BEFORE THE

RAILROAD COMMISSION OF TEXAS

NEWARK, E. (BARNETT SHALE) FIELD

HOOD COUNTY, TEXAS

JANUARY 20, 2011

VOLUME TWO

REPORTED BY: DAVE HOWARD, CSR

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BEFORE THE
RAILROAD COMMISSION OF TEXAS

RE: COMMISSION CALLED HEARING TO CONSIDER WHETHER OPERATION OF THE RANGE PRODUCTION COMPANY BUTLER UNIT, WELL NO. 1H (RRC NO. 253732) AND THE TEAL UNIT, WELL NO. 1H, (RRC NO. 253729) IN THE NEWARK, E. (BARNETT SHALE) FIELD), HOOD COUNTY, TEXAS ARE CAUSING OR CONTRIBUTING TO CONTAMINATION OF CERTAIN DOMESTIC WATER WELLS IN PARKER COUNTY, TEXAS	)	OIL AND GAS DOCKET NO. 7B-0268629

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BEFORE: EXAMINER GENE MONTES
EXAMINER DONNA CHANDLER

JANUARY 20, 2011

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BE IT REMEMBERED THAT THE ABOVE-CAPTIONED matter came on for hearing on January 20, 2011, and was reported by Dave Howard, Certified Shorthand Reporter in and for the State of Texas, reported by computerized stenotype machine in the 12th Floor Hearing Room at the William B. Travis State Office Building, 1701 N. Congress Avenue, Austin, Texas 78701.

PROCEEDINGS

JANUARY 20, 2011

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EXAMINER CHANDLER: On the record.

MR. JACKSON: We are ready to proceed. Thank you.

MR. COONEY: Madam Examiner, before we proceed, I do have a little bit to say to address the matter of "unidentified" on Exhibits 2 and 3 that were --

EXAMINER CHANDLER: I did ask about that.

MR. COONEY: -- that were status reports. And I think Mr. Jackson and I have come to what we will call a stipulation, if we may, about that, but the practice of the district office on water well complaints is to not come to a conclusion about the person who is responsible for the water well problem so that their status reports on these water well complaints, which would ordinarily on a complaint be addressed to the operator responsible, are addressed in these water well complaints to unidentified.

EXAMINER CHANDLER: With CC's to everybody.

MR. COONEY: With CC's to everybody who might be involved, right. If we could have that in the

form of a stipulation in the record.

EXAMINER CHANDLER: Okay. That makes sense. It just looked odd.

MR. COONEY: And it's consistent with their and the Commission's determination of not having to come to any conclusions about the cause of the water well impact.

MR. JACKSON: We certainly recognize that that's the practice of the Commission and why these exhibits are addressed to unidentified and then various interested parties like Range are CC'd on the letters.

EXAMINER CHANDLER: Okay. I just wasn't aware of that practice. Okay. All right. We are ready. Thank you, Mr. Cooney.

MR. COONEY: Thank you.

JOHN MCBEATH,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION (Continued)

BY MR. JACKSON:

Q. Good morning, Mr. McBeath.

A. Good morning.

Q. Let's start where we finished off yesterday. As I recall, you had just presented a number of exhibits with regard to the mechanical integrity of both the Butler and the Teal well; is that right?

A. That is correct.

Q. And would you please again summarize your professional opinion and conclusion about the mechanical integrity of each of Range's wells, the Teal and the Butler?

A. Yes. Based on my review of the cementing records, of the bond logs, of the pressure tests that have been run on both the Teal and the Butler, I have had been able to rule them out as possible pathways for this contamination problem.

Q. You also presented some evidence yesterday with regard to the lack of faulting in this area; is that correct?

A. Yes.

Q. And how does that relate to the issue of whether hydraulic fracturing could be an issue or could be a cause for contamination of freshwater zones?

A. Basically from the information we have in these wellbores, there is no evidence of faulting that could be -- that could join up with a potential hydraulic fracture even if you could get past the physics of not having enough volume or enough pressure to reach all the way from the Barnett through a mile of rock up to the surface.

Q. Do you have an opinion whether there is any

scenario in which hydraulic fracturing could be a source for contamination in the freshwater wells in this area?

A. With the facts that I have looked at, I have been able to rule that out also.

Q. Thank you. Let's move now to your next area of investigation. Have you made an investigation of penetrations of the freshwater zones within -- in an area surrounding the Teal and Butler wells?

A. Yes. Oil and gas penetrations or oil and gas wells within a two and-a-half mile radius, yes.

Q. Let's turn to your next exhibit, which is a large map marked Exhibit 47. I think we have a blowup of that. Is this it?

A. Yes.

Q. That is it.

MR. JACKSON: Carla, if you would get Exhibit 47 up, please.

Q. (By Mr. Jackson) What is Exhibit 47?

A. Exhibit 47 is a copy of a similar exhibit we looked at yesterday, Exhibit 30. It has some additional information on it, and I alluded to these 11 problem or potential wells that I uncovered. They are shown in kind of a light violet shading around the wells. Most of them occur to the east of the Teal and

Butler surface locations. There is one out here on the western side.

This was the study that I undertook when I initially got involved in this project to look at all the penetrations. We actually looked at 74 wells within the two-and-a-half mile area, looked at the completion, drilling and plugging records. These are the wells that fell out of that study that don't have -- either don't have plugging records or we have identified a problem in that the surface casing doesn't go down deep enough to cover the base of usable quality water or there is just no records at all.

Now, having said that, based on the study that I have done and the fact that these really are not in the proximity of the Lipsky area, I really can't point to any one of wells as being a problem associated with this complaint, but I can't rule them out relating to other areas of possible contamination. For example, the Lake Country Acres is very close to the Center Mills (Strawn) Field that we talked about, and there's some problem wells within that Center Mills Field. So there's 11 wells that really in my view don't relate to the Lipsky complaint but could potentially relate to other problems.

Q. So the focus of your testimony on this exhibit

is on those 11 wells that you've denominated as problem wells; is that correct?

A. That's right. Yes.

Q. And that is out of a total of 77 wells that are shown on this exhibit?

A. It's out of a total of 74. Not all of those are actual wells. Some of those are permits.

Q. Okay.

A. So it's less than 74 total penetrations.

Q. And do those 74 wells include only oil and gas wells or do they also include water wells?

A. Those are 74 oil and gas wells.

Q. And you've also shown water wells that penetrate the freshwater -- obviously penetrate the freshwater zone in this area; is that correct?

A. I have shown water wells only within a 3000-foot radius of the Teal and Butler location. These are the same water wells that will be the subject of additional testimony today that the sampling took place in December and January. And then in addition to that, there's a few other water wells that come in; for example, the Richard Lipscomb well to the west of the Brazos and also the Lake Country Acres water well, the public water supply that we discussed previously.

Q. Based on your investigation of these wells as

reflected on this exhibit and in your testimony, what is your opinion about the likelihood of whether these 11 problem wells may contribute to the issues involved in the contamination of freshwater wells?

A. Specifically to the Lipsky problem, I don't see a connection. There could be a connection to other water well problems.

Q. Thank you very much.

MR. JACKSON: We offer Exhibit 47.

EXAMINER CHANDLER: It is admitted.

(Whereupon, Range Exhibit No. 47 was admitted.)

Q. (By Mr. Jackson) Let's turn to Exhibit 48, Mr. McBeath, which I think may just be a tabulation of the wells on Exhibit 47.

A. It is. Exhibit 48 is a listing of wells. It summarizes the area of review based on Commission records. There are 74 entries. I have highlighted the Range Teal and Butler wells in green, and then for the 11 problem wells or potential problem wells, we have highlighted the issue in sort of an orange color. Either there was no plugging report, the plugs weren't placed correctly, or short surface casing, whatever the issue was is highlighted in the orange. So the orange on Exhibit 48 relates to the violet-shaded wells on

Exhibit 47.

Q. Thank you.

MR. JACKSON: We offer Exhibit 48.

EXAMINER CHANDLER: It is admitted.

(Whereupon, Range Exhibit No. 48 was admitted.)

Q. (By Mr. Jackson) Now, why did you make the investigation that is demonstrated in Exhibits 47 and 48?

A. Well, in my view it's the normal thing to do first. The data is available if you want to look for possible pathways, look for penetrations, uncemented wells, and we are able to rule out within the area of the Lipsky that there really aren't any problem wells we can point to that might have contributed, problem oil and gas wells I should say.

Q. Thank you. Let's turn to Exhibit 49, which is an additional and I think the final area of review map.

A. Yes.

Q. Can you put that up on the easel? What is Exhibit 49?

A. Exhibit 49 is another map that I have created. It's the same two-and-a-half mile radius but what we've done is we have only included wells that were available at the time of the Hurst water well problem. So that

would be October 15, 2005.

And the purpose of this exhibit is to show the lack of Barnett Shale activity in the area at the time we know that there was a problem in the Hurst well. So there's much fewer wells. You don't see any horizontal wells. It's just the old existing shallower wells, Strawn production, and much fewer. All of the 11 problem wells are also included in this map because they were there at the time of October 15, 2005.

I will also point out that outside of the radius, because we haven't reviewed the wells to know whether they were or were not present in October 15, 2005, we just turned off all the wells outside the radius. So this study only relates inside the two-and-a-half mile radius for the timing of the wells. So there is only one well that actually was a Barnett Shale well in that time and it's over on the eastern boundary of the two-and-a-half mile radius.

Q. And who is the operator of that particular well?

A. That is a Devon well.

Q. It's since been plugged; is that correct?

A. It was plugged in early 2010.

Q. Thank you. Anything further on this exhibit at this time?

A. No.

MR. JACKSON: We offer Exhibit 49.

EXAMINER CHANDLER: It is admitted.

(Whereupon, Range Exhibit No. 49 was admitted.)

Q. (By Mr. Jackson) Let's turn to Exhibit 50, Mr. McBeath. And we are going to turn to a review of the Commission's investigation of the Lipsky complaint. What is Exhibit 50?

A. Exhibit 50 is a compilation of correspondence, correspondence in December of 2010 between the Railroad Commission and Range. So it doesn't include all of the correspondence and back and forth between Range and the Railroad Commission going back to August and September and all the way through the fall of 2010.

Q. I think the correspondence in Exhibit 50 actually just represents correspondence during the month of December; is that right?

A. That is true. Yes.

MR. JACKSON: And it is actually -- I will note for the record these are duplicates of exhibits that were put into the record by Mr. Middlebrook. Mr. McBeath has just compiled them into a single exhibit for his purpose here.

Q. (By Mr. Jackson) Mr. McBeath, you mentioned

that the Commission's investigation goes back to August of 2010. Have you reviewed the Commission's files with regard to its investigation of this complaint?

A. I have.

Q. What do those consist of?

A. I've reviewed both the Austin office and district office files, the correspondence, all of the reports that were made on the wells, and it's I would probably estimate at 400 or 500 pages, two redropes full of documents.

Q. And those are the documents in Complaint 7B-9601 as docketed by Field Operations; is that correct?

A. I believe that is the right number, yes.

Q. What is your opinion of the investigation undertaken by the Railroad Commission with regard to this complaint?

A. To me it looks like it's been a thorough, ongoing investigation. It's proceeding in a proper manner, careful. So I think to me it looks like a good investigation. It looks like they are taking it seriously and proceeding in the proper manner.

Q. Now, you became involved in this case some time after December 7th; is that correct?

A. That is right.

Q. But you've reviewed the Commission's file and its investigation of the complaint for the period that precedes your involvement; is that correct?

A. Yes, I have.

Q. And do you see any indication in that file that would show that Range was not cooperating with the Commission at any point?

A. Oh, no. There is a lot of correspondence back and forth. To me Range has responded appropriately, above and beyond. This goes back to the initial letters from the Commission and through the testing of the Butler in October. They had to pull the completion and kill the well. Went ahead and did that and provided mechanical integrity information in October for the Butler and then did the same thing in late December on the Teal well.

Q. Since you became involved in this case some time after December 7th, can you describe Range's response to the Commission's investigation?

A. It's been kind of a remarkable response. They have spent a lot of money. They've hired the right people. I would characterize this as one of the best responses I have ever seen when an operator was faced with something like this.

Q. Is it fair to say that Range has completed a

lot of -- excuse me, Range has undertaken a huge amount of work over the last six weeks in investigating this complaint?

A. That is absolutely right, and a lot of that work occurred over the holidays, over Christmas and New Year's, and they have had people in the field, people working to compile the data, review the data. It's been a remarkable team effort.

Q. As compared to the standard of the reasonably prudent operator, how do you think Range's investigation --

A. It certainly meets that standard.

Q. Let me ask you about one of the findings of fact in the EPA's order. And I am not going to bother to bring that up but -- bring it up on the screen. Finding of Fact No. 40 mention the Railroad Commission as being the state agency with regulatory authority over oil and gas production. And the final sentence on the Finding of Fact 40 says to the effect that the EPA has determined that the appropriate state and local authorities have not taken sufficient action to address the issues raised by the EPA in their December 7th order. Do you have an opinion about whether that finding of fact is justified based on your investigation of this matter?

A. I don't see how it can be justified based on all of the back and forth, based on the actions that have gone on through the fall of 2010, and the ongoing investigation. So I am somewhat confused by that finding. I certainly don't agree with it.

Q. Thank you. In your professional opinion, can you --

MR. COONEY: Excuse me. I am going to -- this line of questioning, I understand it and appreciate it, but objection; relevance. The purpose of the hearing is to address the technical question of the connection, if any, between the oil and gas operations and the water well, Lipsky and the Hayley water wells or any other water wells in the area. And while the EPA order may be relevant in terms of its substantive findings, the process, whether or not anyone meets the elements that EPA has to prove to issue that order is not particularly relevant in this case.

EXAMINER MONTES: The objection is overruled. You may proceed.

MR. JACKSON: Thank you.

Q. (By Mr. Jackson) Mr. McBeath, can you in your professional opinion characterize or compare, I guess, is a better word the EPA's investigation as reflected

in its order with the Commission's investigation as reflected by the Commission's file that you have reviewed and as reflected in all of the components that have gone in to this Commission called hearing that we are participating in today?

A. I think the Railroad Commission certainly has done more work over a longer time than the EPA. So it's difficult to understand where the finding that the Railroad Commission hasn't done sufficient action comes from.

Q. Thank you very much. Just a few concluding questions, Mr. McBeath. Based on your experience as a petroleum engineer and based on the study that you have conducted for presentation in this case, do you have an opinion about the mechanical integrity of Range's wells and whether those wells could be a source for the gas found in the Lipsky well?

A. Based on my review of the records, the bond logs, the pressure tests, the cementing and drilling records of the Teal and the Butler wells, I have been able to rule those two wellbores out as potential pathways.

Q. Based on your investigation and looking at all the possibilities that you have reviewed in your investigation, do you have an opinion as a petroleum

engineer what the most likely source is for the gas found in the Lipsky well and other area water wells?

A. I do. And that is based on my review of the water well records. It's based on discussions with other experts. And I have concluded that the presence of gas in the Lipsky well and the other wells in the area is due to a natural connection between the Cretaceous and the Strawn that is probably exacerbated with the water wells being drilled either too deep and penetrating into the Strawn formation or being drilled almost to the Strawn formation and allowing Strawn water to be drawn into those water wells.

Q. How do your conclusions reconcile with the evidence you heard presented by Dr. McCaffrey?

A. I believe it fits perfectly with that.

Q. And have you talked to Dr. Kreitler who will present geologic testimony later today?

A. I talked to him and worked with him in the study also.

Q. And what is your understanding of how your conclusions, although from a different angle, how they reconcile with his conclusions?

A. I believe that he has come to the same conclusion.

Q. Finally, do you have an opinion about whether

hydraulic fracturing is implicated in this case in any way, shape or fashion?

A. I've been able to rule that out as a possible contributor to this. That's based on my own study and also based on listening to Dr. Warpinski yesterday.

MR. JACKSON: Thank you very much. We pass the witness for cross-examination or questions by the examiners at this time.

EXAMINER CHANDLER: Mr. Cooney, any questions?

MR. COONEY: Yes. I have a few questions.

EXAMINER CHANDLER: Did we admit 50?

MR. JACKSON: I don't think we did. Thank you. We offer Exhibit 50.

EXAMINER CHANDLER: It's admitted.

(Whereupon, Range Exhibit No. 50 was admitted.)

EXAMINER CHANDLER: Sorry.

MR. COONEY: That's all right.

CROSS-EXAMINATION

BY MR. COONEY:

Q. I want to talk a little bit about the Teal well and the Butler well.

A. Okay.

Q. Do you know how Range came to determine what the base of the Cretaceous -- excuse me. Can we refer to the diagram that is behind that map?

A. Sure.

Q. Oh, I am sorry. No, there is one more there. That is the one.

A. That?

Q. Yes. Do you happen to remember what exhibit number that diagram is?

MR. JACKSON: I think it is 46 or 47. Let me see. 46.

A. 46.

Q. (By Mr. Cooney) What does homogenous mean?

A. It means the same.

Q. Okay. Would you say that your line for the Cretaceous on Exhibit No. 46 is homogeneous in the diagram?

A. The color is homogenous. The thickness changes a little bit as you go from the Warner well over to the Teal well.

Q. But the base is a straight line, right?

A. The base is a straight line on this diagram, yes.

Q. Is it a straight line in the field?

A. Between these two wells it is approximately a

straight line, yes.

Q. And those two wells are the?

A. The Warner Addison No. 1. It's a dry hole. And then the Teal well.

Q. And where is it with respect to the Butler well? Where would the Butler well fit on that diagram?

A. The Butler well would be essentially right next to the Teal well since the surface locations are right next to each other on the same pad. So it would be just right next to the Teal well right here. (Indicating.)

Q. And is the base of the Cretaceous in what we are talking about here the same as the base of the usable quality water?

A. It's essentially the same, yes.

Q. How deep is the Cretaceous at the Teal and the Butler well, the base of the Cretaceous?

A. It would be around 324 feet measured depth. And that is reflected on the amended G-1 in Exhibit 37.

Q. I guess I am going to show you my copy of Exhibit 37 and just ask if you can show me where that is.

A. It looks like your copy had the same problem that the other copies had yesterday. So we have --

MR. JACKSON: We apologize. We traded

out copies of the others and missed you. I apologize about that.

A. I can show you where it is on this copy.

Q. (By Mr. Cooney) Okay.

A. Give you a replacement for 37. It's on the last page of the G-1, base of Cretaceous, 324 feet measured depth.

Q. Well, because -- turning to page 3 of Exhibit 37, the Water Board letter.

A. Yes.

Q. Do you agree that the TCEQ did not advise that the base of the Cretaceous is at 175 feet, they estimated it at 175 feet?

A. That is what it says on the letter, yes.

Q. Have you been in situations and -- well, as -- where the water -- the base of usable quality water is estimated and the operator takes on the responsibility or assumes the onus of advising the agency where they discover the base of usable quality water to be?

A. I have been in situations where logs have been provided where the TCEQ had asked for logs, but that would be the extent of it.

Q. When an operator like the operator for these two wells is drilling, how do they come to find out what the base of a formation like the Cretaceous is

here?

A. It's based on logs usually.

Q. And what does the log show them?

A. Oh, it will show the characteristics of the formation. It will show density, porosity. It can tell you resistivity, which will indicate the formation water resistivity. Also indications of the type of formations, whether it is sandstone or limestone based on some of the log readings.

Q. Are the logs run at the time of drilling? I mean, how do they know it -- are the logs run at the time of drilling?

A. The logs are run just after drilling the hole prior to running casing.

Q. And I take it the G-1 for both the Butler and the Teal were amended, right?

A. I think just the Teal. Just the Teal was amended.

Q. One of the earlier G-1s showed that the base of the Cretaceous was at 600 and something feet, and I just want to know how that happened.

A. My understanding is that that was based on kind of a generic assessment that is used in the area, that that was a mistake. It wasn't based on actual measurements out of the Teal, and that is why it has

been corrected.

Q. Well, then if the Butler hasn't been corrected, then that is still showing 175 feet?

A. No. It would still be showing at 600 feet.

Q. Actually, no. The Butler and the Teal in the originally filed one showed two different numbers.

A. I stand corrected. That should probably be corrected to reflect 324 feet.

Q. The base of the Cretaceous is a pretty important number in this situation, isn't it?

A. That is for sure.

Q. Why is it important?

A. It's important because that sets the depth that the surface casing should be set to protect groundwater.

Q. Now, these records aside, the surface casing was set at or near the time of -- I don't know my terminology as well as you do and I apologize -- at the time the well was completed or near the time of it being actually drilled or how does that work?

A. The surface casing would have been set early on in the drilling of the well just a few days into drilling. When the surface hole was finished drilling, the surface casing was set and cemented and tested and then the rest of the drilling proceeded through the

inside of the surface casing.

Q. And the surface casing for both the Butler and the Teal was set at what when it was at that time?

A. Around 400. A little deeper than 400, 427. I would have to look at the other one to give you the actual number.

Q. So no matter what the paperwork says, the actual surface casing was through the base of usable quality water as the conditions occurred in the field?

A. That is right. The Cretaceous is protected by the surface casing and the cement.

Q. And then I think you testified that you have run bond logs on the cement and it is sound?

A. The bond logs actually relate to the long string, the four-and-a-half that was run to the bottom. There are no bond logs on the surface casing. We rely on the fact that the cement is circulated to surface. And that is standard procedure. It is unusual to run bond logs in surface pipe.

