:43 | 20 | Q. | So right now we have Flow Meter             |
|       | 21 |    | 150 as being positioned ahead of the first  |
|       | 22 |    | Isolated Manifold Path 122, right?          |
|       | 23 | A. | That's what it shows in                     |
|       | 24 |    | Figure 5.                                   |
| 12:44 | 25 | Q. | How would you measure the                   |

1 condition of a fluid flowing through that  
2 Isolated Manifold 122 if the measurement  
3 device was positioned ahead of the manifold?  
4 A. Because the flow -- the flow is  
12:44 5 not going to change significantly between the  
6 front end of that manifold and the second end  
7 of the manifold if everything is working as  
8 designed.  
9 Q. So --  
12:44 10 A. Flow in equals flow out.  
11 Q. So the pumps don't have any  
12 impact on the pressure of the flow of that  
13 fluid after it enters Valve 470?  
14 A. Which -- which actual parameter  
12:44 15 are you talking about? Pressure or flow?  
16 Q. Any of them.  
17 A. Well, it affects the pressure  
18 certainly. It increases the pressure, but  
19 mass balance says it doesn't change the flow  
12:44 20 rate.  
21 Q. Okay. So condition of a flow  
22 is pressure, could be?  
23 A. Condition of a flow is  
24 pressure? No, I think I have to disagree  
12:45 25 with that statement.

1 Q. Okay. A condition of a fluid  
2 is pressure?

3 A. That's one example. It could  
4 be.

12:45 5 Q. And so how would you measure  
6 the condition of the fluid -- if you're  
7 measuring pressure, how would that first flow  
8 meter measure pressure if it's positioned  
9 ahead of the pressure pump?

12:45 10 A. It's described as a flow  
11 element; and a flow element, absent of a  
12 different element, would not measure  
13 pressure.

12:45 14 Q. Okay. So the flow element that  
15 is in Carr, you think, does not measure  
16 pressure?

17 A. Correct.

12:46 18 Q. So if that Valve 470 was  
19 positioned where it currently is or in the  
20 middle of Flow Path 122 or at the end of Flow  
21 Path 122, you think the reading would never  
22 change?

12:46 23 A. It would not change  
24 significantly assuming all equipment is  
25 operating as designed. In other words, no

1 leaking seals, no leaks in the manifold or  
2 the iron. The mass flow -- or mass balance  
3 says flow in equals flow out. It's kind of  
4 first law of dynamics thing.

12:46 5 Q. So as long as everything is  
6 pumping in, it should never change?

7 A. As long as everything is  
8 working as designed, with no leaks.

9 Q. Now, if Carr were to include a  
12:46 10 third row, we would add a third well to that  
11 Figure 5, you agree with me that the third  
12 well would be deployed in the same way and  
13 with the same mechanism as already described  
14 with -- with Wells 140 and 142, right?

12:46 15 A. Yes, that's how I would  
16 understand Carr to teach.

17 Q. And there would be a third  
18 isolated manifold path with its own  
19 associated flow meter, valve, pumps, and  
12:47 20 well?

21 A. Yes.

22 Q. Does adding any more wells to  
23 an operation like Carr increase the  
24 complexity?

12:47 25 A. Sure.

1 Q. How?

2 A. You're adding equipment. Any

3 time you add equipment you've increased

4 complexity by definition.

12:47 5 Q. Would adding a third well be

6 equally as difficult as adding a hundred

7 wells?

8 A. Well, each one is going to add

9 a level of complexity, but the steps from one

12:47 10 to two to three or four to five are the same.

11 Q. Is it just a matter of adding

12 the parts?

13 A. Adding parts and the

14 communication and controls.

12:47 15 Q. And that can become -- is it

16 equally more complex, or does it become like

17 exponentially more complex with each

18 position?

19 A. Oh, you're asking if it's

12:47 20 linear or exponential?

21 Q. Yes.

22 A. Largely, I'd say linear.

23 Q. Okay. So every single one is

24 an incremental increase in complexity?

12:47 25 A. Yes. As far as equipment goes

1 and operation goes, yes. And you could have  
2 more interactions certainly. But as far as  
3 performing the same function, it's a linear  
4 relationship.

12:48 5 Q. Other than pressure, do these  
6 Pumps 130 associated with each isolated  
7 manifold impact any other fluid conditions?

8 A. Yes.

9 Q. Can you give me some examples?

12:48 10 A. Temperature. It would  
11 certainly affect temperature.

12 Q. Okay.

13 A. Increased temperature.

14 Again, with the caveat that  
12:48 15 everything is working as designed, it would  
16 not have a significant impact on viscosity,  
17 for example, other than the change in  
18 temperature, which affects viscosity.

19 Wouldn't have any significant  
12:48 20 affect on the density of the material because  
21 water is nearly noncompressible.

22 So I think it's going to affect  
23 pressure and temperature and those that --  
24 parameters that are impacted by pressure and  
12:49 25 temperature.

1 Q. Do the pumps not ever change  
2 the speed of the flow?

3 A. It does impact velocity at  
4 different locations.

12:49 5 Q. Within the isolated manifold  
6 path?

7 A. Sure. If you're pumping fluid  
8 at a higher flow rate, then you've impacted  
9 speed, velocity.

12:49 10 Q. Does the Flow Meter 150 measure  
11 that?

12 A. Velocity?

13 Q. Sure.

14 A. It depends on the type of flow  
12:49 15 meter and how it operates. It could use a  
16 velocity relationship to flow.

17 For example, a paddle wheel  
18 type meter is really affected by velocity,  
19 and it knows the size of the chamber it's in,  
12:50 20 so that can back-calculate flow.

21 Q. I'm trying to find in  
22 Carr -- do you recall in Carr where we talk  
23 about the flow meters and what they measure?  
24 Flow meters?