Q. Well, is it fair to say that surface casing is the only barrier between Strawn gas getting to -- out into a formation and from this well?

A. Well, which formations?

Q. The Strawn or the Cretaceous. I mean, I think you've said that Strawn occurs at the border in the

Strawn and the Cretaceous.

A. That is right. But within the wellbore, you are correct that the surface casing provides a seal between the Strawn and the Cretaceous in that wellbore. But we have to recognize that just right outside the wellbore you have got the Cretaceous sitting right on top of the Strawn and may have a natural connection.

Q. You have talked to a lot of people and you have looked at a lot of records. You have to rely on the accuracy of what people tell you, I take it?

A. That is true.

Q. And you have to rely on the accuracy of the records you reviewed to come to your conclusions?

A. That is correct.

Q. In the course of doing your investigation, did you find any other inaccuracies or look for -- let's just say look for or test any of the statements that, for instance -- I am sorry. I just want to narrow this down. Let's talk about your visits with people concerning the surrounding water wells, the first part.

A. Okay.

Q. What did you do to test the accuracy of what people were telling you?

A. Well, if we take the Hurst well, for example, I was able to talk to two different people that were

involved in that, the water well driller who provided the photographs of this flaring event from October of 2005, and also the owner of that well, and their statements matched. I am hearing the same story from both of them.

And in fact, they each have kind of a different piece of that. Mr. Peck, who drilled the well, he knows about what happened on that day, but then very shortly after that he wasn't in the picture. So I was able to supplement that information with the owner of the well, Mr. Hurst, and what he did with that well over the next month, and so put all that information together. But the parts of their stories that do overlap, they made sense and they confirmed each other.

Q. Did you talk to anyone -- and I can't remember if we talked about this yesterday -- about the municipal water wells -- the water authority water wells?

A. Lake Country Acres?

Q. Yes, sir.

A. I did not talk to anybody but I had much more of a paper record on those wells. We have information going back to 1995 where those wells had been sampled, and that is because it's a public water supply system.

And then that also going on into the later years when they attempted to drill the replacement well, we have got reports from consultants that were hired to drill that well and to investigate the problem there. So I have -- on that particular set of wells, I have got a considerable paper trail to rely on.

Q. What did you do to test the information that you came across when you were investigating the oil and gas wells in the area?

A. For the most part I relied on the records of the Commission. We would look at scout tickets as some form of confirmation. They are generally not Railroad Commission documents. So that is all I have really. I don't have any way to dig any deeper into those records.

Q. Do you expect any more testimony here today concerning the matter of faulting or no faulting in the area?

A. I think there probably will be in Dr. Kreitler's testimony.

Q. I want to refer you to Exhibit 47 now.

A. Okay.

Q. And particularly within the 3000-foot radius line. Is the map to scale?

A. The map is to scale, yes.

Q. You may have talked about this but it is your testimony that we can rely on the representation of the of the path of the Butler and Teal wellbores as presented in this exhibit?

A. Yes. Those are as-drilled based on the directional surveys.

Q. What is the distance in feet on the surface between the Lipsky water well and the Butler -- the path of the Butler well?

A. Well, on the surface, of course, we have to remember that the actual --

Q. I am just asking on the surface now. Trust me. All right.

A. It's hundreds of feet. I can scale that off but it's on the order of hundreds of feet.

Q. Well, you can do both if this is to scale.

A. If I had a ruler.

Q. Is it 500 -- do you the know what it is on this map?

A. There is another exhibit that may help. I am calling it 350. 350 feet on this map.

Q. Okay. Now, there is no footprint on the surface 350 feet east or northeast of the Lipsky well that indicates that wellbore is there, correct?

A. No. That wellbore is a mile below the surface

of the ground.

Q. That was my next question. At that place east or northeast of the Lipsky well -- I am giving you the right approximate direction of the wellbore path from the Lipsky well?

A. Northeast.

Q. Do you have a record that shows how deep the wellbore is at that approximate location?

A. Approximately a mile. It's going to be 5200 feet, 5300 feet below the surface.

Q. My question was, do you have a record that shows that depth at about that location?

A. That would be contained in the directional survey also.

Q. And then again, and how deep would it be?

A. Approximately one mile.

Q. And then same questions for the Hayley well.

A. Okay.

Q. Approximate distance from the surface and then distance at depth.

A. The Hayley well shows about 300 feet, and it is -- the Hayley well is to the northeast of the Butler wellbore path. 300 feet based on this map.

Q. Now, do you just know off the top of your head if the wellbore path underground stays at about the

same depth or does it continue to bore a little deeper or a little shallower, say, between where it lines up with the Lipsky well and lines up with the Hayley well?

A. If we look at exhibit --

MR. JACKSON: 41.

A. Yes. No, not 41. It's the one with the gamma ray.

MR. JACKSON: 45 I think, John.

A. If we look at Exhibit 45 that has the as-drilled pathway of the Teal and the Butler wellbore -- I guess we are talking about the Butler wellbore. And you can see that at this portion of the wellbore that we have been talking about the horizontal piece of the well path is staying relatively constant at the same depth from the surface of the ground.

Q. (By Mr. Cooney) And then if you could just summarize those same questions or that information I asked for with respect to the Teal well.

A. Okay.

Q. I guess don't worry about the distance from -- well, yes, between the Teal well and the Hayley well and the Teal well and the Butler well.

A. The Teal well and the Lipsky and Teal well and the Hayley.

Q. Right. Sorry. Yes.

A. For the Lipsky well, it is located to the northeast of the pathway of the Teal well about 650 feet. And for the Hayley well it's located approximately 1300 feet to the northeast of the pathway of the Teal well. And I have measured those perpendicular to the trajectory of the wellbore.

And then following up with respect to your question on how the pathway of the Teal well changes as it moves laterally, how it changes with respect to the depth, it is also relatively constant as it moves along its pathway. It tends to get a little bit deeper as it gets farther from the heel of the well to the toe.

Q. So the Teal well at that point is about a mile deep, as well?

A. That is right.

Q. 5280 feet?

A. No. It's a little more than that. I am using a mile as approximate. But it's on the order of -- the Teal well at that distance is about 5820, 5820 feet.

Q. What -- if there were or -- if it were obvious that there were a connection between the Butler well and the Teal well and the gas in the water wells, what would you expect to see?

A. I think you would expect to see --

Q. And pardon me for jumping in. You can talk -- I don't know how to ask the question perfectly. I am thinking it may be easier to talk about certain parts as opposed to all at once. For instance, what would you expect to see in the first 200 feet of the oil and gas wells?

A. Okay. If there was a connection between -- let's say if the Teal well or the Butler well was a pathway that provided a way for Barnett Shale gas to get from the Barnett Shale into the Cretaceous, I think the first thing you would have to see is a sufficient pressure in the bradenhead that would allow that kind of movement to occur. We don't have that.

Q. You mentioned allowing Barnett Shale gas to get into the water wells. Didn't Mr. -- after lunch. I am sorry, I forget his name. Dr. McCaffrey, pardon me. I thought he testified that in his opinion it is not Barnett Shale gas that is in the water wells?

A. That is right. That is my understanding.

Q. Okay. So why are you worried about Barnett Shale gas being in the water wells?

A. I thought you just asked me if there was this hypothetical connection, what would you expect to see.

Q. Right.

A. First of all, I would expect to see Barnett

Shale gas in the Lipsky well.

Q. Why wouldn't you -- did you consider the possibility of these wells being a pathway for Strawn gas getting into the Lipsky well?

A. Yes, I did consider that and I have ruled that out, as well, based on the integrity and based on the level of protection that we have for the Cretaceous, the depth of the surface casing, and based on the pressure that we see in the bradenhead.

Q. The integrity of what?

A. The integrity of the wellbore.

Q. And when you say integrity of the wellbore, what do you mean?

A. I mean that the casing has passed pressure tests so that we know that it is -- it provides a seal between the production that comes from the Barnett up to the surface. I am talking about the bond logs that I have discussed that tell us that that casing is cemented properly to isolate the Barnett Shale from the rest of the wellbore. I am talking about the surface casing, the depth that it's set and the fact that it's cemented and circulated to surface, all of those things.

Q. And when you say level of protection, what are you talking about? You said integrity, level of

protection, and one other thing that I didn't write.

A. I am not sure. Maybe we have to have it read back and see what I said.

Q. The question was -- I mean, did you consider the possibility of the wells, the Teal and the Butler wells, being a conduit of Strawn gas to the Lipsky well, and you said no?

A. I know --

Q. You said you considered that and you ruled it out?

A. Yes. I did.

Q. And I asked why. And you said the integrity of the well, the level of protection, and then one other thing.

A. The level of protection, I think I was referring to the level that we set the surface casing at that we've actually protected the Cretaceous so that that Cretaceous in our wellbore is behind surface pipe. So the level we set was around 400 feet, so we know we've got all that Cretaceous behind surface pipe. And then also the bradenhead was the last thing I mentioned, bradenhead pressure. We only see 30 pounds as a maximum. And we have information that says that that is only building up to 10 pounds these days, between five or 10 pounds. That is not enough pressure

to provide for movement of fluid from the Butler wellbore into the Strawn. It's just not enough. And we know that because you can calculate what the approximate pressure would be at the shoe of the casing, and 30 pounds won't get any movement there.

We also have additional confirmation that the bradenhead of the Teal well doesn't show any pressure. So that is confirmation that there really is no movement in that area in the Strawn.

Q. And when you say movement, are you talking about movement from what to what?

A. Any type of pressure response attributable to that bradenhead pressure. We are not seeing that because we don't see any pressure in the Teal well.

Q. I understand that. How does what you just said relate to the possibility of the wells being a conduit for Strawn gas getting released? I am sorry.

A. All of that taken together --

Q. I am sorry. Strawn gas getting from either of these wellbores to the Lipsky well or the Hayley well?

A. In my opinion, all of that taken together rules out these wellbores as a pathway for Strawn gas to be moving from the Butler or Teal wells to the Lipsky well.

Q. Mr. Lipsky reports that he did not have a

water well problem until after -- I guess a year after the Range gas wells were drilled, right?

A. That is what he reports, but I think we have to keep in mind that he was having his house built at that time, and there's strong evidence that suggests that he has changed the way he has used the well. It would have been used very moderately before the house was built, and once his house is in place with all the requirements, that is going to result in higher use of the well, more drawdown, which could have contributed to this problem.

Q. I am going to ask the question again. Mr. Lipsky reports that he did not have a water well problem until after the Range gas wells were drilled, right?

A. That is how the dates fall, yes.

Q. Okay. And I guess it's your position that there is another explanation for -- other than the coincidence of the dates falling the way they do for the Lipsky well producing gas?

A. Yes.

Q. And I guess there are two parts to that. One is the presence of gas in the formation from which people are getting their water and then the other is the -- your understanding of the heightened pull on the

water well to accommodate the more intense use of water by Mr. Lipsky after his house was built?

A. That is correct.

Q. Have you ever done a study like what you have done here to try to find the source of gas in a water well?

A. No. I have been involved in reviewing wellbores for this type of out of zone. I would equate it to looking for pathways, but specific to water wells, no, I have not.

Q. I want to just finish up one little area I think I talked about. If there were an obvious -- going back to if there were an obvious connection, in your mind, between the gas wells and the gas in the Lipsky water well, what -- and I think I just asked you about the first 200 feet of the well, trying to break it down.

A. Mm-hmm.

Q. What else would you expect to see?

A. Well --

Q. Considering the whole operation.

A. I think if you had seen pathways, for instance if we had taken these bond logs and found that there was a channel behind pipe that we didn't know about that might have provided some kind of pathway for

Barnett Shale gas to get into the bradenhead, that might have been something you would expect to see. Now, that starts to come up in to your 200 foot part of the question but it's related. That could have provided bradenhead pressure that would then perhaps result in an opportunity for the well to be supplying shallow formations. Now, we don't see any of that. So that would be the part relating to the deeper part of the well.

Q. Now, the Hayley well has -- I am going to call it dissolved gas. That is not the right word, I know, but there's a difference between the head gas --

A. I think you have got the right term.

Q. I just don't remember you talking about much the -- and maybe the answer is the same, but much about the potential source of this dissolved gas in the water.

A. That is probably better handled by the other experts that --

Q. Such as?

A. The groundwater -- Dr. Kreitler, the groundwater hydrologist.

Q. And did you look into similarities and differences between the gas in the Lipsky well and gas in all the other water wells that you looked at?

A. I didn't undertake that analysis but I have seen the results of that through the gas fingerprinting expert, Dr. McCaffrey, so I have relied on his summaries of that, and I heard the testimony here yesterday and recognize it through that, but I haven't independently.

MR. COONEY: That is all I have.

EXAMINER CHANDLER: Any redirect?

MR. JACKSON: Just a couple of questions, Madam Examiner.

REDIRECT EXAMINATION

BY MR. JACKSON:

Q. Mr. McBeath, Mr. Cooney asked you about a number of things that you -- or asked you what you would have seen had there been a connection between oil and gas development and contamination in the fresh water, and I just wanted to make sure the record is clear. Are you seeing anything that indicates that there is a connection between oil and gas development by Range in the Barnett Shale and any natural gas in the aquifers?

A. I have not.

Q. Mr. Cooney also asked you about necessarily having to rely on other sources in your investigation.

A. Yes.

Q. And he asked you about interviews with Mr. Hurst and Mr. Malone, for example.

A. Peck, the water well driller.

Q. Mr. Peck. Thank you. In addition to those interviews, you've also relied on sworn deposition testimony of Mr. Peck; is that correct?

A. That is true. Yes.

Q. And you've also relied on sworn deposition testimony by Mr. Malone, another water well driller, correct?

A. That is right.

Q. You've also relied on sworn deposition testimony by Mr. Lipsky who is not with us today, correct?

A. That is true, yes.

Q. In terms of the documents that you have reviewed, Railroad Commission records, TCEQ records, is there anything that you have reviewed and relied on that does not fall into the category of something that you would customarily rely on as an expert in petroleum engineering to investigate oil and gas contamination?

A. No. Whether this was a proceeding like this or just my normal work, it is the same type of data I've always looked at.

Q. Thank you.

MR. JACKSON: No further questions at this time.

EXAMINER CHANDLER: On the Exhibit 42, which is the completion paper for the Butler, could we maybe get someone from Range to take a look at the mud logs or whatever they have available to find out what the base of the Cretaceous is? It says 175, and apparently that may be just taken off the TCEQ letter. I don't know.

MR. JACKSON: I think Mr. McBeath may be able to address that.

EXAMINER CHANDLER: Okay.

THE WITNESS: I think because the surface holes are so close together, if we amended that, and I think we probably should, it would be the same number that we have got in the Teal. So it's going to reflect 324, approximately.

CLARIFYING QUESTIONS

BY EXAMINER CHANDLER:

Q. Because they were drilled from the same surface location and we are only 300 feet down?

A. That is right.

Q. Or 400. I don't know if it's worth changing or not. And do you have any idea -- and maybe you said this already -- how the -- where the 600 feet came

from?

A. My understanding is that that is a generic number that is used probably in a nearby pilot hole, maybe -- I know we have 500 feet on one of the pilot holes, but it's clearly not based on any data from the Teal well. It is a mistake.

Q. And is it your understanding that Range is aware that whatever the TCEQ recommendation was was not completely adequate to cover the entire Cretaceous?

A. They were aware of that, and I think they, in fact, sent a correspondence, it may have been by e-mail, saying are we sure that it is this, and got back an answer that said, yes, 175 plus 20. And even when that was conveyed to Range, they went ahead and availed themselves of the additional surface casing that they could set setting down to approximately 400 feet.

EXAMINER CHANDLER: Okay. Thank you. All right. Thank you, Mr. McBeath.

MR. JACKSON: Thank you very much.

MR. COONEY: Can I ask one more question?

EXAMINER CHANDLER: Yes.

RECROSS-EXAMINATION

BY MR. COONEY:

Q. I think I asked this of somebody earlier but I

want to get your take on it. We have Strawn gas at the bradenhead and Strawn gas at a nearby water well and we have ruled out the Barnett Shale gas or the deeper gas being into the water well. Do you agree that the only way we can know if there is a connection between the gas well and the water well is to know the integrity -- is to know the integrity of the surface casing?

A. Is that the only way?

Q. That is my question.

A. I guess it depends on how much investigation you're willing to do. There would be a possibility of drilling additional wells to research that. You could have well tests, pump-in tests that you could do. There are tracers that are available. But I don't think that is necessary. Knowing the integrity of the wellbore and the level of the pressure that is there, I am comfortable saying that there is not a connection.

Q. And the integrity of the cement behind the surface casing, you know that because it was circulated to surface?

A. That's right. So we have complete coverage from the shoe up to surface.

Q. The shoe being at 400 and --

A. 427, I think.

MR. COONEY: Okay. Thank you.

EXAMINER CHANDLER: Any more, Mr. Jackson?

MR. JACKSON: Not at this time. Thank you.

EXAMINER CHANDLER: Okay. Next witness. Let's go off the record a second.

(PAUSE.)

EXAMINER CHANDLER: Back on the record. Next witness.

MR. SIMS: Madam Examiner, Mr. Examiner, Range calls Dr. Charlie Kreitler.

(WHEREUPON, THE WITNESS WAS DULY SWORN.)

CHARLES KREITLER,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. SIMS:

Q. Dr. Kreitler, would you please state your full name?

A. My name is Charles Whiteman Kreitler.

Q. By whom are you employed, sir?

A. I am employed a groundwater consulting firm referred to as the LBG-Guyton & Associates. Our offices are here in Austin and in Houston as well as nationwide under the name of LBG.

Q. What type of work does your firm do in the

nature of groundwater investigations?

A. We do a myriad of different areas of investigations in groundwater. Much of it is water supply oriented. We have been instrumental in drilling wells for El Paso, San Antonio, Houston. I have over the last 18 years with the firm done a lot of work in groundwater contamination associated with oil and gas.

Q. All right. Throughout your career have you been involved in studying the geological and hydrogeological formation throughout the state of Texas?

A. Yes. I have been working in hydrogeology for -- well, since 1974 and worked initially for the Bureau of Economic Geology, University of Texas, for 18 years, taught the hydrogeology program at the University of Texas for two years back in the '80s. I actually then went on to the University of Arizona, taught there for a while, came back and have been in the consulting business, and in that context looked at hydrology from El Paso to Beaumont, from the Panhandle to South Texas. Done a lot work on the Trinity Aquifer that we are talking about today.

Q. What is your educational background, Dr. Kreitler?

A. I have a bachelor's degree from St. Lawrence

University, which is in upstate New York, a master's and a Ph.D. from the University of Texas.

Q. Did you get your Ph.D. right here at the University of Texas in Austin?

A. Right here just a block to the north.

Q. Have you written over 100 technical articles and reports related to geology and hydrogeology throughout the state of Texas?

A. Yes, I have.

Q. Have you received any awards and honors as a geologist and hydrogeologist?

A. Yes. The primary one was I was what was called the Birdsall lecturer for the hydrogeology division of the Geological Society of America, presented lectures throughout the United States for a year.

Q. Have you testified before numerous courts and agencies as an expert in the field of geology and hydrogeology in connection with your work in the state of Texas?

A. Yes, I have. I have presented at the county level, I have presented at the county commissioners level, I have presented in federal court, I have presented before the Railroad Commission, I have presented before TCEQ.

Q. Have you actually been hired by the Railroad Commission before to be involved in various investigations?

A. Yes, I have. In the '80s we had a contract when I was at the Bureau of Economic Geology to use geochemical techniques for evaluating sources of salinity in groundwater. This was through Mr. Jerry Mullican, which he has retired and subsequently passed away.

Q. Dr. Kreitler, if you would look at Exhibit 52 in the notebook. Can you identify that, please?

A. That is my resume.

Q. Does it accurately describe your professional work experience, your academic experience, and list a number of the awards and papers and that sort of thing that you have been involved in?

A. Yes, it does.

MR. SIMS: At this time we offer Exhibit 52.

EXAMINER CHANDLER: It's admitted.

(Whereupon, Range Exhibit No. 52 was admitted.)

MR. SIMS: And also at this time we request that Dr. Kreitler be accepted as an expert in the fields of geology and hydrogeology.

EXAMINER CHANDLER: He's accepted.

(By Mr. Sims) Dr. Kreitler, in connection with your study and investigation in this matter, have you assembled a set of exhibits and prepared a set of exhibits that include charts and cross sections and diagrams and pictures that will assist you in explaining your conclusions that you have reached as an expert in the field of geology and hydrogeology in and around areas of the Butler and Teal wells?

A. Yes. And they are included in this book of exhibits.

Q. Do those exhibits encompass Exhibits 53 through 76?

A. Yes, that is correct.

Q. Do these documents accurately depict the information that you are going to be describing in connection with the geology and hydrogeology in this area?

A. I believe so.

MR. SIMS: At this time, Your Honor, we offer Exhibits 53 through 76.

EXAMINER CHANDLER: Okay. They are admitted.

(Whereupon, Range Exhibit Nos. 53-76 were

admitted.)

Q. (By Mr. Sims) Dr. Kreitler, let's look at Exhibit 53. And if you would, please, explain the significance of this diagram to your study.

A. Fortunately we put this in. Madam Hearing Examiner, you asked early on yesterday where are we. And I think this cross section and geologic map will give you a nice reference there.

We are looking at two different diagrams here. One is a cross section through Parker County. It's in a report by Mr. Stramel produced in 1951 on groundwater resources of Parker County. And beneath that is a geologic map for this particular area. The geologic map is from the Bureau of Economic Geology, geologic atlas series. There is a yellow line here that is the cross section that is represented in the upper area here.