12:50 25 A. I know it's at least in

1 Paragraph 35. It seems it may be in 33 as  
2 well. But I'd say generally 25 to 35.

3 Q. You talk about flow, possibly  
4 viscosity.

12:50 5 A. Well --

6 Q. Density.

7 A. I don't -- I don't intend to  
8 say that those are in Carr.

9 Q. I'm looking in Paragraph 24,  
12:50 10 kind of towards the middle.

11 It says, "Information from the  
12 first flow meter 150 and the second flow  
13 meter 152 can be utilized to control desired  
14 fluid properties such as density, rate,  
12:51 15 viscosity, et cetera," right?

16 A. Where is that? You said 24.

17 Q. It's in Paragraph 24, it's on  
18 Page 3. Bit in the middle -- I can turn you  
19 to it.

12:51 20 A. Yeah, I don't see that in 24.  
21 I'm sorry.

22 Q. (Indicating.)

23 A. I read that to be 25.

24 Q. 25? Okay. Thank you.

12:52 25 A. Okay. Sure.

1 Q. And so those flow meters can be  
2 used to control fluid properties such as  
3 density and viscosity, how would that happen?

12:52 4 A. You would use information from  
5 a flow meter to change what's going on, for  
6 example, in the blender to change the density  
7 and viscosity of the material and what  
8 additives you're adding, et cetera.

12:52 9 Q. So the speed of the flow of the  
10 fluid entering into the isolated manifold  
11 would be different than the speed of the flow  
12 exiting the manifold?

13 A. The speed of the flow is  
14 governed by flow rate and orifice size. So  
12:52 15 if you assume the same pipe on the intake and  
16 discharge, then they would have the same  
17 velocity.

18 Q. Even with the pumps?

19 A. Sure. Because pumps don't --  
12:52 20 because the flow rate is the same. Flow in  
21 equals flow out. You have a 3-inch pipe, for  
22 example, on the intake and a 3-inch pipe on  
23 discharge, then they're going to have the  
24 same velocity.

12:52 25 Q. The only thing that would

1     increase is pressure?

2             A.       Temperature.

3             Q.       Pressure?

4             A.       Pressure and temperature.  And,

12:53   5     you know, temperature affects viscosity.

6     There's -- there's an interplay of materials.

7             Q.       Are you familiar with a

8     reference called Beuterbaugh?

9             A.       Yes.

12:53   10    Q.       Okay.  Let's look at that one.

11            I'm going to hand you

12   Beuterbaugh, which was previously identified

13   as Exhibit 1005.

14   (Previously marked was Exhibit No. 1005.)

12:54   15    Q.       (By Ms. Cooke) Do you have the

16   Beuterbaugh reference in front of you?

17            A.       Yes, I do.

18            Q.       And Beuterbaugh describes a

19   simultaneous pulsed frac treatment, right?

12:54   20    A.       It does describe that.

21            Q.       And what is a simultaneous

22   pulsed fracture treatment?

23            A.       Well, Beuterbaugh talks about

24   various embodiments; but at the top level,

12:54   25   taking all of Beuterbaugh as a whole, it

1 teaches changing the pressure downhole in a  
2 shorter time frame in order to initiate or to  
3 propagate fractures more efficiently.

12:54 4 Q. Is this technique in  
5 Beuterbaugh designed to create or increase  
6 well production for performance?

7 A. Ultimately, that's the goal of  
8 all fracturing, so I would agree with that.

12:55 9 Q. Have any of the well sites that  
10 your company operates or is involved in ever  
11 used the pulsed fracturing techniques  
12 described in Beuterbaugh?

13 A. Certainly not the ones we  
14 operate because we always do one at a time.

12:55 15 But the ones I've been involved  
16 in, I wouldn't -- I don't know that I would  
17 know that.

18 Q. You're not familiar?

12:55 19 A. Well, I don't know sitting here  
20 today I can recall any necessarily.

21 Q. How does the method in  
22 Beuterbaugh optimize downhole pressure waves  
23 and minimize surface impacts?

12:55 24 A. Can you point to it? It sounds  
25 like you're quoting Beuterbaugh. Can you

1 point to that section?

2 Q. I'm not quoting anything. I'm  
3 just asking if there's any way that  
4 Beuterbaugh optimizes downhole pressure and  
12:55 5 minimizes surface impacts?

6 A. (Reviewing.)

7 One of the things he describes  
8 is running the pumps at a constant rate. I  
9 believe that's Paragraph 18. Which would  
12:56 10 minimize surface impact.

11 And, again, optimizing downhole  
12 conditions, as Beuterbaugh's goal, is to  
13 increase fracture initiation and propagation,  
14 which would maximize production. At least  
12:56 15 that's the goal of all fracturing.

16 Q. So how does the method in  
17 Beuterbaugh make that process more efficient?

18 A. Make what process more  
19 efficient?

12:56 20 Q. Fracturing or propagation.

21 A. Beuterbaugh teaches using a  
22 series of pulses taken as a whole.

23 Beuterbaugh, as a whole, teaches using a  
24 series of pulses to initiate or propagate  
12:56 25 fractures.

1 Q. And why would that be more  
2 efficient than any other method?

3 A. According to Beuterbaugh -- I  
4 have to find the section (reviewing).

12:57 5 Paragraph 24, for example, of  
6 Beuterbaugh talks about manipulating the  
7 valves to create a more efficient operation  
8 and creating a positive water hammer wave  
9 going to the first well and a rarification  
12:59 10 wave in the second well. And those -- fluid  
11 flows each overlap to optimize the pressure  
12 waves.

13 And pressure waves, generally  
14 speaking, is the same thing as hammering a  
12:59 15 nail versus pushing a nail. When you create  
16 a pressure wave, you can drive something and  
17 create fractures.

18 In this case, in a different  
19 way, but maybe make them longer or initiate  
12:59 20 new ones similar to pushing -- hammering a  
21 nail versus just pushing on a nail.

22 Q. Okay. In your experience with  
23 wells, you're not actually aware of any  
24 actual operations using the Beuterbaugh  
01:00 25 method, right?