If we can talk first about the cross section, because it is a fascinating cross section. It's a fascinating geologic section that we are looking at in Texas. The green is representative of what we call the Cretaceous or the Trinity Aquifer, the Water Development Board's designation for this aquifer series here. And beneath that is the blue section, which is the Pennsylvanian. This is part of the Fort Worth

Basin. And what you see are two contrasting hydrogeologic characteristics.

We see that the green, the Cretaceous section, is dipping to the Gulf of Mexico, dipping off towards the southeast. It is dipping at approximately we would call, say, 10 feet per mile. That is the elevation of the base where a marker bed is changing about 10 feet per mile and declining as we go to the east. And in the underlying section, in our Pennsylvanian section right here, we see that these units are dipping off basically to the west, to the northwest. They are dipping off more steeply, and you have a dip of about 100 feet.

Between these two is what we would refer to as an unconformity, we also call them an angular unconformity because they form an angle, or also that they are an erosional unconformity in that they represent two very different periods of time. And basically this time in here that is missing, it is a hiatus in time, is about 150 million years. There is 150 million years. And the geologists, people actually quiver when they think about this loss of 150 million years. I appreciate you don't appreciate it, but for geologists it is kind of, wow, there is 150 million years missing here.

EXAMINER CHANDLER: I am quivering.

A. Okay. We won't talk about the -- kind of the religious experience that we get for these features. But it is a very interesting zone in here because it's the hydrologic system of the Pennsylvanian section and it's the hydrologic system of the Cretaceous.

Q. (By Mr. Sims) Let me ask you, Dr. Kreitler, in this blue area, is this an area where from a geological standpoint is it well known that there is natural gas in the blue area that you have referred to as the Pennsylvanian here on your chart in the Strawn Group?

A. Right. Our blue area is -- it contains gas. It contains oil. It contains saline water. These are a sedimentary basin that has oil and gas deposits in it. And again to contrast it, we have the green up top. That is the area of the Cretaceous section that doesn't have producible oil and gas but it is a section that is full of fresh water and you have this contrast between the two.

Q. From a geological perspective, are there attributes of this angular unconformity that you've talked about that create natural pathways or sort of a plumbing system from the blue area into the green?

A. Yes. The blue is again a Pennsylvanian

section. The Pennsylvanian was known for a series of what we call cretonic deltas and a lot of sand packages. A lot of sands were laid down there. And they are dipping off to the north-northwest. It's a plumbing system. It's a series of pipes coming up underneath here. And then they crop out underneath and join with the series of pipes that are here in the Cretaceous section.

And here we have what we call the Twin Mountain, which is a set of pipes that is a producing sand aquifer. And then we have the Glen Rose formation which we would refer to as an aquitard. And then overlying that we have the Paluxy, which again is another sand system, another set of plumbing.

Q. All right. Let's look at Exhibit 54. What does this indicate?

A. Let me -- before we go on, let me just briefly comment on the geologic map down here. Here is Weatherford, so Fort Worth is going to sit up in this region. We come south to the site right here and then we go further south to Granbury, and geologically we are over in this region and the light blue is what we call the outcrop for the Twin Mountain. As we come right over into this region, we see this Pennsylvanian rock cropping out at land surface. And then as we move

ourselves to the east, we have the Twin Mountain and then we have the Glen Rose. And the Glen Rose is the dark green. Then we have the Paluxy here, which is the lighter green. And these units again, as I said, are dumping off towards the south.

Much of the area that we are dealing with here is within the outcrop of the Glen Rose. If you get to the field, you will see all these limestone beds interbedded there.

Q. All right.

EXAMINER CHANDLER: Did you say the Strawn -- I mean the Pennsylvanian outcrops to the west?

THE WITNESS: Yes. This purple, dark blue over here is part of the Pennsylvanian section cropping out.

Q. (By Mr. Sims) What does Exhibit 54 show, Dr. Kreitler?

A. This is our stratigraphic column. Again, all good geologists have to have a stratigraphic column so they kind of know the players in the geologic section. And this is relevant to the Hood and Parker County area. And here we are at the Barnett Shale. Here is our production zone for the Barnett down here. Then we work our way up section and getting shallower and

shallower and getting younger and younger in time. And here the base of the Cretaceous is an unconformity. It's indicated by that squiggly line there. The base of the Cretaceous is, say, 150 million years old and the top of the Pennsylvanian 310. So we are missing a big period of geologic time there.

We have another down here at the base of the Barnett, the Ellenburger. There's extensive erosion that has occurred in the Ellenburger in comparison to the overlying Barnett. You've heard reference to Morrowan and Marble Falls. One represents a time period. The other represents a formation. So they are synonymous. We talked about Atokan and we talked about Bend Conglomerates or Bend Formation, same thing. And then we come up into the Strawn here and then the Cretaceous section on top.

Q. Let me ask you about these depths for just a minute. Are these reflected on your stratigraphic chart in feet below the surface of the earth?

A. Yes. This is in feet below land surface. And one of the complexities that we have between the petroleum engineering area and the geology area is whether we are measuring features as below sea level or relative to a sea level date or below land surface. It's easier to measure it below land surface. You

drill a hole and you measure from the top of the well at the land surface down.

To put it in as a datum, a common datum, then we have to translate it back to elevations that are starting at the same point and we use sea level for that. And there is a mix back and forth here of data that is reported as below land surface and data which are tied to a sea level.

Q. All right. What is Exhibit 55?

A. This is a seismic section to give you again a vertical perspective of the geology within Parker and Tarrant County. It's based on a line that runs through Weatherford running west to east. And again, here we are at the Ellenburger, and overlying that we have our Barnett, and then here it's referred to as the same as the Marble Falls, the Atoka, or the Bend, and then up into the Strawn and then to the Cretaceous. And you can see in general there is an upward dip to these Strawn units in that they are coming up beneath the Cretaceous and they have an angular relationship between the two, and this is our angular unconformity.

One other point just for clarification is that when we measure a seismic section, you measure it in time. You are doing a reflection. You are sending a wave down and it's bouncing back up. And typically

those are in time in seconds. If you then have a vertical -- you have a well and you have depths on that well, then you can tie the vertical perspective in feet to the vertical perspective in time. So we tie them together. And what was shown on the previous slide, this Barnett is down about 5000 feet.

Q. So the seismic data also verifies this angular unconformity?

A. That is correct. That is correct.

Q. What is Exhibit 56?

A. 56 is a top of the Barnett Shale. This is based on three-D seismic. One of the issues that became apparent early on is whether we could have Barnett gas leaking up fault zones or fissures to get to the Cretaceous, which is up at 5000 feet, up that mile distance there, and requested Range to if they had any sort of three-D seismic, that three-D seismic is used extensively in locating where they would like to drill their frac'd gas wells. They don't want to find faults, and so they run a three-D seismic.

What we see here is one example of a fault coming up to the south. And so faults are evident when you look at three-D seismic. And this is the location of where the well is drilled and these are the horizontals that have come off the Butler and the

Teal well. And the contour interval we have here is about 25 feet. That is the -- your resolution is within 25 feet. And our depths here are about 5000 feet. And what they see is a flat surface. We don't see evidence of faulting.

I have done a lot of fault interpretation in the Gulf Coast using geophysical logs and we should be able to see faults that are in the 25-foot range when properly done. So I think this is an important piece of evidence that says we are looking at a flat surface, we are not looking at obvious faulting down here.

Q. What are these little squiggly lines throughout the 3-D seismic?

A. Those are your contour intervals. And they should differentiate the different colors which are related to the scale over there.

Q. I believe you testified that this little --

MR. COONEY: I'm sorry. Which related to the what? I just didn't hear your --

THE WITNESS: Excuse me. Related to the colors over here, the gradational colors of depth. And this is a depth below sea level here.

Q. (By Mr. Sims) And your reference earlier, just for the record, this little sort of triangular

black area is representative of what a fault might look like if one were present in either of the wellbore paths of the Butler or Teal wells?

A. That is correct.

Q. And no such faulting is present anywhere near either one of those wellbore paths; is that correct?

A. That is correct.

Q. What is Exhibit 57, Dr. Kreitler?

A. Again, you have seen this exhibit previously. We can blow that up. And basically that here is the horizontal trace of the Barnett well for the Teal. It stays within the Barnett. And there is a lot of geology that sits on top of the Barnett. And if there is a potential for leakage coming out of the Barnett by the frac'ing process, we have a very thick section over which we have to move fractures or fluids or gas or something to get all the way up to our Cretaceous here.

Q. From a geological perspective, that is just not -- that is just not possible?

A. No. I don't see that that is reasonable.

Q. What is Exhibit 58?

A. Again, this is our geologic section. And my interest is not dealing with a better understanding of the geology that is occurring down here but with the Strawn and with the overlying Cretaceous and just to

say I would like to focus now on this Cretaceous and Upper Pennsylvanian or Middle Pennsylvanian section.

Q. Will the remainder of your testimony and your opinions be related to this upper area from the Strawn up through the Cretaceous?

A. Yes, sir.

Q. What is Exhibit 59?

A. This is what we would call a type log for the area in depths of concern. It contains the geologic section for the Cretaceous and for approximately 100 feet within the Pennsylvanian. It helps us define this issue of what constitutes Cretaceous, what constitutes the Paluxy, the Glen Rose, and the Twin Mountain, what helps constitute the underlying Pennsylvanian. We use it or I use it typically in understanding the geology for the drilling of water wells, construction of water wells to make sure we don't go into saline units. If we can blow that up a little bit more.

That what we see is a very interesting curve here on the induction log. These indicate the presence of sands or limes. We have a sand right here in the Paluxy and we see it over here on I believe it's probably a gamma here. We see that it extends away from what we call the shale line. We see that here in the Glen Rose limestone that we are on the PE curve,

that it separates out the limes from the sands.

And then we come down into the Twin Mountain, which is the aquifer of concern, and there is some little sands, predominantly a muddy section through here, and then we have a thicker sand here at the base, and then this thicker sand is probably what the drillers are looking for. And then we go down into the Pennsylvanian and we get some sands but they are probably interbedded with some limes in there.

It is interesting. We have this shale section and it's where we are trying to pick the base of the Cretaceous and the base of the Pennsylvanian is that we often are depositing what we call basal conglomerates at the beginning of a new deposition period. So these are probably relatively coarse grained materials and they may well sit on a muddier, clayier section.

Q. Dr. Kreitler, these type logs were taken, I believe up at the top of the chart if we zoom back out, from a Moncrief well; is that correct?

A. That is correct. And it represents one of the best complete sections we have for the geology here.

Q. And I want to talk to you a little bit about the depths here. I note that this shows at the area of the Moncrief well the depth of the Cretaceous looks

like it's showing about 670 feet or so. And I know there has been some discussion about how a mistake could be made on a document about the depth of the Cretaceous, but in the area of the Moncrief, is it quite a distance away from the Teal and the Butler?

A. Yes. It's at distance. And if you will notice also that -- well, two things. One, we are measuring from land surface down. So it's a depth below land surface, not related to a sea level datum. And also we have another formation that we have put in here, which is the Goodland, which is another Cretaceous lime that sits on top of the Paluxy. It gives us a hint that we are looking at different elevations. And the next slide.

Q. It's Exhibit 60.

A. It takes this type log that has the best geologic section, hangs it at the correct surface elevation, and then compares it to other logs as we come over towards the Range Teal area. Here is our Moncrief and then there are a total of four logs that tie across here. And again, the elevation at this well is land surface is higher than here. So where we are saying that we have a greater depth to that contact between the Cretaceous and the Pennsylvanian, part of that is elevation control. And the next slide.

EXAMINER CHANDLER: So how far is that Moncrief well to the Range area?

THE WITNESS: I believe it's about a mile to two miles.

EXAMINER CHANDLER: Okay. Fine.

THE WITNESS: It's close enough to be relative but it's also far enough that there are definitely some changes in elevation in the area.

Q. (By Mr. Sims) I think we can get a better sense of that on the next exhibit, 61. Were you ready to move to 61?

A. Yes. Let's move to the next exhibit. And this is a base of Cretaceous map. And it ties the -- here is our Moncrief well and here is our Range well. Each one of these little blocks in here represent other wells for which the base of Cretaceous was determined.

Q. You say that the unit chart down here is 5000 feet or looks to be about an inch?

A. Yes. That is about five. So that is maybe four miles away.

Q. Or even more?

A. Yes. And then the base of the Cretaceous or the top of the Pennsylvanian has then been picked based on -- and this is a sea level elevation here. And we are at about 500 feet, and we are at about 440 over

here. And basically what we are seeing is that as I said previously, the Cretaceous is dipping to the east-southeast. That is towards the Gulf of Mexico. So we might expect to see in other locations that this formation has dipped further into the subsurface, which is happening up here at this Cretaceous.

Q. Just to be clear, these numbers that are shown on this chart do not represent the distance between the surface level of the earth down to the base of the Cretaceous, do they?

A. No. No. These are below sea level.

Q. You can't --

A. Or they are actually above sea level.

Q. You can't glean that or understand what that depth is by looking at this kind of map?

A. No. No. And the depth to the Cretaceous that is in the area of Teal has been stated at about 324. The elevation of the base of the Cretaceous is at about 500.

Q. Okay. What is Exhibit 62, Dr. Kreitler?

A. Well, this is kind of to summarize where we are going to go from here and kind of put into focus the issue of what is the geology, what is the groundwater hydrology, where our wells screen within this geologic section, and how does this underlying

Strawn formation have a potential impact on the Twin Mountain.

I showed you a geologic map where we had the Paluxy and the Glen Rose and the Twin Mountain. From a hydrologic perspective, the Paluxy is an aquifer. It is not a major producing aquifer. Domestic wells are in our area. Some of them are in the Paluxy. Most of them are in the Twin Mountain. The Glen Rose is a limey unit and functions as what we call an aquitard, differing from an aquifer, that is a zone to retard the vertical movement of water from one zone to another. And in other studies that I have done that you find that water levels in the Paluxy are typically higher than water levels in the Twin Mountain. And if you don't have good control, you can separate them out because of the difference in water levels.

Then we have the Strawn down here from a hydrologic perspective. And occasionally people drill down into this. When we are to the west where the Pennsylvanian units are right at the land surface, then that is the water supply. People go into that. People don't routinely drill down into the Strawn, not purposely, because characteristically they will get saltier water down there.

When they put water wells in, again, they put them into the Paluxy, they put them into the Twin Mountain, and they often end up with dual completions in the Twin Mountain and down into the Strawn.

We also talk about water levels as being static water levels and we talk about water levels as being dynamic or pumping levels. And if the wells aren't pumped, then the water levels rise to a certain elevation that is kind of a natural condition. But the pumping of a well causes the water levels to decline. And in units such as the Twin Mountain they can decline quite significantly. This is because the Twin Mountain is not necessarily the best aquifer in the world. It is the aquifer they have available to them but it is not a highly productive aquifer. Water wells typically are producing 15 to 25 to 40 gallons a minute.

Put that in contrast. We worked for the City of San Antonio and have worked on what we call their Artesia Well Field and we got five wells that produced 25,000 gallons a minute and have had seven feet of drop-down. That is a good aquifer. This is not a good aquifer on that. And this plays into the issues we have here is that water levels are being pulled down by even minimal amounts of pumping.

Q. Dr. Kreitler, from a geological perspective,

are the waters that exist down in the Pennsylvanian and the waters that exist in the Cretaceous zone, do those waters have the ability naturally to mix with each other and sort of churn over time through natural processes?

A. Right. And groundwater flows from higher head to lower head. It flows from higher water levels to lower water levels. And in other places where we have looked at this relationship, we find that the water levels in these Strawn sands may be a little bit higher than they are within the Twin Mountain. So there is a hydraulic potential that we could get some leakage that would go from the deeper units into the shallower units.

EXAMINER CHANDLER: Does the fact that there is this angular unconformity there make any difference to the way the Pennsylvanian might communicate with the Cretaceous or not?

THE WITNESS: Well, again, the Pennsylvanian is a series, often a series of limestones, shales, sandstone, and they are dipping up. So this plumbing is probably primarily the sand. And that these sands are dipping reasonably steeply at 100 feet per mile, then you may have a sand that comes up here and then you may have to come over here before you

have another sand that comes up. And over here you may have another where alignment may come up. And we will talk a bit later. I worked on what was the Mitchell lawsuit up in Wise County and where again we had very similar hydrologic conditions and we had three different sands. We had the Turkey Creek, we had the Brazos River, and the Hog Mountain. And these were all distinct sands within the Pennsylvanian section and they came up under different locations. And it appeared from the work that we did back then that you could see these pockets where these sands would come up underneath there.

We don't have that level of definition here within the Strawn but we do know that there are sands and that that previous section on the Moncrief we see that there are some very definite sand packages there.

EXAMINER CHANDLER: Thank you. Before we go any more, let's go off the record.

(BREAK.)

EXAMINER CHANDLER: Okay. Let's go back on the record.

MR. SIMS: Thank you.

Q. (By Mr. Sims) Dr. Kreitler, we were looking at Exhibit 62 before the break. And just a couple of

final questions about this exhibit. The -- you have got a circle here with, looks like Na plus Cl minus and SO4 in it, in the Pennsylvanian area of Exhibit 62.

What does that represent?

A. Well, those are salts that we believe are probably coming out of the Strawn sands. These are dissolved components, sodium chloride and sulfate. And I will show you the testing of the wells for -- for chloride and TDS and methane but just reference that there are an increased elevated, elevated concentrations of sodium probably coming out and sulfate as well.

Q. We are going to look at some exhibits that show the presence of coals in this area of the Pennsylvanian and this area of North Texas.

A. Yes. That would be the next set of slides.

Q. What about natural gas in this area of the Pennsylvanian section, Strawn, have you documented that there is, in fact, natural gas in this area of the Strawn, the Pennsylvanian Formation in this area --

A. Yes.

Q. -- of North Texas?

A. They are natural gas fields out there.

Q. Let's look at Exhibit 63, if you would, please, quickly explain what this is.

A. Well, I am interested in whether there is evidence in -- in the Strawn that there are organic deposits, whether they are coal, whether they are oil, whether there are natural gas deposits. And if the -- the gas is not migrating from the -- the Teal and the Butler Well, why is it there. Well, it is occurring there because of the natural processes. If it is occurring because of natural processes, do we have evidence that it has existed prior to the drilling efforts within this area and we went back to the three different publications. We went to Stramel's Groundwater Geology of the Parker County. We went to -- can't remember the gentleman's name. It is the geology of Parker County and there is a Bureau of Mines publication that deals with the early occurrence of oil and gas and coal within the United States and the State of Texas. And we are able to pull out the data relevant to Wise, Parker and -- what's the third, Hood County down there. And they are identified on the maps here. And if they are orange there is occurrence of coal. And there is a lot of coal up there in the Bridgeport area. And it was an early mining effort up there at the turn of the turn of the century and a lot of coal was mined up in that region. If we go down into Parker County, we see the presence of coal and oil

and gas in a number of different locations at relatively shallow depths and of occurrences that are before 1987. And we have some kicks down there for gas in Hood County, basically, just south of where we are for the site area of investigation.

Q. Dr. Kreitler, did you pull all of those sources together to show them on a map of Parker County and plot them where there have been documented findings of all these hydrocarbons?

A. Yes, sir.

Q. And -- and these are in the Pennsylvanian Formation?

A. They are 90 percent of them are in the Pennsylvanian by doing a call of sort of less than 2500 foot depth, I think there is a few occasions where they are in the Bend or the Atoka down there, but they are all shallow occurrences of gas, coal or oil.

Q. All right. What is Exhibit 64?

A. Well, this is an interesting figure more from an historical perspective. This is a coal gas analysis that was done to see whether coal gas for street lights was a viable option at the turn of the century. And the -- the yellow indicates the coals that were analyzed for in North Texas. The coals in North Texas are bituminous coals, they are good coals for testing

whether they have gas that could be generated from them. They are relatively volatile coals as most bituminous coals are. And they measured through a rhetoric process the percentage of the gas being generated of methane and nitrogen. And the methane concentrations range, of the gas that was collected, range from about 20 to 40 percent for these coals and they are, also, high in nitrogen which I find interesting in the context of our discussion yesterday of the isotopic and composition of the gases that are being measured there.

Needless to say, coal gas didn't turn out to be a long-term viable solution for energy for the state of Texas.

Q. What is Exhibit 65?

A. Another option for a source of gas is the -- the Strawn gas fields. And Mr. McBeath showed us yesterday a number of fields through Parker and Hood County, relatively close to our site indicating that, you know, within the Strawn there is natural gas occurring on a natural basis.

Q. Now, the -- the yellow areas that are shown, are these areas of natural gas production that have occurred in -- in these areas in a commercially viable manner?

A. Those are the commercially -- the commercial fields. It doesn't say that that's the only place where natural gas occurs. It says, that's where it occurs commercially. And one would expect to see natural gas under the entire section of Strawn through that area.

Q. Some areas, it may be more prevalent than in others but you would fully expect to see natural gas throughout the Strawn all through this area.

A. That's correct.

Q. What is Exhibit 66?

A. Well, another way of identifying whether there is a natural source of natural gas within these formations is this issue of whether there were wells that were constructed that -- water wells that were constructed that had natural gas within them before any of this Barnett Well drilling. And I offered just three different examples. Mr. McBeath offered us more examples. All of these examples, the Hurst, the Lake Country Acres, a third one that we referred to as the Guge Well, all either had consultants working on them or Railroad Commission or TCEQ working on them, having identified that there was specifically natural gas associated with it.