1           A.       Well, I can't recall sitting  
2 here today whether I've been on a well site  
3 that was specifically practicing the method  
4 of Beuterbaugh or not.

01:00

5           Q.       Now, the pulses we talk about  
6 in Beuterbaugh are timed, correctly --  
7 correct?

01:00

8           A.       Well, they are based on the  
9 pulse size, which is a combination of time  
10 and flow rate.

11          Q.       Where do you see the pulses are  
12 based on flow rate?

13          A.       (Reviewing) Paragraph 18. I  
14 should have known.

01:03

15          Q.       Where is that?

16          A.       Paragraph 18.

17          Q.       Or what part of Paragraph 18?

18          A.       "The number of high pressure  
19 pumps in total flow rate from the one or more  
20 high pressure pumps determine the pulse size  
21 of the fractures --

22                 THE REPORTER: Whoa. Slow  
23 down, please.

24                 THE WITNESS: Sure. What did  
25 you get to?

1 THE REPORTER: Just start over.

2 A. "The number of high pressure  
3 pumps in total flow rate from the one or more  
4 high pressure pumps, 135A to 135E, determine  
01:03 5 the pulse size of the fracturing fluid that  
6 are selectively diverted to the plurality of  
7 Wells 120A, 120B, by one or more switching  
8 valves 150A and 150B."

9 So the pulse size would be the  
01:03 10 volume of fluid flowed, which is a function  
11 of both flow rate and time.

12 Q. Okay. I want you to look at  
13 Paragraph 22 where it says, "The timed  
14 duration that a switching valve is open can  
01:04 15 vary or can be maintained of a constant  
16 duration from cycle to cycle."

17 Do you see that?

18 A. Yes.

19 Q. So do you agree that switching  
01:04 20 valves 150A and 150B are opened based on  
21 certain time durations?

22 A. That's one of the factors, yes.

23 Q. Where does that sentence say a  
24 different factor is considered?

01:04 25 A. Well, you have to take the

1 teachings of the entire reference as a whole.  
2 You can't read 22 in isolation of 18.

3 Q. 22 goes on to say, "The time  
4 may be selected from a range of about a  
01:04 5 hundred milliseconds to about ten seconds."  
6 You see that, right?

7 A. Yes.

8 Q. So the time duration for the  
9 switching is selected from a range of a  
01:04 10 hundred milliseconds to about ten seconds,  
11 right?

12 A. That's what that  
13 statement -- that sentence says, yes.

14 Q. So to perform these pulses in  
01:05 15 Beuterbaugh, Beuterbaugh uses a valve  
16 sequencing such that the high-pressure pumps  
17 can continue to run at a constant rate,  
18 right?

19 A. That's what Beuterbaugh  
01:05 20 teaches, correct. If you're -- if you're  
21 teach -- practicing Beuterbaugh, that's what  
22 it teaches.

23 Q. What types of hydraulic  
24 fracturing systems would benefit from using  
01:05 25 the pulsing system taught in Beuterbaugh?

1           A.       Well, according to Beuterbaugh,  
2 any time you want to use a pulse.

3           Q.       Why would you want to use a  
4 pulse?

01:05 5           A.       Again, the concept is, whether  
6 or not it works quite this way, but the  
7 concept is it's easier to hammer a nail than  
8 it is to push a nail in.

9                    So impulses impart a different  
01:05 10 movement, if you will, of the -- of the  
11 formations.

12           Q.       And what causes a pulse?

13           A.       What causes the pulse?

14           Q.       Yeah.

01:06 15           A.       In -- in practicing  
16 Beuterbaugh, it would be switching the  
17 valves.

18           Q.       Do you agree with me that  
19 Paragraph 22 said that the switching of the  
01:06 20 valves is a time duration, right?

21           A.       That is one of the factors, I  
22 agree.

23           Q.       Where does -- show me where  
24 that a factor of valve considers in switching  
01:06 25 is something other than time.

1           A.       It's based on the pulse size,  
2 Paragraph 18.

3           Q.       Which is programmed based on  
4 time?

01:06   5           A.       And flow rate. Pulse size is  
6 a function of time and flow rate. That's  
7 the -- so if your pulse size -- if your pulse  
8 length is five seconds and you're pumping ten  
9 barrels of fluid, then not only are you going  
01:06   10 to have a different volume of fluid, you're  
11 also going to have a different pressure as  
12 opposed to pumping 20 barrels of fluid for  
13 the same period of time.

14           Q.       I think we're mixing up the  
01:06   15 cause and the effect. The cause is how  
16 long -- like, the cause is how long do we  
17 open a valve, right? And the effect is a  
18 length of a pulse, right? How long I open a  
19 valve can impact the length of the pulse?

01:07   20           A.       Yes.

21           Q.       And the pressure flow,  
22 et cetera?

23           A.       Pressure, not flow.

24           Q.       But the valve doesn't say, I'm  
01:07   25 going to measure this, this, this, all these

1 different factors. It simply is, I'm open  
2 for ten seconds, and then I close?

3 A. No, a POSITA reading  
4 Beuterbaugh would understand it's the pulse  
01:07 5 size that's important, and understanding that  
6 the goal of Beuterbaugh is to increase  
7 pressure and create pressure waves, which is  
8 a function of both the flow rate and the  
9 amount of time as taught in Paragraph 18, for  
01:07 10 example.

11 Q. But you achieve that by telling  
12 a valve how long to be open?

13 A. And you decide how long a valve  
14 can be open based on the flow rate as well.

01:07 15 Q. I understand. But the  
16 instruction is "open for a period of time and  
17 then close"?

18 A. That is the end result  
19 instruction of the system, yes, to practice  
01:07 20 Beuterbaugh, which I'm not practicing  
21 Beuterbaugh in any of my analysis so...

22 Q. That's fine. I'm just saying,  
23 in order to open -- in order -- strike all of  
24 that.

01:07 25 The input into the valve in

1 Beuterbaugh is a time input. You would open  
2 five seconds. Close.

3 A. In the nature of that question,  
4 no. The input to the valve is open.

01:08 5 Q. Okay. And then what -- how  
6 does it know to close?

7 A. It's told to close.

8 Q. Okay. Based on a period of  
9 time has expired?

01:08 10 A. And the flow rate --

11 Q. So it gets an --

12 A. -- and pulse size.  
13 (Simultaneous speaking.)

14 Q. -- outside reading of a flow  
01:08 15 rate and says you've met your desired flow  
16 rate and now you can close?

17 A. The valve doesn't know flow  
18 rate or time, either one. It just knows open  
19 or close.

01:08 20 Q. Who tells it what to do?

21 A. The control system.

22 Q. And what goes into the program  
23 of the control system?

24 A. Flow rate, time, and the  
01:08 25 desired pressure.

1 Q. Okay. So it measures -- the  
2 control, you say, measures flow rate, time,  
3 and pressure. And it's not time based, so  
4 it's not saying you're open five seconds,  
01:08 5 five seconds, five seconds, five seconds?  
6 A. I disagree with your  
7 characterization of my testimony.  
8 I'm not saying it's not based  
9 on time. It is. But it's also based on the  
01:08 10 flow rate.  
11 Q. I think we're talking past each  
12 other here.  
13 Are the -- are the pulses in  
14 Beuterbaugh equal?  
01:08 15 A. No. It teaches they can  
16 be -- they can vary from well to well, from  
17 cycle to cycle.  
18 Q. Within a cycle within a single  
19 well, you're going to make equal pulses?  
01:09 20 A. Well, within one cycle, yes,  
21 there is only one duration.  
22 Q. So it would only be one pulse?  
23 A. For one cycle, yes.  
24 Q. Okay.  
01:09 25 A. That's what a cycle is.

1 Q. I want you to take a look at  
2 Paragraph 24.  
3 A. Okay.  
4 Q. You agree with me that what's  
01:09 5 in Paragraph 24 says that the rate controls  
6 the pulse, right?  
7 A. (Reviewing.) Well, it says the  
8 rate of opening will have -- certainly have  
9 an impact on the pulse.  
01:09 10 Q. Right.  
11 A. That's what it says, which I  
12 agree with.  
13 Q. In Beuterbaugh, are the pumps  
14 positioned ahead of the valves 150A and 150B?  
01:10 15 A. Yes, in the embodiment in  
16 Figure 2, for example, they are.  
17 Q. You said earlier that you were  
18 not practicing Beuterbaugh in any of your  
19 analysis. What did you mean by that?  
01:11 20 A. In other words, I'm not picking  
21 up Beuterbaugh as a -- as a whole and bodily  
22 incorporating it into the combination with  
23 Carr, for example. It's -- it's not  
24 necessary, and that's not my intent is to  
01:11 25 bodily incorporate Beuterbaugh.

1 Q. What part of Beuterbaugh are  
2 you using?

3 A. First, to the -- Paragraph 492  
4 of my declaration. I could read it into the  
01:11 5 record or we could just read Paragraph 492  
6 that talks about to the extent Carr doesn't  
7 already have a computer-based system or  
8 apparatus, Beuterbaugh explicitly discloses  
9 that.

01:12 10 Q. Okay. So using Beuterbaugh's  
11 computer system.

12 What else?

13 A. Right. And to the extent that  
14 the board finds Carr does not specifically  
01:12 15 disclose the specific sequence of closing the  
16 first valve after the second valve, then I'm  
17 picking that up from Beuterbaugh as well.

18 I defer to Carr's goal, as I  
19 say, as pumping fluid simultaneously to the  
01:12 20 first Well 140 and the second Well 142 via  
21 Manifold 120.

22 Q. That's it, right?

23 A. No. There's also another  
24 example. Although Carr teaches multiple  
01:12 25 wells, it has details of two, using an

1 example of two.

2 So, again, to the extent that

3 the Board finds that Carr only teaches just

4 two, Beuterbaugh teaches you can do more than

01:12 5 two. Those are the three elements.

6 Q. That's it, those three?

7 A. Yes.

8 Q. And so -- and you're not

9 considering this structure of Beuterbaugh in

01:13 10 contemplating how it would work into Carr?

11 A. Well, certainly I'm

12 understanding the structures in Beuterbaugh,

13 for example. The computerized control system

14 is a structure. The valves is a structure.

01:13 15 And how they would interact. But I'm not

16 picking up all of Beuterbaugh and dropping it

17 in.

18 Q. Can you point me to the

19 manifold in Beuterbaugh?

01:13 20 A. There are several manifolds

21 shown in Beuterbaugh. There's a suction and

22 a discharge manifold associated with -- I'm

23 referring to Figure 2, for example.

24 There's a suction and a

01:13 25 discharge manifold associated with the

1 Pumps 135A through 135D.

2 And there's also a  
3 discharge -- there's also a manifold shown at  
4 the Discharge 135E.

01:14 5 And there's a further manifold  
6 shown with comprising at least Valves 160A  
7 through 160D.

8 Q. And by "manifold," are you just  
9 referring to pipelines?

01:14 10 A. No. No. A manifold is not  
11 just a pipe. A manifold is a place where the  
12 fluid is gathered for multiple sources into  
13 one location or one source or distributed  
14 from one source to multiple sources, multiple  
01:14 15 destinations.

16 In -- in this instance,  
17 referring to Beuterbaugh.

18 Q. What is the purpose of valves  
19 150A and 150B?

01:14 20 A. Beuterbaugh refers to those as  
21 the switching valves, to switch flow between  
22 one well or the other.

23 Q. And are those considered zipper  
24 valves?

01:15 25 A. In this operation, I would say

1 that they would probably comprise -- or be  
2 referred to as zipper valves. They certainly  
3 meet the definition.

01:15 4 Q. Switching back briefly to Carr,  
5 you agreed with me that Carr teaches a method  
6 of pumping fluids simultaneously into  
7 Well 140 and Well 142, right?