Q. Tell me a little about this Guge Well since I

don't believe we have heard about that before. What -- where was that well and where did you gain your information about it?

A. We gained our information from that from Mr. Malone's deposition. Mr. Malone was one of the drillers, Mr. Peck was one driller. Mr. Malone was a second driller that has been involved in the Silverado Subdivision drilling wells and was deposed a couple weeks ago. And he references the Guge Well, he drilled it before year 2000. He drilled it in the Silverado Subdivision. It is not within the smaller area of review but it is in the -- in the subdivision there. And the well flared, they lit it. And to light the gas to me is a good indicator that a well will burn and that it is a natural gas source.

Q. All right. What is Exhibit 67?

A. 67, again, is the -- the Hurst Well. We don't need to say anything other than they ignited that well in 2005 so it predates the Range well construction drilling.

Q. What is Exhibit 68?

A. 68 is Well No. 2 of the Lake Country Acres public water supply system which is a mile, mile and a half to the east of the Hurst -- excuse me -- to the Teal and Butler Well. It indicates on that particular

well that it is a flammable well and that one needs to be concerned about that, indicates that you can produce that well but there will be the potential for buildup of natural gas. The next figure --

Q. Exhibit 69.

A. 69, is the cross-section then. Mr. McBeath introduced us to the Lake Country Acres yesterday. In the middle is the Lake Country Acres wells. To the -- at least to my right is the Center Mill Strawn field not to far. And then on to the left is the Silverado Subdivision area where the area of concerns are and where Range has done extensive sampling. But let's go back to the Lake Country wells. And again the total depths have been plotted there. And you can see that, based upon a base -- base of Cretaceous elevation, that several of these wells do penetrate down into the Pennsylvanian.

We have our -- my first record of a gas problem is a two -- a 1998 record, Mr. McBeath had some earlier records going back, I believe, to '95. They indicated natural gas on TNRCC forms for this well field at that particular date.

In 2003, they came in and drilled what is labeled as a "P" well there. That was drilled, definitely, into the Pennsylvanian section and produced

more gas and than it was producing water, so they plugged that well. They, also, at that time, did a qualitative evaluation by a consultant as to whether there was natural gas within those wells and all those wells that were not plugged indicated that there was natural gas there in their water wells.

That same consulting group, Collier consultants out of Stephenville, Texas, came back in December of 2010 and measured the -- the methane concentration coming out of their wells. And they are indicated in red at the top of the individual wells.

And Well No. 2 was .17 milligrams; Well No. 1 was 12 milligrams; Well No. 3 was 19 milligrams. There is a problem of nomenclature for the naming of these wells. And Well No. 5 is, which may or may not be their Well No. 4 one was plugged, was at .13.

So, again, here is a well field that has methane, we have quantified it in 2010 but it was identified early as having gas in 1998 or 1995.

If we can go back to the slide there. And what we want to look at is over on the left side, the water wells. And we have just put a few representative wells on there. Twenty-eight wells were sampled, maybe it is 29 wells. There were some folks that did not give access to their property. We look at

about half the wells we have records on as to their drilling history. The total depths range from about 600, the total depth elevations, let me make that clear, not depth but depth elevations range from about 613 down to 399. If we made the pick earlier that the base of Cretaceous is about 500; so some of these wells are drilled 100 feet into the Pennsylvanian section.

The methane is ranging from non-detects to little under three parts per million. And if we could go back to that -- the full screen again. What we have are the -- the two Hurst wells and the -- the Peck Well, and a third well, which is the Stites Well, that I just want to make a few brief comments on. That Mr. Hurst drilled his first well relatively close to that interface. And this well flowed natural gas on a natural basis, was not being pumped and it flowed and eventually that gas dissipated out of that well. He came back and drilled his second well at a shallower depth and did not have that problem. And we will show you in a second, it still has natural gas in it but at lower concentrations.

Q. And then Mr. Peck drilled his well not too far from the Hurst wells. And he, basically, drilled it to about the same elevation.

EXAMINER CHANDLER: Mr. Peck?

Mr. Lipsky.

A. Excuse me. Mr. Lipsky. Mr. Lipsky.

And so both of those wells are, basically, completed about the same depth and they are, basically, completed just a bit above where we think the base of the Cretaceous is.

The third well is the Stites Well and that's not too far from either Mr. Lipsky or Mr. Hurst.

Q. Let's -- before you talk about that.

A. Okay.

Q. Let's figure -- let's try to figure out. Since we haven't heard much about the Stites Well. Let's go to the next exhibit and then we will come right back to this one so we can identify where that is.

Look at 70.

A. Okay.

Q. Carla, if you could enlarge this area showing Mr. Lipsky's property and just right in here. Yeah.

A. Mr. Stites is indicated there in yellow and then has methane in his well of .67.

What is interesting is: There is a pond right here (indicating), a lake. He may even had a little speed boat on it. It is about three-acre lake. And as we have gone through the droughts in the

previous summers, Mr. Stites decided he needed to keep his lake by pumping his well. And he pumped that well for three to four months one summer at a constant four-inch stream of water that left his well to fill that lake.

The importance here is that, we are dealing with the Trinity Aquifer here and the Twin Mountain Formation of the Trinity. It is a low transmissive unit. And this subdivision didn't exist, basically, 10 years ago. And we have come in and put a minimum of 28 houses, not all houses were sampled here, they are all on water wells, they are all pumping water out of this relatively low transmissive unit causing water levels to significantly decline.

Q. All right. Let's go back to the prior exhibit. And what were you --

A. Just that Mr. Stites' well, again, is about the same elevation for the total depth for the well, for his well, as it is for the -- the -- the Hurst Well and the Lipsky wells on that. It's a coincidence here. But his pumping and Mr. Lipsky's pumping may be aggravating the situation out there.

Q. All right. Now, let's move forward to Exhibit 70, the exhibit we were just looking at. And if you can, tell us what you have plotted here on the aerial

and what the significance of it is to you, Dr. Kreitler.

A. The -- these are the wells that were sampled. This is the -- the Teal and Butler wellheads right there, that's their pads (indicating). This is what we will call Lake Country Drive. And there are a number of houses along Lake Country Drive. And then the -- the Silverado Subdivision, basically, is fitting up in this location here (indicating). And rather than saying, Silverado, Lake Country Drive area, I have just been referring to it as the Silverado Subdivision including all these residences down in this area.

We have come through and color coded to give you an indication of the type of -- or the concentrations of methane that are seen in all these wells. And they are broken out as to a non-detect, to .5 milligrams per liter from .5 to one milligram per liter to greater than one, and it goes to one, two, basically, four milligrams per liter. That was our coding when we put it into our GIS system to plot this out.

So the green wells here (indicating) are wells that have methane concentrations, less than half a ppm.

The yellow wells are wells that are from

half a ppm to one.

And then we have two red wells, here is the Lipsky Well and here is the -- we call this the Purdue Well. It is, also, listed as the Yates Well.

The reds are the highest concentrations. And the highest concentrations for any of the methanes out there are from the Purdue Well. And this is a concentration of 2.8 milligrams per liter. It is interesting to note that this well over here (indicating) is the deepest well that is out there that has been measured, it extends approximately 100 feet into the Strawn based on our sur -- on our elevation of about 500 feet for the Cretaceous contacts.

The well over here, Mr. Stites is going down towards the base of it. But it is interesting, we got a well here and then we have a well here (indicating). And then we have some lower concentrations in here (indicating). We have a range of yellow wells of the .5 to one ppm up in this area here (indicating). And in large part, the wells over here in this section right here (Indicating) have lower methane concentrations. I don't see a plume. I don't see a contaminant plume that is coming from a single source. This is -- looked at a lot of oil and gas fields, looked at brine pit contamination, looked at

well contamination, worked on blowouts of wells and where a lot of wells have been then installed to see where we see the -- the potential contaminants being -- flowing to these wells and, typically, we see a plume. We see, you know, the highest concentrations at where the blowout occurred and then we see decreasing concentrations as we migrate away. We don't see that here. We see kind of a random distribution. And to me that argues that, you know, we don't have an obvious source down here at the -- the Teal and Butler Well location. It argues for a random distribution and a possible leakage coming out of the underlying Strawn.

The other thing that we see here is that, these concentrations are -- are present, that everyone has a degree of methane there. There are a few non-detects up here. Some of these non-detects were measured by the -- the firm that -- Premier that did the sampling. They could not get a sample on the front side of the treatment, they got them on the back side of a treatment. And so some of the wells have non-detects because they were located because of the methane had already been cleaned out. And there was no way to sample that.

But it's -- it's interesting that nearly all the wells do have a little bit of methane in them.

If we look at the next slide, I want to --

Q. That's Exhibit 71.

A. Try to put this in comparison to what methane concentrations have been measured in other locations. And if we could blow up this map, this is a map of West Virginia. And this is a study that was done by the U.S. Geologic Survey, trying to get a background level on what methane is in aquifers for a state. And it has recognized that this is a coal-bearing state. West Virginia is definitely known for its mining of coal. But it is interesting to see the concentrations that they are seeing on an average basis on, as I believe, on a county here. And what we are seeing, again, a lot of red dots, greater than 28 milligrams per liter. Orange dots as 10 to 28 milligrams per liter. And then we drop down to one to 10, kind of the yellow in here, there are a few of those, and then less than one ppm is open circles. None of our waters here in the Silverado are fitting into this red or this orange classification. So there are geographic out -- areas out there that have definitely higher concentrations of methane in the groundwater on a natural basis.

Q. Let's look at the second page of that exhibit. I just want to make sure that you point out,

Dr. Kreitler. Under this Action Levels paragraph, you understand that this is taken from the Department of Interior?

A. Yes. This is a Bureau of Mines publication on the safety issues associated with methane in groundwater.

Q. And in relation to some of the evidence we have already heard about venting of these wells, you see the statement there, "that methane will not accumulate in the wellbore if the wellbore is properly vented to the air."

A. Right. This is very critical. Was going to talk about this in a second. But wells should be vented. It is a requirement of TCEQ in the public water system program for water wells that all public water supply wells are vented. It doesn't always happen with domestic wells. But. Typically, the well construction done for domestic wells may have a plate that is welded to the top of one bets there is a leakage that goes on. And so whatever gas accumulates within the wellbore can escape out. But it is a requirement of the public water supply program that all wells are properly vented. They have to have a little screen on them so that wasps don't get in and lay nests inside but they are required to have that.

Q. In relation to the statement that "methane concentrations less than 10 milligrams require no action other than periodic monitoring," what, again, is the highest methane concentration that was found in any of the wells out in the Silverado area?

A. The highest concentration was in the Purdue Well at 2.8.

Q. And that's 2.8 milligrams per liter.

A. Milligrams per liter.

Q. What is the next exhibit, Dr. Kreitler?

A. Well, we have talked a little bit about the problem of overproducing water wells. And within, I think, we call it the statement of fact from the EPA order, there was a comment about Mr. Lipsky had complained that there was fizzing water and that this fizzing was, by implication, was that we were getting the gases to exsolve out of the water and that there was natural gas that was creating the fizzing or frothing nature to waters that are produced. Characteristically that does not happen, particularly, with the concentrations that we are seeing here. That water fizzes or froths in a water well. When you pull the water down to the pump itself and you look through the general records and you find that water wells for this area, typically, are having their pumps replaced

on a regular basis. Pumps are replaced because they burn up and they burn up because the water level is pulled down to the pump itself and the cooling nature of the water is no longer there to keep the motor running and they burn up, very common practice. And when we design water wells, we try to make sure you don't overbuild a well with putting a pump that's too big because you're going to replace it. You're dealing with municipal wells, you're talking 100,000 bucks a pop for the motor and for the pump itself. For these, you know, you're talking a couple thousand. But you routinely don't want to pull the water levels down to the pump, that's the kiss of death for a well. And it appears to be happening on a routine basis out there because they are over pumping their wells.

Now, what this over pumping does is, it permits the waters to come into the well, they get agitated and then the gas which is in -- dissolved in the water itself comes out a solution and then it accumulates within the wellbore itself.

And the example I have here had, we went back and looked at the drilling report for Mr. Lipsky. And basically, the water level at the -- at the time of drilling was 65 feet down and they pumped it down to his pump which was 115. We lowered the water level

approximately 100 feet within his well; or we took the pressure off that aquifer of about 50 PSI, decreasing that pressure will then cause gases to come out of solution into the wellbore. It's the same phenomena that they use in coalbed methane which is one of these alternate natural gas sources where you pump a well to pull the water level down and you de-gas the water and then you collect the gas; that's how the whole coalbed methane program works. We have this occurring for Mr. Lipsky. We have this occurring, potentially, for Mr. Stites pumping his well for three months straight. We have 30 odd wells out there on relatively large tracts all with beautiful lawns and wonderful gardens, they are pumping a lot of water out of this subdivision.

Q. Dr. Kreitler, do you recall seeing, as a part of Mr. Malone's testimony and the exhibits that he produced to his deposition, in fact, that Mr. Stites had replaced his water pump on his well in 2009?

A. Yeah. And he -- most of the pumps out here are half a horsepower to one and a half horsepower and he put a five horsepower on.

Q. On his water well?

A. On his water well. I -- I don't know Mr. Stites, but it may well be a belief that the bigger

the pump, the more water you're going to get out of your well.

Q. He is the one that has the three-acre lake.

A. Yes, he is the one that has the lake.

Q. All right. What is Exhibit 73?

A. Well, not only are we seeing methane within nearly all the water wells that we have out here, we are, also, seeing that there are increases in chloride and sulfate as two very primary constituents within these waters. Early on, when the sampling protocol was put together to ensure that there was not a health issue or a safety issue, I said, you know, I would like to see the basic inorganic constituents for those waters, also, measured to see whether we are seeing elevated concentrations on many of the dissolved components, chloride being one of them and/or -- and what I have here is a total dissolved solids map which is the summation of all the dissolved inorganic species. And what we are seeing are relatively elevated concentrations, kind of to my surprise, that all these red highlighted areas, basically, have total dissolved solids at greater than a thousand. If you're in the public water supply business, greater than a thousand is something you don't want to have.

We are, as a firm, presently working for

the City of El Paso in developing their brackish groundwater resources. We are working for the City of San Antonio developing their brackish groundwater resources. And those are resources, as defined, as groundwater with TDSs greater than a thousand. And they are willing to spend, you know, hundreds of millions of dollars to develop this to bring water chemistry down below this thousand.

So these are issue wells, people drink them. Particularly in the domestic unregulated area, people drink these waters. But it is surprising to see the number of thousand greater TDSs. This well over here is 1800. The -- the Purdue Well is 800. The -- the yellows are all, I believe, 750 to 1,000. So there is a lot of water here that has higher total dissolved solids. And I would suspect that the total dissolved solids for this part of the aquifer, for the Trinity, ought to be in the 500 to 700 ppm range.

Q. Is this a naturally occurring phenomenon as a result of the intermingling between the Strawn or Pennsylvanian and the Cretaceous zone and those --

A. I think -- that's why we are seeing the increased TDS in these waters is because we are seeing discharge coming up from the underlining Strawn Formation. If we go to the next slide, we can look at

the specifics of chloride.

Q. Is that Exhibit 74?

A. Yes, sir.

Q. Okay.

A. And this is chloride concentrations. And what I will show you a slide in a second is that, probably the -- the background chloride concentration, we would expect to see out here, if it was just water flowing through the Twin Mountain ought to be in the 50 -- 25 to 50 ppm range. And that's the wells that are indicated in green here. All the yellow wells are 50 to 100, and then the red wells are -- excuse me -- 50 to 100. And then we go to 100 to 300 and 300 to 500. The red wells are half chloride concentrations higher than about 500. These are, to me, quite anomalous to see these higher chloride concentrations. And again, they are occur kind of on a random basis. We may see in most of the low chlorides here in the northeast section and there is some higher ones here but there is a green one, Mr. Lipsky has a low chloride. And then we have a number of high values over here that go all the way to -- let me look at 500 ppm chloride, very strange, very strange.

If we go to the next exhibit, what I did is take all this data and plot sodium versus chloride.

I use figures like this quite often to understand the geochemical origin of these waters. And what I see is that there is a linear increase in the sodium and chloride concentrations. And it has a ratio of that line of about .6. What that indicates to me is, that's how fast the sodium and the chloride are equally increasing. And if you look at a number of saline waters that come out of oil field operations or deep sedimentary basins, that's the ratio that we see for deep basin brines, sodium to chloride. It may be you know, when we are dealing with total dissolved solids of a variety of 100 to 200,000, they will still have, basically, a .6 sodium to chloride ratio. So it looks like a -- a saltwater source is being added to here and I will talk in a second. This is the -- what we have seen elsewhere with the Pennsylvanian section where we see waters getting higher in salinity.

The other interesting thing is that, this line does not progress back to a zero-zero access, that said, we had a clean water and we just started adding sodium chloride to it as it was recharged and it flowed through the aquifer. What it tells me is that, the water which was probably recharged further to the west where the Twin Mountain crops out and I guess it is in Palo Pinto or the western side of Parker County, starts

with a sodium concentration of about 200. And we typically see in an aquifer like this, we generate what we call sodium bicarbonate waters. And there is a series of complex reactions that give us sodium and bicarbonate. And typically, we get a linear relationship between sodium and bicarbonate. But here we are seeing that sodium goes up not because of the addition of bicarbonate. What we are seeing it goes up because of the addition of chloride. We are bringing a water in which all -- I don't have the data here, but it is a sodium bicarbonate water and we start adding a new source of saline water. And this new source, to my perspective, is probably the underlying Strawn formation.

Q. And what is Exhibit 76?

A. Well, one of the issues is: Do we have evidence of more saline waters within the underlying Strawn Formation. Well, we have some wells, the Purdue Well is a higher sodium chloride water, it penetrates down through there. But we can't use that as an example to prove that the Purdue Well is a high sodium chloride water on that, we get into some circular reasoning. If we go to the west, we can go into the Pennsylvanian section where we do have water wells that go down into the -- the Pennsylvanian section and they,

quite often, are higher sodium chloride waters, it is not very good water quality. But I think the best example we have is to come up to Wise County and I made reference to the Mitchell lawsuit which was right up in this region. And again, the Mitchell lawsuit referenced -- or occurred because of the presence of natural gas in the water. And when we started working on that, we found that there was a study done by the Water Development Board in 1990 that indicated there was a large naturally occurring saline plume that extended off from the Twin Mountain towards the southeast. And when we got into the details of it, what we found -- and again, we had these thin sands that were in the underlying Pennsylvanian cropping out at this unconformity with the overlying Cretaceous and where those sands cropped out, we found increases in sodium chloride sulfate. We found methane concentrations that were and -- not normally high but they were present in this same range of a quarter per part per million up to maybe 10 parts per million. It is amazing the similarities of what we found in this location as to what we are currently seeing down here in the Teal-Butler area. Geographically, they are not very far apart, so I think they are quite related to each other.

Q. Dr. Kreitler, in view of your study of the area and in view of your experience and knowledge of geology and hydrogeology throughout the state of Texas and in -- and in this area in particular, in view of your previous work in the area, have you reached some conclusions about why we're seeing the presence of methane in the Lipsky water well?

A. I think the presence of methane in the Lipsky water well is similar to why we are seeing methane in the -- most of the other 28 wells, it is a naturally occurring process, it is resultant from leakage either by groundwater flow or single phase or separate phase flow of gas percolating up out of these Strawn formations into this geographic area.

MR. SIMS: Pass the witness, Your Honor.

EXAMINER CHANDLER: Mr. Cooney.

MR. COONEY: Thank you.

CROSS-EXAMINATION

BY MR. COONEY:

Q. I am going to ask you to turn to Exhibit 72. Did you create this cartoon?

A. Excuse me. I got the wrong one. That's the schematic of a well.

Q. Exhibit 72.

MR. SIMS: Objection as to characterizing

it as a cartoon.

EXAMINER MONTES: Sustained . It is a schematic, I believe.

A. Dilbert in the corner.

Q. I beg your pardon?

A. Dilbert in the corner of the cartoon.

No. Yes, I created this figure with my drafts person.

Q. And is this intended to be an accurate representation of the geology where the Lipsky Well is?

A. It is a -- a reasonable approximation. It doesn't have the appropriate thickness for the underlying Twin Mountain as related to the Glen Rose, as it relates to the overlying Paluxy.

Q. I am sorry. I don't see Glen Mountain or Twin Rose [sic] or --

A. No, it is not, it is a schematic.

Q. Well, and what I am curious about is: You mentioned communication between the Strawn and the Cretaceous in your very last answer.

A. Correct.

Q. But this figure, Exhibit No. 72, identifies a confining formation. So I don't know how to reconcile those two --

A. Okay.

Q. -- thoughts.
A. Okay.
Q. Or those two positions.
A. Let me clarify. It does not show the -- the Strawn in this figure. It shows the -- where it says "aquifer," that that would be more synonymous to the Twin Mountain. And the confining formation would be more synonymous to the Glen Rose. And then the yellow section would be more akin to the Paluxy. It's strictly here as a schematic to show what happens with a declining potentiometric surface from a pumping well and the issue of cavitation associated with pulling the water table to the well itself.
Q. And in the -- so the Strawn isn't even on this figure.
A. No, it is not.
Q. Okay. I just wanted to --
A. Yeah.
Q. What does the word "empirical" mean to you, as a scientist?
A. As a scientist, basically, data driven.
Q. And then, I guess, there are different sources of data, data that you discover yourself or create yourself from testing, as a scientist, right?
A. That is correct.