8 A. It does teach that.

01:15 9 Q. I want you to look at  
10 Paragraph 493 of your declaration.

11 A. Okay.

12 Q. Are you there?

13 A. I'm there.

01:16 14 Q. You state, "A POSITA would have  
15 been motivated to apply the teachings of  
16 Beuterbaugh to the method and system of Carr  
17 in order to further Carr's goal of pumping  
18 fluids simultaneously to the first well, 140,  
19 and second well, 142, via a manifold."

01:16 20 Right?

21 A. Yes.

22 Q. Did I read that correctly?

23 A. Yes.

01:16 24 Q. And Carr discloses pumping  
25 fluids simultaneously to both Wells 140 and

1 142 without any need for Beuterbaugh's  
2 assistance, right?

3 A. Yes. That's part of what Carr  
4 teaches. It teaches other things, but that's  
01:16 5 part of it.

6 Q. Without Beuterbaugh's  
7 assistance, correct?

8 A. Correct. I believe so.

9 Q. And all you would need to do in  
01:16 10 Carr is open both Valves 470 and 472?

11 A. Well, that's not all Carr  
12 teaches. No, I disagree. There's more than  
13 one way to go about the processes Carr  
14 teaches.

01:16 15 Q. To do simultaneous fracking  
16 in Carr?

17 A. That's one way.

18 Q. And how would Beuterbaugh  
19 further the goal of pumping fluids  
01:16 20 simultaneously into Well 140 and 142 in Carr  
21 that Carr does not already tell you how to  
22 do?

23 A. Well, I -- it is my opinion  
24 that Carr does tell you what to do. All  
01:17 25 right? Now, what Beuterbaugh teaches is

1 specifically --

2 Q. I -- I didn't ask. I just

3 asked --

4 A. You actually did.

01:17 5 Q. -- specifically -- move to

6 strike.

7 My question -- maybe the court

8 reporter can read the question back.

9 A. Yeah.

01:17 10 THE REPORTER: Sure.

11 Question: "And how would

12 Beuterbaugh further the goal of

13 pumping fluids simultaneously into

14 Well 140 and 142 in Carr that Carr

01:17 15 does not already tell you how to do?"

16 Q. (By Ms. Cooke) So does

17 Beuterbaugh add anything to this ability for

18 Carr to simultaneously pump into 140 and 142?

19 MS. MARGONIS: Objection. I'm

01:17 20 going to ask you to let him finish

21 that first question.

22 A. Yes, how does Beuterbaugh do

23 that, because to the extent that the board

24 finds Carr doesn't specifically teach closing

01:17 25 the first valve after the second valve, then

01:18 1 Beuterbaugh does teach that during the period  
2 of time where the first -- in Beuterbaugh,  
3 for example, the first valve is open and the  
4 second valve is open at the same time, that  
5 would further Carr's goal of simultaneously  
6 pumping.

7 MS. COOKE: I move to strike  
8 that as nonresponsive.

01:18 9 Q. (By Ms. Cooke) So -- I just  
10 need to get this clean for record so I  
11 understand you and that we understand each  
12 other.

13 With respect to Carr, it's your  
14 position that Carr teaches a simultaneous  
01:18 15 fracking of Well 140 and 142, correct?

16 A. That's part of what Carr  
17 teaches, yes.

18 Q. By itself?

19 A. Sure.

01:18 20 Q. And you do not need  
21 Beuterbaugh, in your opinion, for Carr to be  
22 able to simultaneously frac wells 140 and  
23 142?

24 A. Correct.

01:18 25 Q. Thank you.

1 Beuterbaugh has a controller,  
2 right?

3 A. Yes.

01:18 4 Q. The Beuterbaugh controller can  
5 control operational opening and closing of  
6 valves, right?

7 A. It does certainly do that.

8 Q. Where does Beuterbaugh disclose  
9 measuring flow conditions with the  
01:18 10 controller?

11 A. I don't believe I pointed to  
12 any section of Beuterbaugh that taught that.  
13 But it certainly suggests that in  
14 Paragraph 18.

01:19 15 Q. Are you relying on  
16 Beuterbaugh's ability or alleged ability to  
17 open and control valves or measure flow  
18 conditions?

19 A. Yes.

01:19 20 Q. Strike that. That's probably a  
21 bad question.

22 THE WITNESS: And when we get  
23 close to a time -- to a stop point, I  
24 would like a break.

01:19 25 MS. COOKE: Okay. We can take

1 a break now.

2 THE WITNESS: Okay.

3 THE VIDEOGRAPHER: The time is

4 1:19 p.m. We are now off the record.

01:19 5 (Recess taken at 1:19 p.m.,

6 resuming at 1:44 p.m.)

7 THE VIDEOGRAPHER: The time is

8 1:44 p.m. We are now back on the

9 record.

01:44 10 Q. (By Ms. Cooke) Welcome back,

11 Dr. Durham. Did you speak with anyone during

12 your break?

13 A. Yes.

14 Q. Who?

01:44 15 A. Counsel.

16 Q. Did you discuss the substance

17 of your testimony?

18 A. No.

19 Q. Do you recall the reference

01:44 20 Jackson that was attached as Exhibit 1005 to

21 the petition?

22 A. I do.

23 Q. And Jackson was a conventional

24 single wellhead fracturing operation,

01:44 25 correct?

1           A.       Do you have Jackson there so I  
2       can answer that question more intelligently?  
3           Q.       I will hand you Jackson, which  
4       was marked Exhibit 1005.  
01:45 5       (Note: Per counsel's later instruction,  
6       Exhibit 1005 should be marked as Exhibit  
7       1007.)  
8           A.       Sure.  
9       (Previously marked was Exhibit No. 1007.)  
01:45 10       A.       (Reviewing.)  
11                I will agree it's a single well  
12       operation. Just the term "conventional," I'm  
13       not sure what that means.  
14           Q.       (By Ms. Cooke) Single well  
01:45 15       hydraulic fracturing operation, Jackson,  
16       right?  
17           A.       Yes, it is.  
18           Q.       Okay. It's not a zipper frac  
19       operation?  
01:45 20       A.       Correct.  
21           Q.       Not a simul-frac?  
22           A.       Correct.  
23           Q.       And does Jackson have a  
24       manifold?  
01:45 25       A.       It's highly likely that Jackson

1 does have a manifold for both the suction and  
2 discharge of the fracturing pumps at least.

3 Q. Show me where.

4 A. I don't -- I don't know what  
01:45 5 location it is, but that would be a very  
6 common and well-known component of the normal  
7 run-of-the-mill fracturing system at the time  
8 of Jackson.

9 Q. Even for a single well?

01:46 10 A. Yes.

11 Q. What about a zipper manifold?

12 A. No, a zipper manifold is unique  
13 to multiple wells and switching between them  
14 or simultaneous.

01:46 15 Q. All right. Are you also  
16 familiar with a reference called Tolman?

17 A. Yes.

18 Q. Let's get Tolman out. Tolman  
19 was marked Exhibit 1006.

01:46 20 A. Thank you.  
21 (Previously marked was Exhibit No. 1006.)

22 Q. (By Ms. Cooke) Let me know when  
23 you have that in front of you.

24 A. I have that.

01:46 25 Q. Okay. Do you recognize what I

1 handed you as 1006 to be the Tolman  
2 reference?  
3 A. Yes. It appears to be.  
4 Q. Ad I'm going to correct for  
01:47 5 record. It looks like Jackson is actually  
6 1007.  
7 Look back at Jackson and  
8 confirm that that --  
9 A. Yes, it's marked as 1005; but  
01:47 10 in my list of exhibits it's 1007.  
11 Q. Can you hand me Jackson,  
12 please?  
13 A. (Tendering.)  
14 Q. Okay. Well, whatever I'm  
01:47 15 handing you is -- it's IWS Exhibit 1005. It  
16 appears to be the Jackson reference. If  
17 you'll just confirm that that's what's on the  
18 page?  
19 A. (Reviewing.)  
01:47 20 Yes, it's publication 2007,  
21 0023184, which is my Exhibit 1007.  
22 Q. Okay. Let's look at Tolman.  
23 Tolman is 1006. Is that right?  
24 A. Yes.  
01:48 25 Q. Okay. And Tolman is zipper

1 fracturing, right?

2 A. Well, yes. Certainly.

3 Q. Look at Tolman Figure 2.

4 A. Okay.

01:48 5 Q. Let me know when you're there.

6 A. I'm there.

7 Q. Can you, similar to what we did

8 in Carr, walk me through the fluid flow

9 through the system shown in Tolman Figure 2?

01:48 10 A. With regards to which -- which

11 components, I should add, or which system?

12 Because there's three kind of independent

13 fluid paths.

14 Q. Walk me through them.

01:49 15 A. Okay.

16 Q. Starting at the top, it looks

17 like everything starts in 204, right?

18 A. Yes, 204 would be your stem

19 fluid storage system.

01:49 20 202 is a system of pumps.

21 203, I don't remember what

22 Tolman calls 203. 203 is a piping between

23 the stimulation storage system and

24 stimulation fluid storage system, and the

01:49 25 simulation fluid pumping system.

1                   It then goes into a main  
2 manifold valve, 210, which is part of  
3 Manifold 206.

4                   And there's also a manifold  
01:50 5 check valve 212, downstream of 210.

6                   220 is a densitometer. Fluid  
7 flows through that.

8                   224 -- I'm sorry, 222 is a  
9 pressure gauge, 222.

01:50 10                  224 is a ball injector or ball  
11 drop mechanism. Tolman calls it a ball seal  
12 injector.

13                  226 is a flow meter.

14                  And 214, 216, and 218 are  
01:50 15 valves, discharge valves on the manifold.

16                  And then 106 -- and those are  
17 coupled with three individual well heads,  
18 106A, 106B, 106C. I think, as I recall,  
19 Tolman calls those well trees. Well trees  
01:51 20 would be, of course, associated with the  
21 wellhead.

22                  And then out through piping  
23 228C -- I'm sorry, 228A through 228C into a  
24 series of manifold valves, 230A through 230C.

01:51 25                  And this side is associated with flowback

1 operations, 228 and 230.

2 And then finally into 238A

3 through C, which are flow lines out to

4 various fluid handling equipment such as

01:51 5 tanks and separators and the like.

6 Q. That was very helpful.

7 I think we missed one. It was

8 208. What -- can you just quickly tell me

9 what 208 is?

01:52 10 A. Sure. 208 is piping. It's

11 part of the manifold. And really the best

12 description is starting at Column 636 on

13 through Column 8, call it, 62. It just

14 defines what those individual structures are.

01:52 15 Q. And so you mentioned 228A,

16 right?

17 A. Yes.

18 Q. And what is the function of the

19 pipe that's labeled 228A?

01:52 20 A. It's for flowback operations.

21 Q. And so fluids flow out of

22 Well 106A through Pipe 228A?

23 A. Correct.

24 Q. And you call that flowback?

01:52 25 A. Yes, that's for flowback. And

1 Tolman may also teach that as part of the  
2 production, could be used for production as  
3 well.

4 Let me see what he says there.

01:53 5 (Reviewing) That will take some  
6 doing.

7 Well, generally, I'd say that's  
8 true, but Tolman does say it can also be used  
9 for -- it can also be used in stimulation in  
01:54 10 another embodiment.

11 Q. How would you use a flowback  
12 pipe for stimulation?

13 A. It's just another way to do it.  
14 You reuse the same piping structure if you  
01:54 15 choose to.

16 Q. Would it require moving  
17 anything?

18 A. It would require coupling the  
19 pumps to a different location.

01:54 20 Q. Okay. But in its current  
21 structure that we see in 2, Figure 2?