Q. And then data that you gather from other sources that you find to be credible or worth using.

A. Correct.

Q. In this case, would you say that more of your data was gathered by your own testing or by relying on sources that you conclude are credible and worth relying on?

A. I would -- I couldn't put a percentage on it. There is a fair amount of the data that is public record data, that it is data that comes from driller's reports, it is data that comes from the Water Development Board, it is data that comes from the Railroad Commission. There is that type of data. Then there are data that would be, let's say, anecdotal, what wells have methane in them based on prior discussions with people either in their depositions or through consulting reports. And the quality of that data varies. And you know, if you have a re -- a deposition that's been from a driller under, you know, sworn oath then I put a lot of credibility in that. If I was sitting in a shop with him talking about his, you know, where he drilled and how -- how deep he drilled and, you know, whether there was gas coming out, I put -- put less credibility on that.

Q. I might do the opposite, actually, but -- I

understand where you're coming from.

A. I see, you're a lawyer.

Q. Let's look -- let's go back to Exhibit No. 52 or 53.

A. That's the geologic section and the geologic map.

Q. Entitled, "Geologic Map and Cross-Section Parker County, Texas."

A. Yes, sir.

Q. Okay. The numbers on the left of the top figure, I don't understand. Will you please explain what those refer to? There is -- the bottom number is 400 feet and the next number up is six or 800 feet?

A. Yes. Those should be land surface elevations.

Q. From sea level?

A. From sea level.

Q. Because we have talked -- part of what you have talked about are depths but sometimes we talk about depths from sea level and depths from actual land surface, correct?

A. Right.

Q. And it is clear in looking through all these exhibits when we are talking about depths from sea level versus depths just measured from the earth, the top of the earth?

A. I think reasonably. I can't guarantee you with the whole set here. I think an important number is that, basically, the base of the Cretaceous is at about 500 feet above sea level.

Q. How do you know that?

A. How do I know that? That -- whether it is an oil well or a water well, we have a couple different measures. We will take a steel tape or electric tape, we will count the number of pieces of steel that went down into the ground and measure how deep the well is or how deep the water is.

Q. Pardon me. I am going to interrupt you right there. Did you do that in this case?

A. No.

Q. So I am going to ask my question again. How do you know, in this case, that the depth of the Cretaceous is about 500 feet?

A. That it is --

Q. From sea level, right?

A. Right. That you -- you take the geophysical log, the geophysical log, that is that electrical signature that has been --

Q. Pardon me for interrupting, I apologize. Which geophysical log?

A. That -- it will vary. There may be a whole

suite of geophysical logs available you to. The Moncrief shows you a variety of different logs that have been used to construct that type log.

Q. The Moncrief is over a mile away, right?

A. Right. But I am using that as an example to say here is a -- here is how I make that measurement. That was your question is, how we make that measurement.

Q. No. My question was, and so I apologize if I wasn't clear. How do you know, in this case, that the Cretaceous is 500 feet below sea level, the base of the Cretaceous is 500 feet below sea level?

A. Your question was, did we make that measurement and then we can talk about the measurement at the base of the Cretaceous.

Q. Pardon me. I withdraw that question, then.

My only question is: How do you know, in this case, that the base of the Cretaceous is 500 feet below sea level?

A. That we take the Moncrief Well, we make a determination as to what the base of the Cretaceous is in that well, even though that well is "X" miles away. We then acquire other geophysical logs for the area and correlate from the location of the Moncrief where we have the best geologic information out from that

location to get us over to the Teal location. Where we don't necessarily have the best geophysical logs available.

Q. Would there have been -- well, would the drilling log have been a source of information for that?

A. The -- like the water well driller's log?

Q. No, the drilling log for the Teal or the Butler.

A. Yeah. And the Teal or the Butler Well was included within that.

Q. So I am sorry. Is there a drilling log in evidence from the Teal and the Butler? I may have missed it.

A. I did not introduce it. I believe it has been introduced.

Q. Okay. What other geophysical logs besides the Moncrief Well did you use to determine the base of the Cretaceous in this case?

A. That in that cross-section, it lists additional wells.

Q. Cross-section being exhibit? I am sorry.

A. Which would be -- is it 61?

MR. SIMS: It would be 60.

A. Or 60, excuse me.

Q. So how many logs are on Exhibit 60?
A. Well, there is the one, two, three, four.
Q. And where do they come from in relation to the Teal and the Butler?
A. Where do they -- they are other wells that are drilled and there are other wells for which geophysical logs were collected and --
Q. How far away is each one of these four from the Teal and the Butler?
A. Oh, the Devon Well is -- or oh, a quarter mile away.
Q. I am sorry. On Exhibit 60 -- is it 60? I was looking at 59, no wonder.
Well, but the Devon Well doesn't show that it was logged to the base of the cretaceous, does it, according to your diagram?
A. Correct.
Q. So how -- how do you get any information about --
A. Right. And that's where you are -- you're taking your best logs and have your best geologic section. You're working within those logs that have less of a section. You are correlating your best logs to your logs that have less data and you're interpreting.

Q. What -- have you ever drilled a well or participated in drilling an oil and gas well?

A. I -- yes.

Q. Have you ever studied the cuttings that come out of a well, worked at a mud shaker or --

A. Yes.

Q. What would you expect to see on the well, as you were drilling, as you got to the transition between the base of the Cretaceous and the -- the top of the whatever the next formation.

A. In the Strawn. That we actually cored one of those on the Mitchell that we -- we cored all the way from land surface down into the Strawn which is -- where it wasn't the Strawn, it was the Hog Mountain. And it was a very similar situation. And we cored it. And as you go, you go from sands and, typically, what you would expect to see at the base of a unit like the Twin Mountain, you go into some gravel, you then go into a cemented section of -- and then you get rip ups out of the Pennsylvanian. You get Pennsylvanian rock getting incorporated into the Twin Mountain and you see those clasp within a rock. And then you go into a harder geologic unit, which you're going into the Pennsylvanian that's a lot older unit than what you had in the Cretaceous, and the, you know, there may be a

slow down in the drilling speed. It's -- you know, you got to be there to see this process.

Q. Right. Okay. Going -- let's look now at Exhibit 54. Now the number for the base of the Cretaceous there is 400 feet. How do we reconcile that 400 feet with what we have talked about here today?

A. That, this is one where this is a below land surface.

Q. So it is important to know if we are talking about below sea level or if it is on --

A. To worry about that specific, yes.

Q. Well, in your opinion, is that specific kind of important in this case or am I whistling Dixie here. I mean, you may think I am whistling Dixie no matter what I talk about.

A. I won't go there, sir.

Q. Okay.

A. It is an important consideration.

My understanding on the setting a casing is something that Range worked out but they were conservative. They said, you know, this is a difficult pick and we will go deeper into the section than what was recommended and prescribed by TCEQ.

Q. I understand that. But the question is: Is knowing the depth of the base of the Cretaceous

important in this case? Is it an important factor?

A. It's an important. It is not a super important factor.

Q. What are the super important factors?

A. In this particular issue is the, basically, the occurrence of methane in, basically, nearly all the wells out in the Silverado Subdivision and they don't have a particular pattern.

Another important consideration is the presence of the water chemistry is, also, suggesting that we are getting an upward leakage coming out. You know, from my testimony. I think all the other gentlemen that have testified here are offering very important points as well.

Q. Looking, again, at Exhibit No. 54. The squiggly line represents that the base of the Cretaceous is not homogenous in the field; is that correct?

A. That is correct.

Q. What is the right -- when someone in your profession draws or assumes is credible, a squiggly line such as a difference between the base of the Cretaceous and the Pennsylvanian on Exhibit No. 54, what's the -- what's the range that such a squiggly line represents?

A. There is a --
Q. In feet, please.
A. Pardon?
Q. In feet.
A. In feet. There is a thesis by a gentleman by the name of Peter Boone that currently works over at the General Land Office, and he did a thesis on the lower Trinity section. And he measured that variation. And I believe it was 25, 30 feet or so. But I would have to go back and look, specifically.

The problem though is that, I don't think he found the correct unconformity. I think he found a surface that was shallower in the section. Because he believed that the depth to the interface was probably -- or the unconformity was only down about 200 feet rather than down at the 300. So he measured one but I don't think he measured the right one. But that's the kind of the -- the range that he thought he was seeing for channels cutting through -- sand channels cutting through muddier sections. To give you a range --

MR. COONEY: Objection, nonresponsive.
A. No. I am trying to answer your question, sir.
Q. (By Mr. Cooney) That could well be from my ignorance, I totally understand.

A. Well, you're asking a very difficult question.
Q. Well, I am just asking: What is the range in feet that the squiggly line on Exhibit No. 54 represents, the squiggly line between the Cretaceous and the Pennsylvanian.
EXAMINER MONTES: For the record, I am going to overrule the objection. But you may continue.
Q. (By Mr. Cooney) And let me clarify -- see if I can clarify. You answered about a thesis that somebody in GLO did. And I didn't know if you were talking about this particular area between the Cretaceous and the Pennsylvanian and the vicinity of the wells we are talking about here today or if his thesis was about squiggly lines and geology --
A. No.
Q. -- or what, so.
A. Okay. Let me clarify. He studied this Twin Mountain Formation.
Q. Where?
A. In North Texas. He covers Parker County. He, also, covers a lot of the area going further to the west. And he looked at the shape of this unconformity.
Q. Pardon me for interrupting, I apologize. Unconformity between what and what?
A. Between the Twin Mountain and the underlying

Strawn. And he had a variation in the topography of this surface, as I remember, about 25 feet.

Q. Pardon me for jumping in. So does that mean, in his thesis, is this squiggly line represents about 25 feet up or down across the --

A. Well, he measured what he thought was that -- that topography on this squiggly line. But when I looked at his thesis, I think he has misinterpreted where that unconformity is in the geologic section. He put it too high.

Q. So he has put it between the Glen Rose and the Twin Mountain as opposed to between the Twin Mountain and the --

A. No. He has put it in the Twin Mountain. But he thought he was looking at the contact between the Twin Mountain and the Pennsylvanian where he was really looking at the contact between the Twin Mountain and the Twin Mountain. But it gives you an idea of the -- the topography that one might see in this type of setting.

Q. So are you then -- all I am looking for is: If the Cretaceous is -- the border between the Cretaceous or the transition from the Cretaceous to the Pennsylvanian is at 400 feet at Point A, how do you guess what it will be 300 feet away at Point B? I

mean, will it be 410? Does the squiggly line mean it could be at 410 feet or does it mean it could be at 460 feet?

A. I would say, as a geologist, we draw from what -- as a geologist, we draw analogies to other settings that we have seen. And that what they have -- what he is seeing at a shallower depth within the Twin Mountain was what he thought was the topography of about 25 feet. And so I -- by analogy say that which is occurring between the Twin Mountain shallower may well be kind of what's happening at the contact between the Twin Mountain and the -- and the Pennsylvanian. I don't have data because I got a well here and I got a well here (indicating).

Q. Those two. Pardon me for jumping in. Pardon me for jumping in. A well here and well here and how far apart?

A. Maybe they are half a mile a part. But I look to see how much topographic relief I might see in a similar geologic setting and say, that is the possible range that I might see at this particular interface. I don't see 1,000 feet. I don't see several 100 feet. I see that going well to well that they are, you know, basically, at the same elevation. So what would be occurring within here, kind of like what I expect to

see in a natural geologic system.

Q. And -- what I want to know, as best we can in this case is, how certain we can be that this -- the Butler and the Teal wells are cemented, actually cemented -- the surface casing is actually cemented to the base of the Cretaceous. That's why I am asking you all this.

A. Right.

Q. So have you -- do you feel -- has that -- do you have an opinion on that?

A. I really don't have an opinion on that. I am, in part, getting dragged in here. This was a call that was made by -- by the Range people. I would agree with their interpretation on where the -- this contact is, but I have not gone back to say, you know, here is their well and this is the depth of the surface casing and does that meet the particular criteria.

Q. Well, what criteria -- I am sorry.

A. Whether it is deep enough to provide that protection.

EXAMINER CHANDLER: You all are going to have to do a little better for our poor court reporter over here.

MR. COONEY: That's mostly my fault. I apologize.

Q. (By Mr. Cooney) Okay. The criteria that we are talking about is that, the well is cemented to the base of the -- and through, we hope --

A. Right.

Q. -- the base of the Cretaceous.

A. Right.

Q. Will you please let me finish my question before you start your answer and I will do my best to let you finish your answer before I start my questioning, even if I want to interrupt. Deal?

A. Are you --

MR. SIMS: Your Honor, I am going to object to the tone and the -- of this questioning. I mean, Mr. Cooney has interrupted Mr. -- Dr. Kreitler a number of times. And I think it would go a lot better if we could just get the questions asked and the answers answered. So I would object to the constant interruption.

EXAMINER MONTES: Objection sustained.

Q. (By Mr. Cooney) Okay. Looking, again, at Exhibit No. 54. First of all, what does "MY" mean from those numbers on the left-hand side of that column?

A. That is millions of years.

Q. Okay. And from where do you get the information, what is your source of information on

number -- Exhibit No. 54?

A. For the -- for the ages?

Q. No. I am sorry, for the -- for everything.

A. That -- I asked Range if they had a geologic stratigraphic chart that we could use to explain the geologic section, so they provided that.

Q. Did you look at that chart?

A. Yes.

Q. Okay. Where did it come from?

A. They -- this is the chart that was provided. This is a -- this is a standard chart.

Q. So you don't know who made it or what they looked at to get the information that's on this chart.

A. I didn't ask them to go to that level. This is a standard chart, you know, I -- there are a variety of publications on the Pennsylvanian section. I went out and looked at those to make sure our nomenclature was correct because there was issues on nomenclature and, you know, the Morrowan stage is actually comparative to the Marble Falls, yes. I went back to the sources on that sort of thing.

Q. Did you go back to any sources to -- to check the depths?

A. Yes.

Q. And what sources did you go back to on that?

A. There are some geologic cross-sections that are general published geologic cross-sections.

Q. Such as what?

A. Oh, I -- I am sorry. We have them hanging on our wall in the office.

Q. Okay. I mean, I am not --

A. It is a North Texas geologic site. A West Texas Geologic Society.

EXAMINER MONTES: Mr. Cooney, is there a question really as to whether or not these -- these -- these depths are at issue?

Do you have a concern that -- I am not really clear what you're getting at.

MR. COONEY: I understand. I have a concern about the accuracy of the information concerning the border, for lack of a better word, between the base of the Cretaceous and the top of Pennsylvanian for purposes, and that this information has been presented as if it's somewhat uniform and known. And it's important to know if, indeed, at the location of these particular wells, we got to the base of the Cretaceous that that whole area is cemented off. And so I -- in my understanding of his testimony, there was a variety of numbers that we -- that have come up. And in -- and so that's what I am exploring.

MR. SIMS: I would like to address that, if I could just for a moment.

EXAMINER MONTES: Please.

MR. SIMS: Mr. McBeath is the Petroleum Engineer. He has carefully studied the type logs, that's the type of thing petroleum engineers do.

Dr. Kreitler was presented to talk about the geology in the area and how the Strawn Formation can intersect and does intersect with the Cretaceous Formation.

Dr. Kreitler is not here to talk about professional petroleum engineering issues which is what Mr. McBeath addressed and has gone through at length in talking about setting the surface casing and how that's done and that sort of thing. So I really feel like it is a little unfair as to the types of questions that are being asked here when Dr. Kreitler hasn't been presented to talk about those kinds of engineering issues.

EXAMINER CHANDLER: Well, I think we have in the record information specific to the Teal and Butler wells about how they determined the base of the Cretaceous and what's presented on the Form G-1; is that right?

MR. SIMS: That's right. By other

witnesses who have looked at that and carefully studied that.

EXAMINER MONTES: Mr. Cooney, if you have anything specific about this 400 foot figure that's on Exhibit 54, I am going to allow that question. But if you could do it quickly, I would appreciate it.

MR. COONEY: I will.

EXAMINER MONTES: Okay.

MR. COONEY: And I promise not to be flip at all. I thought I was asking him geology questions so.

EXAMINER MONTES: Well, I think it is -- by asking him about the casing on the wells, you're crossing over into the expertise of the other witness. So I think really what we need to concentrate here is, if you have an issue, you know, a reason to doubt the accuracy of the -- of the measurement that's included on Figure 54, by all means, explore that.

MR. COONEY: Okay.

EXAMINER MONTES: And I will let you proceed.

MR. COONEY: All right.

Q. (By Mr. Cooney) You mentioned the plumbing system. What do you mean by "plumbing system" between, I guess, the Cretaceous and the Pennsylvanian?

A. When I say a "plumbing system," that there are -- you know, pathways that are more permeable. And this would be analogous to having pipes, in that the more permeable pathways may be sands or they may be limestone versus shale. And that because of the dip of these underlying Strawn formations, that they are dipping at approximately 100 feet per mile that there will be places where a sand may come up beneath the Cretaceous sands. You may go quarter mile away and that sand isn't there. It is a shale section because that's part of the plumbing, the impermeable part of the plumbing that then comes up beneath the sand. But we may have another sand that's on another half-mile and it may come up underneath.

Q. All right. Turning to Exhibit No. 55. What is the source of the information in Exhibit No. 55?

A. That is a cross-section that was provided by Range. That's a seismic section here, if we are looking at the same figure.

Q. On Exhibit No. 56, again, what is the source of that?

A. The source of that is from Range.

Q. And other than the black pointy line on the low -- in the bottom -- on the bottom left middle that you identified as a -- what looks like a fault, is

there anything else on Exhibit No. 56 that indicates a fault?

A. No.

Q. The pointy black arrow along the bottom left, is that partial or -- if we saw an entire fault, would this -- how would that compare to what we see in this lower left?

A. It would look like a splinter that -- we had a more -- a larger map of this -- of the Barnett and decided to give you a blowup here to show specifically the area of the Teal and Butler Well, to show in the exhibit.

Q. All right. Turning to Exhibit No. 57. First of all, what is the source of that figure?

A. Again, that is data from Range Resources.

Q. Now, on that one, looks like a base of the Cretaceous is identified as 500 feet, is that -- or what are the numbers on the left and right?

A. Right. Those are in feet and that is below sea level.

Q. And then going back to 54, that's below sea level or below ground surface?

A. That is below ground surface.

Q. Turning to Exhibit No. 62. And would it be fair for me to say that that is a -- well -- I was

going to say that looks like, I would call that or might call that the plumbing exhibit, 62.

A. 62, yes.

Q. Are any of the wells identified on Exhibit 62 intended to represent any of the wells that you studied in this actual case or are these just representative examples?

A. It is just a schematic.

Q. And the -- I hate to ask you this. Is -- are the angled gray and yellow areas that say "coal, shale, and then Strawn sand limestone," are those supposed to be the Upper Pennsylvanian or the --

A. Yeah. They are diagrammatic schematic of the Strawn.

Q. Okay. And your theory is that, like in the yellow areas that are angled, natural gas seeps up from the Strawn into the Cretaceous.

A. That is correct.

Q. And what -- is it just the presence of the gas in the Cretaceous that leads you to believe that or what other empirical factual information do you have that tells you that, in addition to the presence of the gas?

MR. SIMS: I am going to object to that question. I mean, we spent, you know, 30 minutes

talking about all of the evidence of natural gas and the Strawn from producing fields to coals and other things. It is just repetitive at this point. I am not sure where we are going.

EXAMINER MONTES: Are you going anywhere new, Mr. Cooney, on this?

MR. COONEY: I guess I didn't hear and maybe this is my own shortcoming, that he provided his empirical information or the basis for his theory.

EXAMINER MONTES: I will allow the question. Objection is overruled.

A. Okay. Question was allowed.

EXAMINER MONTES: Would you repeat the question.

A. I need to respond.

EXAMINER MONTES: Would you repeat the question.

MR. COONEY: Oh, yeah.

A. Yeah.

Q. (By Mr. Cooney) What empirical information, aside from just the presence of the gas in the -- I am sorry, in the cretaceous do you have that substantiates or supports your theory about gas migrating from the Strawn to the Cretaceous?

A. That we have, one, the presence of wells that

go down into the Strawn for which we see natural gas.

We, also, have in -- we have an analogy to the area in southern Wise County, the Boyd area, where we have looked at the, 15 years ago, we looked at the issue in far greater depth. And we see a very similar type of situation, and we see that we have, you know, salty water within the Pennsylvanian locks rocks. We see we have natural gas within the Pennsylvanian rocks. And we see there are cases up there where they drilled water wellers -- water well drillers drilled down into the -- the Pennsylvanian rocks and found higher salinities and gas presence. And in those cases, they would plug back up to the Cretaceous.

Q. Turning to Exhibit No. 63. My question was, and it may not be a good question. But did you do a more localized study, you know, to focus on the area around the Teal and Butler wells to -- looking for coal, gas and oil?

A. No. We wanted to go back to publications, published reports that, you know, showed the presence of coal, gas and oil within the three county area that would be, you know, synonymous with areas that are, you know, kind of overlaying by the Twin Mountain.

Q. Turning to Exhibit No. 66. Where -- are these the only three wells that you found that had, at least,

a public record indication of gas in the wells?