22 A. So, again, in those same  
23 columns, 6 through 8, down towards the bottom  
24 of 8 you could read that to interpret that  
01:54 25 the pumping system manifold -- I think the

1 sentence is probably not what the inventor  
2 intended to say, but nevertheless, it says  
3 that -- at least implies coupling the pumps  
4 to those Pipes 238A and the  
01:55 5 manifolds -- Manifold Valves 230C, et cetera.

6 Q. That's not what's shown in  
7 Figure 2, right?

8 A. Well, this is talking about  
9 Figure 2. It --

01:55 10 Q. That's not -- that's not what's  
11 shown in Figure 2?

12 A. It does not show the pumps  
13 connected to those locations, correct.

14 Q. So --

01:55 15 A. It shows pumps connected to  
16 Manifold 206.

17 Q. What's shown in Figure 2, the  
18 function of the 228A is to flow fluid back  
19 from the well through 228A, right?

01:55 20 A. Yes. That's my understanding.

21 Q. And then I know you just  
22 mentioned the sentence that maybe doesn't  
23 necessarily reflect what's shown in Figure 2.  
24 Where is that sentence you're referring to?

01:55 25 A. Column 8 starting at 44 through

1 50, maybe. It's kind of a confusing  
2 sentence.

01:56 3 Q. I think you testified earlier  
4 that you are involved in planning of  
5 stimulation operations, right?

6 A. I've designed fracking  
7 operations, stimulation operations in  
8 general, yes.

01:56 9 Q. Okay. And is that the same  
10 thing as what is often referred to as a frac  
11 plan?

12 A. It can -- a frac plan can be  
13 part of the design -- it's part of the  
14 design, yes.

01:56 15 Q. Okay. And what is included in  
16 a frac plan?

17 A. Well, I mean, it could be a  
18 large variety of things, but examples are  
19 flow rates, desired pressures, and volumes of  
01:56 20 fluid injected, pounds of proppant injected.  
21 Things like that go into -- into a frac plan.

22 Q. So in a frac plan will you  
23 articulate or lay out all the wells that need  
24 to be frac'd?

01:57 25 A. Yes, particularly in zipper or

1 simultaneous frac operation there would be  
2 interplay between hem.

3 Q. So say we had four wells we got  
4 to frac here?

01:57 5 A. Right. You do a frac design  
6 for each one and a frac plan for each one.  
7 Likely, they're going to be  
8 very similar because in a multi-well pad it's  
9 often drilled into the same formation.

01:58 10 Q. And what about stages? Would  
11 you also detail the stages for each well,  
12 Hey, we're going to do a hundred stages in  
13 this well?

14 A. That may be a record, but yes.

01:58 15 Q. Ten?

16 A. Yeah, 40.

17 Q. Forty?

18 A. 20, 40, something.

19 Q. Okay.

01:58 20 A. Sure.

21 Q. So your frac plan would include  
22 not only which wells you're going to drill  
23 but the stages for each well?

24 A. Yes. That would be part of the  
01:58 25 frac design at least.

1 Q. What's the difference between a  
2 frac design and a frac plan?

01:58 3 A. Well, a frac plan is part of a  
4 frac design. So a frac plan is the operation  
5 of the equipment really.

6 A frac design is -- includes  
7 the -- for example, the models of what the  
8 fracture should look like after the -- after  
9 the frac plan is executed and how those  
01:58 10 interplay with each other.

11 Q. And the frac plan and the frac  
12 design, those are both created or designed  
13 ahead of operations beginning, correct?

01:58 14 A. That's one way, but certainly  
15 not the only way. And certainly not a  
16 hundred percent common today.

17 Most frac plans today  
18 are -- there may be a general design, but the  
19 frac plan changes during the course of the  
01:59 20 fracturing operation based on the response of  
21 a formation.

22 Q. If you would, take a look at  
23 Tolman Column 9, Line 17. The paragraph  
24 starts: "After the first stimulation  
01:59 25 treatment is completed a determination is

1 made whether the planned stimulation  
2 treatments for the wells are completed as  
3 shown in Block 318."  
4 Do you see that?  
01:59 5 A. Yes.  
6 Q. What is a planned stimulation  
7 treatment for the wells?  
8 A. That would -- the way I  
9 understood Tolman to use that term, that  
02:00 10 encompasses all the treatments you're going  
11 to do at that particular pad location for  
12 each of the wells.  
13 Q. All the stages?  
14 A. All the stages for all the  
02:00 15 wells.  
16 Q. And now I want you to look at  
17 Tolman Figure 3.  
18 A. Okay.  
19 Q. So can you walk me through  
02:00 20 Steps 312, 314, and 316?  
21 A. Okay. Well, they kind of go  
22 along with 310 because --  
23 Q. Sure.  
24 A. -- you have a loop between 310  
02:00 25 and 318.

1 Q. That's fine. Start there then.

2 A. So at 310 you adjust the  
3 pumping system manifold for whichever well  
4 you want to inject fluid into. It's part of  
02:00 5 the primary stimulation treatment as Tolman  
6 teaches.

7 And I'm going through one  
8 example. There's -- there's a lot of  
9 teachings in Tolman maybe that won't be in  
02:00 10 my -- all of my examples.

11 But in 312, you're pumping  
12 stimulation treatment into one of the wells.

13 314, you're preparing another  
14 well, for example, running wireline  
02:01 15 operations.

16 And in 316, you're doing other  
17 things in one of the remaining wells, and  
18 Tolman gives examples of that. If I can find  
19 that.

02:01 20 Q. You could be producing the  
21 well, right?

22 A. Tolman gives some specific  
23 examples that I would like to find.

24 Here we go. No, that's not it.

02:01 25 It could be flowback. It could

1 be -- here we go. Here it is.

2 It could be flowback. It could  
3 be other wireline operations, injecting  
4 fluids or materials, performing plug removal  
02:02 5 operations, and/or other operations.

6 And that's in Paragraph 863 to  
7 '98 of Tolman.

8 Q. Okay.

9 A. So those are some of the  
02:02 10 examples that could be going on in 316 while  
11 you're doing your primary stimulation  
12 treatment in 312.