A. No. No. There were other wells. I thought these, to me, provided the best substantiation.

Q. What is the significance, if any, of having head gas in a well versus dissolved gas, I mean, coming out of the well?

A. The significance to me is that the headspace gas in the well is there because water from the aquifer flowed to it and de-gased. They are both related to each other, that the headspace gas is there because of groundwater flow to the well. They represent -- the headspace gas can be a little misleading because measurement of the concentration will be dependent on whether the headspace is open to the atmosphere, whether it is sealed. And it may relate, also, to how much the well is pumped.

Q. And the -- well, did you do any work to compare the composition of gas in the Lipsky water well to the composition of gas in the other water wells that -- in the subdivision that were studied, compare the characteristics of that gas?

A. That -- I looked at the composition and whether there was a presence of just methane or whether there was methane, ethane, and some of the other hydrocarbon, and most of the wells have methane and

ethane as well.

Q. So the gas in the Lipsky Well is more similar to or different than the gas, if you can say? Maybe --

A. No. It is quite similar to the gas in the other well.

Q. And can you make that -- and I am just asking this because I don't know. Can you -- is it fair to compare headspace gas and dissolved gas, characteristics and try to make a call?

A. No. I don't think so. There are two -- for the headspace gas, there are too many variables.

Q. Okay. Turning to Exhibit No. 69. And this is kind of what sparked my whole trip at the beginning of our time here, yours and mine, I mean is, looking at the wells, the water wells on the left-hand side of Exhibit No. 69, they purport to show a distance between the base of the Cretaceous and the bottom of the well.

And what I am curious about is, how confident can we be of what we see represented on -- on Exhibit 69 -- 69 in that area?

A. I think reasonably comfortable.

Q. Because?

A. Because that the -- the base of the Cretaceous has been estimated from the geophysical log at the Teal well and those are reasonably close.

Q. Do you know any reason why the -- and maybe I am just missing it, the Butler Well isn't on this exhibit?

A. I don't believe there is a log for that up in that region.

Q. I mean, if that's --

A. You know, I think that was a Range decision.

Q. On the well pumping information that you talked about, the water well pumping information for Mr. Stites and Mr. Lipsky --

A. Right.

Q. -- have you been able to discover, you know, how much water was pumped from each of these wells like on a monthly basis over a period of time? Or are you making a generalization, and I understand that may be all you can do based upon the information you have? Are you making a generalization based on what you know about how the property has been used over time?

A. I have not made that calculation. And one could make that calculation on Mr. Stites saying that, you know, you were pumping 20 gallons per minute and you were pumping for three months straight. I am not -- but I -- you know, I don't have a lot of faith in that number because I wasn't out there for it. We can make a similar calculation for Mr. Lipsky on that,

that he said that he was pumping on, I believe, a couple thousand gallons a day. I don't have any way of verifying that, so I have not made that calculation.

Q. Did he say that in the deposition?

A. I think he did.

Q. Okay. Well, but -- and the reason I am curious about that is because one of the theories is that the draw -- the draw down of the aquifer, the pumping a lot of water from these water wells is a factor in bringing gas to the water -- to the Lipsky Well, for instance?

A. Right.

Q. If I understand that correctly. Is that one of your theories?

A. I think the situation has been aggravated by pumping.

Q. And describe what you call the aggravation. What do you mean by "aggravation"?

A. "Aggravation," that within the -- let me just -- within some of these wells where we talked specifically about Mr. Hurst Well, that they didn't have a pump on the well but gas flowed out of the well, okay, at the -- when he first drilled it. Therefore, pumping down did not aggravate the situation on that particular well. There may well be a little free

pocket of gas that was down there within the Twin Mountain.

Now, it may be that the other wells in that whole area were, also, pumping in the summer of 2005 and caused water levels to climb and having some of this gas to come out of the solution, I don't know. I don't have the data there to speculate as to what caused that. But we do know that pumping water levels down causes gas to come out of solution. And we do know that pulling -- that pumping these wells causes water levels to decline quite significantly in this particular aquifer setting.

Q. What does it mean to say, "causes gas to come out of solution"?

A. That the -- the gas which is held within the water is dependent upon the pressure of the water. And as you depressurize that water, then the chemical equilibrium changes and permits gas to come out of solution.

Q. So that means actually become a gas in the area, whereas, it was locked up in the water before?

A. It was dissolved in the water and it comes to the well and the water in the well becomes turbulent and starts mixing and because of that turbulence, we may see the gas comes out of solution and becomes a

free product rather than -- excuse me, I am losing my voice, as a dissolved component.

Q. A free product capable of being ignited or -- and flaring?

A. Not necessary -- well, accumulating within the headspace of the well.

Q. And I guess another way that gas could accumulate in the headspace of a well is that, you hit a pocket of gas like you described with the Hurst -- possibly happened with the Hurst Well?

A. Correct.

Q. What are other ways that gas could accumulate at the head of a well?

A. By pumping the well.

Q. Okay. Any other, I mean that --

A. Those are the two primary.

Q. Did you gather specific information from the residents or not necessarily you -- but do you know if specific information from the residents was gathered about how often pumps have been replaced and what the power of the pumps of each well in the neighborhood are?

A. No. That's more in the -- the records in the discussions that others have had with the drillers.

Q. But you mention that, the over-pumping of

wells is -- could be a factor here, so. And you base that conclusion on what information?

A. That the over pumping -- well, I know that this -- this formation has a low transmissivity, it is a low ability to produce water. That when you look at the individual driller's reports, you see they run what we call "a specific capacity test" and they pump the well for a short period of time or for a couple of hours and they measure the amount of water level that the water levels decline and at the -- what pumping rate. And these indicate that this is a poor producing aquifer that for a short period of time pulls the water levels down.

Q. How -- how did you find out that Mr. Stites replaced his pump in 2009?

A. I think there is -- there is a report in some of the files. I can't tell you exactly. I have looked at it and, yes, there is a bill of sale and it -- you know, it shows that he wanted to put a bigger pump.

Q. So it is based on some evidence --

A. Yes.

Q. -- that you looked at?

A. Yes.

Q. I am almost done. Thank you for bearing with me.

A. That's no problem, sir.
Q. Will you please turn to Exhibit 74. And if we assumed that --
A. What are we -- I want to make sure I am not looking at 75.
Q. 74. It is 74.
A. Is that -- that the chloride?
Q. Water-well locations, chlorides.
A. Okay. Thank you.
Q. So let's just assume that the gas in the Lipsky Well is from the Strawn Formation. Can you explain why we, you know, don't have a higher level of chlorides in that if -- given the indications in your earlier exhibit, the plumbing exhibit I talked about, about chlorides being present --
A. Uh-huh.
Q. -- in the Strawn Formation?
A. Why do we have a lower chloride here and a high gas in the sand well?
Q. Right.
A. Right. I think we are looking at a snapshot in time and it may well be that, if you look at Lipsky in a year from now, maybe he had a lower methane, I don't know.
Q. Okay. That's -- I just want --

A. Yeah.
Q. The Twin Mountain does in the have high chlorides.
A. That is correct.
MR. COONEY: All right. I -- the -- going back to Exhibit 69, the cross-sections. And I just want to make sure I understand this. It is your theory that there are in some places communication between the Strawn and the Cretaceous and that would -- and that is your explanation of why we have gas in some of these water wells such as the ones on the left side of Exhibit No. 69 that do not penetrate the Strawn. Do I have that --
A. That's correct.
Q. Do you happen to know or did you look at the surface casing depths of the other oil and gas wells in the area?
A. No, I did not.
Q. Do you know if anyone on the team did? And if you don't, that's fine, I --
A. Other than what Mr. McBeath has testified to.
MR. COONEY: Thank you very much. That's all.
EXAMINER CHANDLER: Any redirect.
MR. SIMS: Yes.

REDIRECT EXAMINATION

BY MR. SIMS:

Q. Dr. Kreitler is it accepted and standard in the field of geology to correlate the types of -- type logs that you have looked at from one area to another to another area to come up with depths and that sort of thing?

A. That's very typical.

Q. Let's look at Exhibit 61 if we could put that up on the --

Talked about this structure map before, Dr. Kreitler. You understand that the structure map was created from multiple, multiple points across an area.

A. That is correct.

Q. You understand that every one of these red dots is a point that was used, an interpretation of where the base of the Cretaceous was to create this structure map.

A. Yes.

Q. And this 5 --500 -- approximately 500 feet that we have looked at, subsea level that you have talked about is consistent with all of these points that were used to create the subsea structure map.

A. Right. An entire map is generated.

MR. SIMS: Pass the witness.

EXAMINER CHANDLER: Any more, Mr. Cooney?

RECROSS EXAMINATION

BY MR. COONEY:

Q. Just real quick, looking at Exhibit 61. There is 510 estimated at the Range-Teal location. In the middle left-ish side of that exhibit next to a red dot.

A. Yes.

Q. And that is one of those red dots that was a data point for --

A. Right.

Q. -- estimating the depth of the Cretaceous right?

A. Right.

Q. The base of the Cretaceous.

A. Correct.

Q. Okay. The 510 is obvious -- different from the wells having been cemented down to 400 and whatever feet. What is the -- how do you explain that anomaly?

A. I don't --

MR. SIMS: Objection, that's a misleading question. This is a subsea map and he is mixing apples and oranges talking about below ground level versus subsea.

EXAMINER MONTES: Sustained.

Q. (By Mr. Cooney) That may be the end -- I wanted to make that clear. The 510 on Exhibit 61 is subsea level, correct?

A. That is correct.

Q. And the depth to which the surface case -- hold on -- the depth of the Cretaceous from ground level -- if you were to have put that on Exhibit No. 61, what would that number have been?

A. I think that's, approximately, 325 feet.

Q. Okay. I just --

A. Yeah. It is difficult, and it gets confusing.

Q. But it is over 150 feet in difference, correct?

A. Well --

Q. Between 325 and 510.

A. Correct.

Q. Okay. And the reason for that difference is what?

A. Because of the -- one is a measure from land surface, another is a measure from sea level.

MR. COONEY: Okay. Thank you.

MR. SIMS: No further questions.

EXAMINER CHANDLER: Okay. Thank you, Dr. Kreitler.

A. Thank you.

EXAMINER CHANDLER: You have one more witness.

MR. SIMS: We were going to play a couple of video depositions, very short, for our next witness. We need about 10 or 15 minutes to set up those videos. So if you're going to take a lunch break this might be a good time to do that and get set up and do that.

EXAMINER CHANDLER: I think this would be a great time to do that. Let's come back at 1:15.

(Luncheon recess.)

EXAMINER CHANDLER: Let's go back on the record.

EXAMINER MONTES: Before we get started on the record, just to be clear, you had asked that the record be left open for us to take the evidence of the depositions. And I wanted the record to be clear that we are going to leave the record open for that purpose.

MR. JACKSON: Thank you very much.

EXAMINER CHANDLER: Okay. Mr. Jackson. Okay, next.

MR. SIMS: Thank you. We are going -- we would like to offer into play two depositions, one of which was taken Tuesday of this week. And I have the deposition excerpts for each of these depositions to provide for the record. And the first deposition will

be of a lady named Alisa Rich. She was the consultant that was hired by Mr. Lipsky and who did some water testing and that sort of thing right after he hired her. And just in context, there's one exhibit that she will refer to in the deposition. That is Deposition Exhibit 20. She proves that up in the deposition, and we provided a copy of that.

The deposition transcript for Alisa Rich is Exhibit 77. The exhibit, Deposition Exhibit 20, is 77A. And then we will follow that with the deposition of Mr. Lipsky excerpts, and that is Exhibit 78. Ms. Rich's deposition is about 19 minutes as we have edited it, and Mr. Lipsky's, I believe, is less than five. So we have tried to really cull down to give you a flavor of it. And we will be supplementing the record with the entire depositions with all the exhibits as a part of our closing part of the hearing. With that we would like to proceed with Ms. Rich.

EXAMINER CHANDLER: Okay. So we have 77, 77A and 78?

MR. SIMS: Right.

MR. JACKSON: There are actually blank tabs in your notebook where you can put these if you would like.

MR. SIMS: And we offer those.

EXAMINER CHANDLER: They are admitted.

(Whereupon, Range Exhibit Nos. 77, 77A, and 78 were admitted.)

EXAMINER CHANDLER: We are not going to be on the record while this is playing.

(Videotape playing.)

(BREAK.)

EXAMINER CHANDLER: Back on the record. We are ready for the next witness.

MR. SIMS: Madam Examiner, we would like to call Mr. Keith Wheeler.

(WHEREUPON, THE WITNESS WAS DULY SWORN.)

KEITH WHEELER,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. SIMS:

Q. Mr. Wheeler, please state your full name.

A. My name is Keith Wheeler.

Q. By whom are you employed?

A. Pastor, Behling & Wheeler.

Q. What type of firm is Pastor, Behling & Wheeler?

A. We are an environmental engineering and consulting firm.

Q. In connection with your work at Pastor,

Behling & Wheeler, have you been involved in extensive work in the development of surface and subsurface groundwater investigations?

A. Yes, I have.

Q. Could you give us some examples of some of the work that you have done in connection with designing and implementing plans for surface and subsurface groundwater investigations?

A. I have worked on a number of industrial site investigations across the state of Texas, and also I have been contracted by the Railroad Commission of Texas or my company has to investigate abandoned oil field sites and investigate those sites, determine whether a human health risk exists and, if so, what to do about that risk.

Q. In connection with the work that you do day to day, Mr. Wheeler, can you generally describe the type of process that you go through to design a plan for a surface or subsurface investigation?

A. Sure. A typical process would be to -- when we are looking at a new site we are getting involved with is to review the existing information on that site, identify the potential chemicals of concern, determine the extent of the investigation, how many samples we need to collect to make sure we can

determine whether there is a problem or not at this site, and then finally collect the data, analyze it, interpret it, and determine whether there is a threat to human health or the environment.

Q. How long have you been involved in making those kinds of assessments and coming up with those kinds of plans for surface and subsurface groundwater investigations?

A. I've been doing this type of work for 23 years.

Q. What is your educational background, Mr. Wheeler?

A. I have got a bachelor's degree in geology from Texas A&M University and another bachelor's degree in hydrology from Tarleton State University.

Q. Have you testified before the Railroad Commission before?

A. Yes, I have.

Q. And Mr. Wheeler, is your curriculum vitae accurately set forth in Exhibit 79 with your work experience and your educational background?

A. Yes, it is.

MR. SIMS: At this time we offer Exhibit 79.

EXAMINER CHANDLER: It's admitted.

(Whereupon, Range Exhibit No. 79 was admitted.)

MR. SIMS: We would also request that Mr. Wheeler be accepted as an expert on surface and subsurface groundwater investigations in terms of coming up with and designing plans to investigate and assemble the information related to those investigations.

EXAMINER CHANDLER: He's accepted as such.

Q. (By Mr. Sims) Mr. Wheeler, in connection with your work in this case, did you work with the environmental company, the Premier Company, and with Mr. Middlebrook and others at Range to come up with the plans that would be used to conduct the investigation that we've heard so much about over the last day-and-a-half in this matter?

A. Yes. I was intimately involved in that process.

Q. Was the work that you did in that process consistent with the work that you do, the type of planning that you do for surface and subsurface groundwater investigations in your daily work apart from this hearing in the Railroad Commission?

A. Yes, it is. We follow the same process in

developing our work plans.

Q. Mr. Wheeler, have you compiled a series of documents and pictures and charts that assemble the information that was gathered on the ground and explains how that information was acquired and taken to present to the Railroad Commission today to show what the results of all the testing was?

A. Yes, I have.

Q. Are those exhibits found in Exhibits 80 through 98?

A. Yes, they are.

Q. And do they accurately represent the testing that was done and the test results from all the testing that has been done?

A. Yes, they do.

MR. SIMS: At this time we offer Exhibits 80 through 98.

EXAMINER CHANDLER: They are all admitted.

(Whereupon, Range Exhibit Nos. 80-98 were admitted.)

Q. (By Mr. Sims) Mr. Wheeler, let's look quickly at Exhibit 80. This is a document I believe that was previously admitted as Exhibit 6 when Mr. Middlebrook testified. Does this exhibit, the December 16th letter

from the Texas Railroad Commission, did it play any role as background information in coming up with a plan for investigation in this matter, and if so, explain what it was?

A. Yes. What I was specifically involved in was in Bullets 2, 3 and 4. And they requested that Range undertake several environmental investigation activities. And we designed our work plan to make sure that we addressed the Railroad Commission's request.

Q. All right. Let's look at Bullet No. 2 first. Can you -- tell us what Bullet No. 2 was in your own words.

A. Bullet No. 2 asked that Range collect a sample of bradenhead gas from the Butler No. 1 well and have that sample analyzed for isotopic and compositional analysis.

Q. What was your involvement in Bullet No. 2, if any?

A. My involvement was to make sure that the sample was collected properly, and other than that, I had no real involvement in that process.

Q. All right. Let's look at Exhibit 81. What is Exhibit 81?

A. Exhibit 81 is a photograph of a sample of bradenhead gas being collected from the Butler gas

well.

Q. Did you collaborate with the environmental company to insure that their collection methods and procedures were consistent with the standards that they need to adhere to to make sure that their samples are good samples?

A. Yes, I did.

Q. Other than in terms of the actual collecting of the samples for Bullet Point No. 2 under the Railroad Commission's letter, did you have any other involvement in connection with Bullet Point No. 2?

A. No, I didn't. Doing isotopic and compositional analysis is way out of my pay grade.

Q. All right. Let's move forward, then, to Bullet Nos. 2 and 3 going back to Exhibit 80. Excuse me, Bullet Nos. 3 and 4. Do did you have any involvement in those?

A. Yes, I did.

Q. Describe for me what those bullet points are and what your involvement was in connection with those two requests by the Texas Railroad Commission.

A. In Bullet 3 the Railroad Commission had requested that Range provide information about the water wells in the area that we had identified for sampling and then develop and provide a sampling and

analytical methods to sample these wells.

Q. All right. And did you do that?

A. Yes, we did, and we submitted a sampling analysis work plan to the Railroad Commission. I believe that was dated December 24th.

Q. And you understand that is already an exhibit in evidence as Exhibit No. 10 and Mr. Middlebrook actually tendered that plan under his cover letter?

A. Yes, I am (sic).

Q. And in addition to the water well sampling, if you would, what -- just go on tell us at each well what was sampled.

A. There were basically three components of the water well sampling plan. The first component was to sample the ambient air around the wells and structures near where the water well samples were being collected. The second component was to collect groundwater samples from the wells. The third component of the plan was to collect headspace samples from the top of the well.

Q. And then Bullet Point No. 4 involved what?

A. Bullet 4, the Railroad Commission Staff had requested that Range perform a soil gas survey both around the water wells, the occupied structures, and also they recommended that some samples be collected from near the Butler and Teal surface pads.

Q. All right. Were you involved in putting that plan together to submit to the Railroad Commission as to how to move forward with collecting the soil gas survey?

A. Yes, I was.

Q. And you understand that Mr. Middlebrook testified about that and that was introduced as Exhibit No. 12 during his testimony?

A. Yes, I am.

Q. Let's look at Exhibit 82, Mr. Wheeler. Can you explain what this is, please?

A. What Exhibit 82 shows is the location of the pad site for the Butler and Teal gas wells, a 3000-foot radius, which is the white line drawn around the Butler and Teal gas pads, and then the water wells within that radius that we had identified for sampling.

Q. Looks like that on the diagram there are a couple of blue dots within the circle. Can you explain what those are?

A. Yes. We identified a well. I believe -- I am having a little trouble reading the number but I believe it is No. 13. That is a well owned by a Mr. Mercer. He refused access to his well for sampling. So that well was not sampled as part of this investigation.

Then the other well that was not sampled was Well 14B. That is one of Mr. Hurst's wells in which the pump had reportedly burned up or was no longer working and we could not obtain a sample of water from that well without pulling the pump and installing new pumping equipment, so we did not collect a sample from that well.

Q. You understand that the Hurst No. 15 well as it's reflected throughout the documentation, is that the same thing as the Hurst water well that flared gas?

A. Yes, I believe it is.

Q. All right. What are all the numbers associated with each of the wells? Who came up with that numbering system?

A. I believe this was an identification system that Range identified when they first received the request from the Railroad Commission. They basically went out and did a door-to-door water well inventory to make sure they identified every water well within this area. And as they found a well, they assigned it a number, and that number corresponds to the well owner name. And just so we could keep all these wells straight, we've used that same numbering sequence throughout our sampling program. So later in the presentation when you see sample results for a certain

well, it will be referring to the same wells and names that are shown on this map.

Q. If we zoom out on this diagram, what are all the blue dots over here outside the circle?

A. Those are the Lake Country Acres public supply wells, I believe. Those were not sampled as part of this investigation.

Q. What is Exhibit 83, Mr. Wheeler?

A. Exhibit 83 is the information we collected on the water wells that we had identified for sampling, and we attempted to match the wells we had identified in the field with state records that are provided in the state agency databases. Unfortunately it's not an easy thing to match wells identified in the field with the water well records, but we did collect all the records within this area and a larger area, and where we could find a match based on the well owner name or the address and have a confirmed match, and the well information is provided. In some cases we might have matched a well owner's name but the address was incorrect or we had the right address but the well owner name was different and we found a tentative match. Those are the wells that are highlighted in tan on the exhibit.

And then there are just some wells

identified in the field that we couldn't find a match to state records. We asked the residences during our inventory if they had information on their water wells and in most cases they did not. If they did, we provided that information in this table.

Q. But there is no question that the wells actually exist on the ground. You just weren't able to find state paperwork on some of these wells in your investigation?

A. That is correct.

Q. Behind the cover chart that you prepared as part of Exhibit 83, what are all the other documents behind that?

A. What is provided behind that summary table is just the backup document of the water well reports. Again, we have listed the well ID at the top of each page so you can cross reference the well on the summary table to the water well reports.

Q. And what is Exhibit 84?

A. Exhibit 84 shows the locations where soil gas survey samples were collected. They are actually 117 blue squares on this figure and that is where samples of soil gas were collected.

Q. And in connection with the soil gas sampling, what were -- what was your focus, Mr. Wheeler, in terms

of that sampling and what you were going to be looking for when those samples were collected?

A. There were two primary purposes of the soil gas survey. The primary purpose was to identify whether there was an accumulation of gas in the shallow soils that might present a safety concern for residences in the area. A secondary goal was to obtain data over this areal extent to see if we did find elevated elevations of soil gas, if we could determine the source of that elevated soil gas.

Q. All right.

EXAMINER MONTES: These are soil samples that you-all collected?

THE WITNESS: They are soil gas samples. They were samples of gas from the soil.

EXAMINER MONTES: That you collected and performed?

THE WITNESS: The company that had been contracted by Range, Premier Environmental Services, that I worked with on this project.

EXAMINER MONTES: What was the time frame of the sampling?

THE WITNESS: It happened about over a two or three-week period, I believe, starting the second or third week in December and up through about

two weeks ago.

EXAMINER MONTES: Okay. Thank you. Sorry.

Q. (By Mr. Sims) We will get to this in a minute, but were you physically present for much of the sampling done by the environmental company that you actually go out on the ground and observe them taking these samples?

A. Yes. I was in the field and witnessed quite a bit of the sampling just to insure that the sampling procedures and protocols we had developed in our work plans were being implemented.

Q. Let's talk about some of those procedures and protocols, and let's begin, then, you indicated really two components to this. One was for the water well sampling and then the soil gas sampling. And we will get to the soil gas sampling, but in connection with the water well sampling, I think you said the first thing that was done was some ambient air sampling around the water wells. Is that accurate?

A. Yes, it is.

Q. What is Exhibit 85?

A. Exhibit 85 just shows the instrument that was used to do the ambient air sampling. This is a sophisticated piece of equipment called a Sapphire

Miran portable air analyzer. It can be calibrated to detect approximate concentrations in the field of methane, ethane, and propane. So what you are seeing here is the instrument itself. It has a wand-like device. In this picture the wand is actually being stuck down into the upper portion of the well.

By the way, this is a typical well construction in the area we investigated. There is usually a concrete structure around the well which sits inside this concrete structure, and often there's a little concrete slab that has been placed over the concrete cover.

Q. Just to be clear, we will talk about the headspace gas testing, which I think was the third component of your water well testing, but this is not showing headspace gas testing, is it?

A. No, it's not. This is basically sampling the gas in the upper portion of that concrete structure. It is not coming from inside the well.

Q. All right. What does Exhibit 86 show?

A. 86 again shows some ambient air screening was done. This time what this picture shows is water that is being purged from the nearby water well. That is a hose and you can see the water being discharged. And the wand was moved back and forth over the purged water

as it hit the ground to see if there was accumulation of gases that were coming off the water that might be a safety concern for the field crew.

Q. Were samples taken at each water well, these ambient air samples, sometimes inside a well shed or other place where the water well may be located?

A. Yes, they were.

Q. And after all the sampling was done, did you insure that the readings were recorded and did you tabulate them into a chart that we can look at and see what those readings were?

A. Yes, I have.

Q. And is that shown in Exhibit 87?

A. Yes, it is.

Q. Let's look at the top portion of this all the way across. If you will, walk us across the top portion of it so we can get an idea of what this shows and then we can go back to a larger view and you can explain it in more detail.

A. All right. Well, the first column just shows the well ID that we have referenced to that we will be using for all the wells we sampled. The next column shows the well owner name. We've kept that consistent throughout this investigation. We show the date that the sample was collected. We then show the area where

this ambient air sample was collected. Then we have three columns that show the results of the ambient air sampling for both ethane, methane and propane.

Then the other thing we've got, if you go across the first line, we've got a row entitled lower explosive limit, or also referred to as LEL. And what that is is that is the lowest concentration of a gas or vapor in air that can explode given an ignition source. So that is, you know, a concern and significance in our investigations and screening.

So for example, the lower explosive limit for ethane is 30,000 parts per million. The lower explosive limit for methane is 50,000 parts per million. The lower explosive limit for propane is 21,000 parts per million. The next row down what you will see is out of all the readings we took during our field investigation, ambient air samples from a number of locations at each well, we've summarized that information in this row called maximum ambient air readings. So what that is, out of all the readings, what was the maximum value we detected during our field program.

For ethane the maximum concentration was six parts per million. For methane the maximum concentration was 13.9 parts per million. For propane

the maximum concentration was 81 parts per million.

EXAMINER CHANDLER: Did you mean 61? 81?

THE WITNESS: Excuse me. 61, yes.

Q. (By Mr. Sims) Let me ask you, for example, over here where it says Well No. 1, if we went back to Exhibit 82, which was one of the original charts we looked at that had the aerial with all the numbers on there, if we want to know where that well is located, can we go back to that aerial in 82 and match it up and see where that well is?

A. Yes, you can.

Q. And for example, on Rodney and Geraldine Wells, which is designated as No. 1, you have got listed gravel drive, well shed, and purged water discharge; is that correct?

A. Yes.

Q. So would this indicate that somewhere around the well, the water well, there is a gravel drive that you took sample or an ambient reading?

A. Yes.

Q. And so forth and so on. The well shed, the purged water discharge?

A. Correct.

Q. Let's go to the large zoom on this. Did any of the readings -- and this is a two-page chart in

Exhibit 87; is that right?

A. Yes, it is.

Q. Did any of the readings taken on any of the ambient air samples create any sort of concern about explosivity or immediate danger of any fire or anything like that?

A. No. Not at all.

THE WITNESS: Carla, if you can zoom back in on the upper several rows there. That is good. Yes, go across.

A. What we did is we compared the maximum ambient air sample we collected in the field, which is that row, to the lower explosive limit, and here we've presented that as a percentage of the LEL, the maximum concentration. So all of the maximum readings we detected were less than .3 percent of the lower explosive limit. These are basically insignificant readings from a safety standpoint.

Q. Now, is Mr. Lipsky's well on here?

A. Yes, it is. That would be Well No. 8, I believe.

Q. Let's look at that one. No. 8. You have taken ambient air sampling around -- why don't you explain where you took the ambient air samples.

A. The ambient air readings in Mr. Lipsky's

property were taken right around the top of the wellhead. They were taken around the sampling area, which is next to a shed where he has the treatment equipment for his water. We have taken it from where we were discharging the water out of his well onto the ground, the purged water. We have -- and we have taken it -- readings were also taken from inside the house, the downstairs bedroom and upstairs in the game room.

Q. All right. Were you physically present when the Lipsky's water well testing was done?

A. Yes, I was. I was present and I -- for the water well sampling. I didn't go inside the house and observe the sampling that was done inside the house or the readings done inside the house.

Q. But you did see the ambient air sampling around the wellhead and that sort of thing?

A. Yes, I did.

Q. If we read across the chart, it shows no ethane, no methane, and 10 parts per million of propane?

A. Around the wellhead, yes. That's correct.

Q. From a safety standpoint, around the well was there any explosivity concern or immediate danger of explosivity around this Lipsky well on the date that you-all tested it?

A. No. The values we see are one to several thousand times lower than the lower explosive limit.

Q. And I just want to make a point here because we are going to look at headspace gas inside the well in the Lipsky well in a little bit. And I just want to make sure that we are -- we understand that we are talking here where there is no issue is outside where people are and that sort of thing, people walking around, it's not an issue?

A. That is correct.

Q. Okay. Let's look at the Hayley well. It's No. 10. Did you all do ambient air sampling on it?

A. Yes, we did.

Q. Did it present any sort of explosivity concern at all?

A. No. The values were basically insignificant.

Q. Would you -- would it be fair to say that all the values recorded for all the ambient air sampling were insignificant in terms of creating any sort of fire or explosion danger?

A. Yes. That is correct.

Q. What is Exhibit 88, Mr. Wheeler?

A. This photograph just shows the typical setup that the field crew used when the groundwater samples were collected. You can see the field equipment for

taking field readings has been set up on the table. And what you are seeing here is a typical protocol for collecting a groundwater sample following EPA protocol for collecting low flow groundwater sample. And all that means is the water is being pumped at a very low rate into the sample bottles so we don't have gases or volatiles volatilize off during the sampling process and we get representative samples.

Q. Was the sampling that the environmental company engaged in on all these water wells performed in accordance with the protocol that you set forth in accordance with the EPA standards?

A. Yes, it was.

Q. What is Exhibit 89?

A. Exhibit 89 is a summary of the field readings that were collected as the water samples were being collected, and it shows some basic groundwater quality parameters that were collected from each well.

Q. So with respect to each water sample, the date, temperature, specific conductance, dissolved oxygen, pH, oxidation reduction potential, and turbidity of the water was all recorded right when it was taken?

A. Yes, it was. I might add that this data in itself is of no tremendous significance, but I would

like to add that the level of detail that was put into this project, even though it was done under a tremendously short time frame, there was a tremendous amount of diligence and documentation. Every sample was photo documented. Field notes were taken from each sample location. And I think the data set that we've collected is an extremely high set of quality of data that will withstand any type of public or technical scrutiny.

Q. Now, in connection with the water samples, once they were collected, what happened to them?

A. They were put in an ice chest under chain of custody and sent to the analytical laboratories.

Q. What laboratory actually sampled the water analytes, not the gas part of the water but just the water analytes?

A. The water analyses were done by SPL Laboratories in Houston, Texas.

Q. Is that a reputable laboratory for that sort of work?

A. Yes. They are a very reputable lab.

Q. And you understood from the testimony of Dr. McCaffrey the other day that the gas samples from the water were actually sent to the Isotech lab; is that correct?

A. Correct.

Q. Have you taken all the results from the water testing and tabulated them hopefully in a way that we can get through it and understand what it means?

A. Yes. I hope so.

Q. How many different things were tested for in this water? That is probably not a good word but tell us what was tested for and then we will get into looking at some of the tabulations.

A. We tested for over 135 analytes. That is Exhibit 90.

Q. What is an analyte?

A. An analyte is just a constituent that the lab is trying to identify how much of it is there. It can be chemical or an element or a mineral.

Q. So there's 135 analytes that were tested for in each water sample?

A. 135 times 26. There were over 3500 analyses done as part of this investigation.

Q. Let's look at Exhibit 90. And if you can quickly tell us what this is. And before we get to that, have you created some additional charts to further synthesize all this information to make it where we can try to get through it and make it understandable?

A. Yes, I have. This is a 20-page table with every result listed. So following this table that we may spend a minute or two talking about this table, we can quickly advance to the summary tables which basically has -- I pulled out the pertinent information out of this 20-page table and we can talk about the results and what they show.

Q. Let's run across the top of the 20-page chart first and then we will move on in to the summary charts.

A. All right. If you go across the top rows, there is some sample IDs that the labs use to track the samples. We've also got the -- let's see. We've have got the sample ID again. That would be this number right here. In this case Well No. 1, you can refer back to the map that we saw earlier where there was a Well No. 1. In this case we have also go the owner listed. That would be the Wells well. Here is Well No. 2. That would be the Purdue well. In that column all the results for the sample collected from that particular well are listed in the column below that.

Q. How many pages does it take to get through all 135 or 34 analytes?

A. Four pages per set of wells. So on this first page we've listed five wells, I believe. If you go

across from left to right, four pages gets you through all the analytes. Then the table kind of repeats with the next batch of wells.

Q. All right. So walking down the chart there, under the well owner name there is a groundwater condition box. What does that mean?

A. Groundwater condition simply means were we able to get a sample of water before it went through any of the treatment systems that the residents have to take that sulfur smell out of their water. Our plan was to collect the sample from the nearest spigot or faucet from the water well before it went through that treatment system. In most cases we were able to do that. In a couple of cases we would not have been able to do that without dismantling the plumbing system and tampering with their domestic water well supply configuration. So we had to collect the samples what we call post-treatment. In a couple of samples it wasn't clear due to all the plumbing inside the well house whether it was an untreated or a post-treatment sample, so we simply called it potentially treated.

Q. And that is designated, whatever it was, whether it was untreated or post-treated or potentially, you designated it there so we can follow that?

A. Sure.
Q. The results are reported in MG/L. What is that?
A. That stands for milligrams per liter, which is basically equivalent to parts per million. You will hear both terms used in this presentation.
Q. All right. Let's go ahead and flip over to 91. Oh, what does the J mean by these numbers in here?
A. The J means that the value is estimated. Typically what that means is the value is detected at such a low level that the lab couldn't report it at a precise and accurate value because it was below their reporting limit. Therefore they give it a value called a J, which is called a data qualifier, to let the user know that it's an estimate value and not a precise value.
Q. All right.
A. One more thing if I might, Andy.
Q. Sure.
A. On this Table 2 I would just like to mention that also in this table you will see a column called TRRP PCLs. What that stands for is the Texas Risk Reduction Program Protective Concentration Levels. This what is we call our evaluation standard. And what that is, it's levels that have been established by the

TCEQ to which you can compare your results of an environmental investigation. The protective concentrations level is a value in which the TCEQ has determined that that analyte does not present an unacceptable threat to human health. So you might have a detection of a chemical in a water sample but if it's below the protective concentration level, then the TCEQ has determined that there is no threat to human health from the presence of that chemical at that low level below the protective concentration level.

These are generally very conservative numbers because basically what the TCEQ is saying, if the site has chemicals detected but they are below the PCLs, you can basically walk away from the site, leave the chemicals in place, and no further action is required because they are not a human health concur. We used the PCLs because we understand that the Railroad Commission recognizes and accepts the use of PCLs in investigations done under their jurisdiction.

Q. Let's move forward to Exhibit 91 and try to synthesize these results. What is the first page of Exhibit 91?

A. Exhibit 91, Table 1 is just a summary of all the analytes that we evaluated during the well investigation. And we have broken this up into four

different categories. We've broken that up into four groupings called volatile organic compounds. So we have got all the volatile organic compounds that we analyzed for in the first two columns. There is about 112 analytes called volatile organic compounds or VOCs listed there.

The next column is a grouping called RCRA metals, and this is eight metals that you would typically investigate in this type investigation. RCRA stands for Resource Conservation and Recovery Act and that is a group of metals that they've identified as ones of particular concern in environmental investigations.

The third column is dissolved gases. This was a list of the gas components that were reported from the lab and the methodology we used. Then the fourth column is just general water chemistry parameters, things like basic cations and anions, general water chemistry elements.

Q. So in terms of the volatile organic compounds, that is the largest group of analytes that you reviewed?

A. Yes, it is. I think there's over 112 analytes listed there.

Q. Does the next page of Exhibit 91 then break

down and focus on the volatile organic compounds?

A. Yes, it does.

Q. Explain the second page of Exhibit 91, please.

A. Table 2 is titled VOCs or volatile organic compounds that were detected in at least one of the water samples collected from the domestic water wells. So in the first column we have listed the analyte that was detected in at least one sample. And I believe there were 12 or 13 analytes there that were detected in at least one of the samples. We've then got the minimum detection limit or concentration in which that analyte was detected, the maximum detection of that analyte, average concentration of that analyte, and then how frequently that analyte was detected in the 26 groundwater samples.

The next column we've again listed our regulatory or evaluation standard, the TRRP PCL or protective concentration level, and we've compared the maximum detection of that analyte to the protective concentration level to see if we have any exceedances of those PCLs. So the final column we've listed how many analytes in these samples exceeded the protective concentration level.

Q. What does that mean? It says all data noted with a J flag.

A. What that means, as I mentioned earlier, a J flag means that the laboratory analysis is an estimated value. Typically that means the analyte was detected at a very low concentration below the reporting limit and the lab could not report a precise value. It's simply an estimated value.

Q. You have a footnote down there that says that the remaining 92 VOCs on the analyte list were not detected. Is that true for all the water samples?

A. Yes, it is.

Q. What is the third page of Exhibit 91?

A. Table 3 lists the results of the sampling for RCRA metals that were detected in at least one sample. What this table shows is that three RCRA metals were detected in at least one sample, barium, chromium and lead. The remaining five RCRA metals were not detected. Again, we've listed the minimum detection limit, the maximum detection limit, the average detection limit, the detection frequency. We have listed the protective concentration level, which is values below which are not of concern to human health. And we've listed how many of these RCRA metals were detected above the protective concentration level. And as you can see, there were no exceedances of the regulatory standard.

Q. Do barium, chromium and lead occur naturally in the earth's crust?

A. Yes. They are naturally occurring in the earth's crust in the soils, and the values here below the protective concentration levels are what I would consider background concentrations in many groundwater systems in the United States.

Q. What is the fourth page of Exhibit 91?

A. The fourth page is entitled dissolved gases detected in at least one groundwater sample. Again, we listed the analytes that were being reported for these -- using this methodology, the minimum detection, the maximum detection, the average detection, the detection frequency. And then for TRRP PCLs we've listed NA because these gases are not toxic. They are not toxic from ingestion of groundwater. Really the only concern that these gases pose is from a flammability or an explosivity standpoint. So there are no protective concentration levels from ingestion of these chemicals.

We've also listed a column, and I think you might have seen this earlier in Dr. Kreitler's testimony, the DOI, Department of Interior, or U.S.G.S. screening level. And again they reported a value of 10 for methane at which you would want to make sure if you got a value of 10 milligrams per liter in your well you

would want to make sure that well is properly vented. The maximum concentration we saw was 3.9 parts per million or milligrams per liter methane.

Q. You want to make sure your water well is properly vented no matter what level?

A. I think it's a good procedure to vent wells regardless, but if you did see a concentration of 10 milligrams per liter or greater, according to that publication you would want to insure that your well is properly vented so you couldn't have an accumulation of gas in that wellhead.

EXAMINER MONTES: Let me ask you a question before you move on. The TRRP PCL levels, are these the levels for drinking water standards, as well? Is that what you're telling me?

THE WITNESS: If there is a maximum contaminant level, the TCEQ has adapted the maximum contaminant level. But in many cases there aren't maximum contaminant levels. In that case they have calculated protective concentration levels for those other things that don't have an MCL value. But by default they default to the MCL if there is an MCL available for those chemicals. Yes.

EXAMINER MONTES: So yes for the ones where there is a standard, like in the volatile organic

compounds, that is the standard that would be used for testing the quality of drinking water?

THE WITNESS: Yes.

EXAMINER MONTES: Thank you.

Q. (By Mr. Sims) What is the fifth page of Exhibit 91?

A. The fifth page lists a summary of all analytes in which there was a detection of one of these general groundwater chemistry parameters in excess of something called the secondary maximum contaminant level. Secondary maximum contaminant levels are not based on human health. They are based on aesthetic issues. They are also sometimes called nuisance issues. The water may taste funny or have a funny smell. So for several of these elements they have developed levels at which you can compare things to to see if the water quality meets these secondary levels or not from an aesthetic standpoint.

For chloride, sulfate and total dissolved solids, as you can see we have -- some of the water in this area does exceed secondary maximum contaminant levels but that is not surprising. That is typical in many parts of Texas where the water quality is naturally poor, West Texas, South Texas. It's not an uncommon occurrence and it occurs naturally, but it is

not a health concern.

Q. All right. And what is the sixth page of Exhibit 91?

A. In the sixth page or Attachment A, that just lists all the dissolved gas results by well. So for ease of reference, if you wanted to know what the concentration of methane was in Well No. 1, the Wells well, the answer is .4 parts per million or milligrams per liter. So this is just simply a good summary table of all the dissolved gas results from the groundwater samples that were collected during our investigation.

Q. What was the result on the Hayley well? Can you find that on the chart?

A. The Hayley well is Well 10. Let's see. We had .0081 milligrams per liter ethane, no butane, no ethylene, no isobutane, .12 milligram per liter methane, no propane.

Q. What is the seventh page of Exhibit 91?

A. The seventh and final page of this exhibit, Attachment B, just lists the general water chemistry data by well. And again, this is just a reference page so you can quickly see -- if you wanted to see what a total dissolved solids concentration or a sulfate concentration in a well, all that data has been summarized into one table.

Q. Based on all the test results from all the sampling that was done in the Silverado on the Brazos area in Parker County, from all these water wells, have you reached any conclusions about the safety of the drinking water in these water wells, Mr. Wheeler?

A. Yes, I have. Based on the results of our investigation and sampling plan, the water in this area is safe to drink.

Q. Based on the results of the sampling done, are there any of these water wells that you wouldn't drink from?

A. No. There were no exceedances of human health PCLs.

Q. What is Exhibit 92?

A. Let's see, 92 is just a schematic of a water well, a typical water well design in Silverado Estates. It is not to scale, and the purpose of this diagram is just typically to illustrate where the headspace sample was collected. So what this shows is the well, the well pump, and when the well is turned on, as Dr. Kreitler mentioned previously, the water table is going to drop in that well, the hydrostatic pressure is going to be reduced in that water well, and you are going to change the hydraulic gradients in the vicinity of the well, and water and dissolved gases or gas in

the formation, if present, can come into the wellbore.