13 When you complete that stage,  
14 when all 312, 314, and 316 are complete, you  
02:02 15 check and see if there's anything -- any more  
16 things to do, any other wells, any other  
17 stages, and you circle back to 310 until the  
18 frac job is complete. And when the frac job  
19 is complete, you move to 320.

02:02 20 Q. So 318 is really asking if the  
21 plan for the entire well site is done?

22 A. Yes.

23 Q. And if the answer is yes, you  
24 pick and move your equipment and --

02:02 25 A. Correct.

1 Q. -- drive down the road?  
2 A. That's what Figure 3 is  
3 teaching, yes.  
4 Q. And you said if no, we circle  
02:03 5 back and start again at 310?  
6 A. Correct. We adjust the pumping  
7 system manifold as appropriate. And I go  
8 through some of those steps in my  
9 declaration.  
02:04 10 Q. All right. So look back with  
11 me at Figure 2.  
12 And when Pipe 228A is being  
13 used for flowback, does pipe 228A connect to  
14 a flowback valve on a Well Tree 106A?  
02:04 15 A. Yes.  
16 MS. COOKE: I want to check  
17 with my friends, but I don't think I  
18 have any further questions.  
19 Want to take a break?  
02:04 20 MS. MARGONIS: Sure. Was that  
21 your last question, you said, or you  
22 need a break?  
23 MS. COOKE: I'm just asking if  
24 you want to take a break before I pass  
02:04 25 the witness, or are you guys ready to

1 go?

2 MS. MARGONIS: Yeah, no, we'll

3 take a break then.

4 THE VIDEOGRAPHER: The time is

02:04 5 now 2:05 p.m. We are now off the

6 record.

7 (Recess taken at 2:05 p.m.,

8 resuming at 2:19 p.m.)

9 THE VIDEOGRAPHER: The time is

02:18 10 2:19 p.m. We are now back on the

11 record.

12 Q. (By Ms. Cooke) All right.

13 Welcome back, Dr. Durham. Did you speak with

14 anyone during the break?

02:19 15 A. Well, yes, but not anything

16 substantively.

17 Q. Not about the substance of your

18 testimony?

19 A. To anticipate your question,

02:19 20 yes.

21 MS. COOKE: I have no further

22 questions, and I'll pass the witness.

23 MS. MARGONIS: First, we just

24 want to clarify the exhibits a little

02:19 25 bit while on the record.

1                   That Beuterbaugh is

2                   Exhibit 1005.

3                   Jackson is Exhibit 1007. It's

4                   labeled as such in the PTAB, but it

02:19 5                   does appear that the Bates labeling is

6                   wrong on that, so we will file a

7                   corrected exhibit for that if you guys

8                   are okay with that --

9                   MS. COOKE: That's fine.

02:19 10                  MS. MARGONIS: -- so it's clear

11                  with the Patent Office, too, so

12                  there's no confusion.

13                  MS. COOKE: Okay.

14                  MS. MARGONIS: And with that,

02:19 15                  we don't have any questions.

16                  MS. COOKE: No further

17                  questions.

18                  MS. MARGONIS: Okay.

19                  THE VIDEOGRAPHER: This

02:19 20                  concludes today's deposition, the time

21                  is 2:19 p.m., and we are now off the

22                  record.

23                  (Proceedings concluded at 2:19 p.m.)

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**CHANGES AND SIGNATURE**  
**ROBERT A. DURHAM, Ph.D., P.E.**  
**AUGUST 15, 2024**

| <b>PAGE/LINE</b> | <b> </b> | <b>CHANGE REASON</b> |
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I, ROBERT A. DURHAM, Ph.D., P.E., have  
read the foregoing deposition and hereby  
affix my signature that same is true and  
correct except as noted herein.

\_\_\_\_\_  
ROBERT A. DURHAM, Ph.D., P.E.  
STATE OF \_\_\_\_\_ )  
COUNTY OF \_\_\_\_\_ )

Subscribed and sworn to before me by  
the said witness, ROBERT A. DURHAM, Ph.D.,  
P.E., on this the \_\_\_\_\_ day of  
\_\_\_\_\_, 2024.

\_\_\_\_\_  
NOTARY PUBLIC IN AND FOR  
THE STATE OF \_\_\_\_\_

My Commission Expires: \_\_\_\_\_

Job No: 24-140130

1                   REPORTER'S CERTIFICATION TO THE  
2                   VIDEOTAPED / REALTIMED DEPOSITION OF  
3                   ROBERT A. DURHAM, Ph.D., P.E.  
4                   AUGUST 15, 2024

5                   I, Pat English-Arredondo, CSR, RMR,  
6                   CRR, CLR, Certified Shorthand Reporter in and  
7                   for the State of Texas, hereby certify to the  
8                   following:

9                   That the witness, ROBERT A. DURHAM,  
10                  Ph.D., P.E., was duly sworn by the officer  
11                  and that the transcript of the oral  
12                  deposition is a true record of the testimony  
13                  given by the witness;

14                  I further certify that pursuant to FRCP  
15                  Rule 30(f)(1) that the signature of the  
16                  deponent:

17                  \_\_\_X\_\_\_ was requested by the deponent or a  
18                  party before the completion of the deposition  
19                  and returned within 30 days from date of  
20                  receipt of the transcript. If returned, the  
21                  attached Changes and Signature Page contains  
22                  any changes and the reasons therefor;

23                  \_\_\_\_\_ was not requested by the deponent or a  
24                  party before the completion of the  
25                  deposition.

                  I further certify that I am neither

1 counsel for, related to, nor employed by any  
2 of the parties or attorneys in the action in  
3 which this proceeding was taken, and further  
4 that I am not financially or otherwise  
5 interested in the outcome of the action.

6 Certified to by me this 17th day of  
7 August, 2024.

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CSR (TX), RMR, CRR, CLR  
Texas CSR 3828

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