What happens is that methane is lighter than air, so it's going to rise through the inside of this well. And if the well is not properly vented, you could get an accumulation of gas in the top of that well. So this diagram shows where we actually took our samples of headspace gas from the top of the well above the water table.

Q. All right. Let's look at Exhibit 93. Can you describe that, please?

A. This is just a photograph that was taken in the field of the sampling crew collecting a sample of headspace gas. So what you see on the left part of this picture is the wellhead with a little cap that has been screwed on on top of the water well. And to get our sample in this particular case, we had to unscrew a bolt on that well cap, stick Teflon tubing down that hole where we had unscrewed the bolt a couple of feet into the well and with a handpump pump out some vapors of that headspace gas, put it in the sample bag, and that is how we collected the headspace samples pretty much from all the water wells during this investigation.

Q. All right. Now, are you going to be talking about any of these isotopes or anything that were

tested from any of that kind of gas?

A. No, I am not.

Q. What are you going to -- what kind of results are you going to talk about related to the headspace gas?

A. I think what I will be talking about is just the results of the -- some of the compositional results from this to see if there is any type of safety issue or a buildup of gases in the headspace of these wells.

Q. Have you tabulated the results of all the headspace gas testing?

A. Yes, I have. I have tabulated all the results for which we have gotten results back at this time.

Q. And is that shown in Exhibit 94?

A. Yes, it is.

Q. If you will, describe the chart and what it shows.

A. What this chart shows is similar to some of the other summary charts we have shown. On the first column is the number of the well again referenced back to that original water well location map, the well owner name, the date the sample was collected. In this case we have four components of natural gas that we've reported, methane, ethane, propane and butane, so the results are in these four columns for each of the wells

that we tested.

Q. All right. And you've got the LEL, lower explosive limit, shown there in connection with each of methane, ethane, propane and butane?

A. Yes.

Q. And have you compared those, then, going down the chart or is it easily compared with each well what the levels were?

A. Yes, it is. In most of the wells there was not an exceedance of the lower explosive limit. In two of the wells there was an exceedance of the lower explosive limit in this headspace gas.

Q. Which two were those?

A. We saw exceedances in Well No. 2, the Michelle Purdue well where we saw elevated concentrations of methane. In the second -- if we can scroll down just a -- there you go. Thank you. Also in the Lipsky well we saw a concentration of methane gas above the lower explosive limit in the headspace of that well.

Q. When you tested the ambient air around that headspace, there was no concern; is that correct?

A. That is correct. We sniffed the air immediately above the top of the wells and we saw basically insignificant levels of gas above the top of the wells.

Q. Were you present when the headspace gas on the Lipsky well was collected?

A. Yes, I was.

Q. Describe that. And we have seen pictures of the vent and all that. I would like you to talk about whether that vent was open or closed when the headspace gas sample was collected and that sort of thing.

A. When we collected the headspace gas sample from the Lipsky well, as you might recall, there had been a vent that had been installed on the well by the water well driller. That vent was closed at the time the headspace gas sample was collected.

Q. While you were out there, did Mr. Lipsky -- after the samples had been collected, did he attempt to open that valve on the vent and light the gas coming off the vent?

A. Yes. As we finished up our sampling activities and were starting to walk back to the truck, Mr. Lipsky opened that valve and attempted to light it and it did poof briefly. Yes, he did.

Q. The Purdue well, were you physically present when that well was tested?

A. No, I was not.

Q. Have you talked to the environmental company, Premier, that did the testing and reviewed the

pictorial evidence of that well in connection with the headspace gas testing?

A. Yes, I have.

Q. And did that well have any sort of venting mechanism on it when the headspace gas was tested?

A. Based on my conversation with the field crew, no, it did not.

Q. Based on the results here, do you have knowledge or information if when these results came back that Ms. Purdue was immediately notified that she ought to have her well vented and the arrangements were made to have that done?

A. Yes, I am. I was actually in the room in a meeting with Range when we first saw these results. And their immediate response was to contact Ms. Purdue and let her know of this condition and arrange to have a water well driller come out and put a vent on her well as soon as possible.

Q. And you know that -- I mean, you've seen personally that Mr. Lipsky has a vent on his well and certainly knows how to keep it open and that sort of thing if chooses to do so?

A. Yes.

Q. Do you know who actually volunteered to pay for Ms. Purdue to have the well vented?

A. It's my understanding that Range is paying for the cost to have that well vented.

Q. What is the next exhibit in -- or what is Exhibit 95, Mr. Wheeler?

A. 95 is a photo of a soil gas sample being collected in the field. What this photo shows is a hand gasoline-powered drill in which case a metal auger has been advanced into the soils one to three feet into the ground. Inside that metal auger is a capillary tubing with an opening on the end through which soil gas can be extracted. So in this case what you see is the field sampler with a syringe. He's inserted that syringe through a septum at the top of this auger where the capillary tubing extends. He extracts the soil gas vapor into the syringe and then he injects that syringe into the sampling bag and transfer the soil gas into the sampling bag, and this is a standard protocol for this type of sampling activity.

Q. And I believe you've said this but, again, this was for the purpose of looking at whether there was any sort of safety risk in connection with just any hot spots or methane that might be emanating out of the soils in and around the area of the Lipsky well and the Hayley well in the Silverado on the Brazos neighborhood?

A. That is correct.
Q. Have you tabulated the results of all the soil gas sampling in relation to the safety standards?
A. Yes, we have.
Q. And is that shown in Exhibit 96?
A. Yes, it is.
Q. Explain for us, would you, please, what this shows and whether there is any safety risk associated with any of the gases in the soil in the Silverado on the Brazos addition?
A. All right. Well, in the first column you will see the sample ID. I might point out that for these sample IDs they don't correspond to a particular water well. We will have a map in one of the next exhibits that shows where these are located, I believe. Maybe it was on an earlier map. But there were 117 soil gas survey locations. So we have got them all listed out. I think it takes three pages to get those all listed. Then we have got the results of the soil gas survey at each location reported for methane, ethane, propane, and butane from each sample location. And those are reported in parts per million.
Q. Was there any readings that came anywhere close to creating any sort of a risk, safety risk in connection with any of the soil gas samples?

A. No. The maximum soil gas concentration of methane we detected was 88 parts per million, which is less than .2 percent of the lower explosive limit. That is basically insignificant from a safety concern.

Q. Were all the others even lower than that?

A. Yes.

Q. What is Exhibit 97?

A. 97 is a map that shows again the locations of where the soil gas survey samples were collected. And we've color-coded these into three categories for kind of ease of interpretation. The squares in green represent a concentration of soil gas between zero and 13 parts per million. The yellow coloring indicates a methane concentration in the soil gas between 14 and 42 parts per million. And the orange squares indicate a methane concentration between 43 and 88 parts per million.

Q. In connection with your work in surface and subsurface groundwater investigations, Mr. Wheeler, that you do day in and day out, is this the sort of information that you would be interested to look at to try to determine is there a hot spot, is there something that you can visually see that may be going on?

A. Yes. I would look to see if there is a

concentrated area with elevated concentration of methane gas or if there was information that would indicate that there was a source of methane gas or a plume that was migrating from one area at high concentrations to other areas.

Q. Do you see any sort of plume or higher concentrations in one area than another?

A. No, I don't. Basically these results appear to be fairly randomly distributed throughout our study area. I might add that the Railroad Commission had requested that we do collect soil gas samples near the Butler and Teal gas wells.

THE WITNESS: And, Carla, can you zoom in on that?

A. So what we did in response to that request, we did do three transects. Here is the Butler and Teal gas wells. We did a set of three sets of soil gas surveys in transects away from the Butler and Teal gas wells. As you will note, the three samples closest to this well pad were in the lower concentration category, 13 parts per million soil gas or less. This clearly indicates to me that there is not a source of soil gas that is emanating from the Butler and Teal well pad.

MR. COONEY: What was that last word?

THE WITNESS: From the well pad. Excuse

me.

Q. (By Mr. Sims) Mr. Wheeler, based on your review of all the results of all the testing, have you reached some conclusions in connection with your work in this matter?

A. Yes, I have.

Q. And are those conclusions shown in Exhibit 98?

A. Yes, they are.

Q. What are your conclusions, sir?

A. Based on the results of our groundwater sampling and analysis investigation regarding groundwater, there are -- the groundwater is safe to drink. There were no exceedances of human health risk-based standards. Regarding natural gases, there are no unsafe concentrations of natural gases found in ambient air or in the shallow soils.

And finally, unsafe concentrations of natural gases can accumulate in the top of a water well or other structures where water treatment occurs if these structures are not properly vented. If properly vented, these conditions should not exist.

Q. Were there any of your findings or conclusions that led you to believe or that you could think that the Range pad site or the Butler and Teal wells were causing any kind of plume or subsurface groundwater

contamination based on the results that you saw?

A. No. I have seen no evidence to indicate that at all.

MR. SIMS: I wanted to make sure to check that Exhibit 98 in the examiners' books reflect or match what is shown on the chart on the screen.

EXAMINER CHANDLER: Yes.

EXAMINER MONTES: Yes.

MR. SIMS: Thank you. Pass the witness.

EXAMINER CHANDLER: Let's go off the record a second, Dave.

(BREAK.)

EXAMINER CHANDLER: Are you going to have some cross, Mr. Cooney?

MR. COONEY: I will. A little bit, yes, ma'am.

EXAMINER CHANDLER: Okay. Let's take a 15-minute break.

(BREAK.)

EXAMINER CHANDLER: Let's go back on the record. Mr. Cooney, it is your turn.

MR. COONEY: Thank you.

CROSS-EXAMINATION

BY MR. COONEY:

Q. Mr. Wheeler, nice to see you again.

A. Likewise.

Q. Turning to Exhibit No. 79, your resume or curriculum vitae. I was just wondering. Have you ever been hired by an entity that wasn't an energy-related company or a -- on behalf of the -- of an energy-related company?

A. Occasionally, yes.

Q. Okay. So you have worked for private citizens or just mostly -- have you ever worked for private citizens?

A. Very rarely.

Q. Have you ever worked from someone on the opposite side of an oil and gas company in a case where you have been hired to investigate a case?

A. Yes.

Q. Will you, please, in your own words articulate the problem that your work plan that you put together was designed to address?

A. Yes. Our work plan was designed to do a couple of things. One, to investigate whether gas activities -- drilling activities at the Butler and Teal well had -- had contributed to a degradation of water quality or contributed to natural gas in the Lipsky and Hayley water wells, and further, to expand the surrounding area as well and to identify, is there

a safety concern in that area from the drilling activities at the Butler and Teal well pads.

Q. And I notice in looking at Exhibit No. 98, that those are conclusions -- relating to health and safety. Had you written out anywhere -- and maybe I missed it, but you -- what your conclusions are related to whether gas -- oil and gas activities contributed to gas in the water well, the Hayley and Lipsky water well or the other water wells in the surrounding area?

A. No. I have -- there were other experts hired to reach those conclusions. I -- I focused -- this was a pretty large task we undertook in a pretty short time frame. I focused my investigation on pretty much the human health and safety standpoint of the investigation.

Q. So -- and I just want to have an understanding of what you bring to the table here so it is clear. You would more emphasize the health and safety side based on the situation -- based on the -- what you -- rather than the cause and effect side in terms of gas in the wells?

A. That's correct.

Q. Okay. So do you have any opinion about the source of gas in these water wells?

A. Based on my discussions with the other

experts, the most likely source of the gas in these wells is the Strawn Formation.

Q. Let's turn to Exhibit No. 84, please.

Will you, please, just tell us how -- and I apologize if you mentioned this before. But literally, what the person does when they take a soil gas sample, what does the field person do?

A. Yes. Should we pull up that picture again, would that help or should we -- you want me just to describe it.

Q. Just describe it. The picture' talking about is Exhibit 95.

A. Yes, it is.

Q. Okay. I will jump off from there. Thanks for referring me. For instance, how deep does that probe go under the ground?

A. That goes anywhere from one to three feet in the ground.

Q. And have you ever done a soil gas sample where you did find a hot spot not necessarily here but in any of your work?

A. Yes. I have been involved in a soil gas survey where we have seen high concentrations of methane in the soils.

Q. And we -- and in that situation, were you able

to come to a conclusion pretty easily about where the methane came from?

A. Yes. If I remember in that particular instance, it was determined to be a biogenic gas.

Q. I am sorry. I just don't understand how that -- so where would it have come from?

A. I think it came from organic material in the earth, was my understanding of the conclusion of that particular result.

Q. Turning to, I think, some of your air samples. I am sorry, I didn't write down what exhibit it is. It's the table that includes from where you took air samples at the -- at the 29 -- wells or the water wells in the area. And I just notice that you only took, on the Hayley Well, you only took sample from the tank storage building. Was there a reason for that, that you recall?

A. I don't recall why that was. Oh, well, you know, I think I do remember why that was. It was because, they did not have an outside faucet or spigot, the water was pumped directly into that -- into that tank storage building. So that was the first time water was exposed to the environment, and that's why we only took a sample there.

Q. As opposed to a lot of the other wells that

actually had a spigot at the wellhead or near?

A. Exactly.

Q. How many of the other wells actually had vents, if you know?

A. In talking to the -- the supervisor of the field effort, the Oujesky Well, I was told, had a vent on it. And that was one of the wells, I believe, that had high volumes of natural gas several years ago. And I don't recall her mentioning that any of the other wells had well vents. And I don't recall seeing any when I was on-site witnessing the sampling activities.

Q. Do you know when the Lipsky vent -- and I know we talked about this. But somebody brought it up earlier today. If the Lipsky vent was installed when the well was built or afterwards, after --

A. I don't know that exactly. It is my recollection that the water well driller came back out to the well at a later date and installed that vent at Mr. Lipsky's request but --

Q. And that was before or after this problem came up, if you know and --

A. I don't recall.

Q. Okay. Turning to Exhibit No. 90. In -- in the charts, is there any number anywhere that would give us a hint that the water is going to smell like

sulfur out there? I am -- and is that even a smart question?

A. No. I mean, that's certainly a reasonable question. If I had a smell to my water, I would want to know what's causing it. But I would think that you could look at the concentrations of sulfur in the water which we analyzed for and possibly sulfide, in those two constituents, I would think, might lead to an odor in the wells if they were at elevated levels.

Q. Okay. Then in turning to Exhibit No. 94. It is clear the Lipsky headspace gas number jumps out at you on that exhibit.

Did you ask Mr. Lipsky for how long the vent had been closed before you all did that testing?

A. I did not.

Q. Did he give you any indication about how often he closes it and opens it?

A. He didn't talk to me about that. He may have talked to someone else about that, but I -- I wasn't part of that conversation.

Q. And you mention, there is only one other well that had a vent out of this list; is that right?

A. According to the -- my conversation with the person that sampled -- was present on every well that was sampled, she recalled that a vent was on the

Oujesky Well, that's well No. 28 in this table and it -- I believe it had been reported to have significant amount of natural gas in the past.

Q. Where is the Oujesky Well on the map? Can we just look at that real quick or on the aerial photo?

A. My -- I would have to refer to a map.

Q. Maybe Exhibit 84.

A. Or if you could find 28, that would show that as well.

MR. SIMS: Look at 82.

A. Oujesky is one of the most wells to the north and west. It's kind of the west of the Hayley Well No. 10, so it is kind of the northwest part of this figure.

Q. Well, actually, the Hayley, Oujesky and Lipsky kind of make a triangle in the upper left-hand area of the white circle on Exhibit 82.

A. Yes, they do.

Q. Okay. Turning to Exhibit No. 96. On the soil gas sampling results. Do you have a way to tell us which sample ID numbers correspond with locations in the vicinity of Mr. Lipsky's well and the Hayley Well?

A. We had a soil gas map.

MR. SIMS: That's 84.

A. Oh, yes. They are on Exhibit 84. And --

Q. Let me get that.

A. And if I remember -- if I am looking at this correctly, it looks like numbers 112, 113, 117, maybe 114, 116, 119, usually you can spot Mr. Lipsky's house pretty obviously on aerial photograph. So I think that's the -- if -- you see that big residence on there, I believe that's the Lipsky home.

Q. The large tan kind of dashed line in the just left of center?

A. Yes. I believe that's the Lipsky house. So you can see numbers, it looks like 114, 115, 116 were done. And there was -- there is some additional samples a little to the north of that large structure that were taken around the -- closer to the water well itself, because I think the idea was to get samples between the water well and the residence to see if there was any accumulation between the water well and the home.

Q. If you did find a hot spot, what would be your next step in an investigation?

A. Well, I guess it depends on, you know, how hot of a spot you're talking about. If the hot spot indicated there was a potential safety concern then we would certainly want to look further into where that gas was coming from and what might have to be done to, you know, address that potential safety concern.

Q. But in terms of trying to find a source, what would be your next step in the field?

A. I am not sure there would be a next step in the field. I think that's why Range hired some forensic geochemist to look at the data from that sample. And I don't think we would have done anything other in the field except maybe to try to delineate that hot spot and see if we could look at the surrounding sample results and see if we could trace that back to a source.

Q. On the -- numbers for the soil gas constituents, would -- other than -- I mean, is there any place where you sampled out in the air where you would not allow smoking, assuming that you were okay with smoking?

A. Which I am not.

Q. Fair enough.

A. But you're talking about in our study area?

Q. Right. Right.

A. I would not suggest anybody light a cigarette near the top of a couple of the well heads, No. 2 and number eight, the Purdue and the Lipsky well. I wouldn't recommend having an ignition source where we found elevated levels of methane in the headspace. Otherwise, I would say, no, absolutely -- I see no

concerns at all.

And David, I might add, even where we did find the concentrations of gas elevated in the headspace, one or two feet above those -- those wells, there were no excessive levels of -- of methane. So unless you had the ignition source right at the well, kind of like Mr. Lipsky did when he lit -- tried to light the well the day we were there, put an ignition source right to the well, where the well could vent out if it was opened. I think if you moved several feet beyond that, our result showed there was no safety concern.

Q. And just because you have gas at -- at the headspace of a water well, doesn't mean that it came from -- doesn't tell you, necessarily, anything about where it came from.

A. I think that's true.

Q. Okay.

MR. COONEY: I don't have any other questions.

EXAMINER MONTES: Thank you. Any redirect.

MR. SIMS: Yes, Your Honor.

REDIRECT EXAMINATION

BY MR. SIMS:

Q. The date that the Lipsky water samples were taken and all the testing were done on this property, I believe you testified, Mr. Wheeler, that you were present for that?

A. Yes, I was.

Q. And Mr. Lipsky had his lawyers out there at the time.

A. I don't recall if Mr. Lipsky's lawyer was there or not. There was a bunch of people at the site that day. And I am not sure I met everyone. He may have been there and I didn't meet him.

Q. All right. Is it fair to say that Mr. Lipsky was not striking up conversations with you or anyone else at the pre -- in the sampling group, that he was doing his own thing?

A. During the day, we talked a little bit. He wanted to talk about the Green Bay Packer football team which was getting ready to play in a playoff game, so we talked about that awhile. But other than that, I am -- I don't recall any specific conversation we have with Mr. Lipsky.

Q. You understand that the inspection of that property was ordered by the Examiners, otherwise, we wouldn't have been able to get on there.

A. Yes. I am aware of that. We weren't allowed

onto the property until that permission was granted.

Q. These water wells, we have seen the Department of Interior document, or the USGS document, about venting the wells and that sort of thing.

Just wanted to ask you: If a well -- even if a well is not vented, if there are any leaks or any escape mechanisms for the gas to emanate out of the -- out of the wellhead, will the gas find its way out of the headspace?

A. Yes, it will. The larger the opening is, the more easily it is going to be able to vent out.

Q. If these wells are properly vented, do they create any safety or health issue at all?

A. Based on, you know, my review of the literature and safety practices at other places in the country where there has been methane gas accumulations, the answer is, no. There should not be any safety concern at all.

MR. SIMS: Pass the witness.

EXAMINER CHANDLER: Any more.

MR. COONEY: No, ma'am.

EXAMINER CHANDLER: All right.

EXAMINER MONTES: All right. Hold on just a second.

A. Okay.

CLARIFYING EXAMINATION

BY EXAMINER MONTES:

Q. I wanted to ask you a couple questions. If you could take a look at Exhibit No. 5, which I think is the EPA order. And, also, I guess I would like you to have your Exhibit 91 handy.

A. Okay. I think I can do that.

Q. You will want to pull out the order?

A. Pull this out and I will go to 91.

Q. Yeah. And I want to talk about their Finding of Fact 28.

A. Which one was that.

Q. No. 28 which is on Page 4. And I just wanted to -- give you a chance to look there. To make sure I understand what you're saying. If I look at your Table 4, you're telling me there that there are no applicable standards for TRRP PCLs, those are the drinking water standards for methane, ethane and propane.

A. Yes. That's correct.

Q. Okay. So -- so we really can't compare the figures they have given us in 28 to any drinking water standards in Finding of Fact No. 28. In other words, the -- the two parts per milligrams per liter there, 20 -- 20,100 micrograms per liter, there is no standard for us to compare that to?

A. Not for an injection of groundwater, no.
Q. Okay. Now, if I look at the benzene, toluene and hexane, I would have to look at your Table 2; is that right?
A. Correct.
Q. Just compare those to the drinking water standards, which would be under TRRP PCL?
A. Yes.
Q. Can you tell me there if -- how those compared to the standards, starting with the benzene?
A. Benzene concentration is 4.55 parts per billion.

The regulatory standard for benzene is .005 or five parts per billion. That's .005 milligrams per liter which is equivalent to five parts per billion. So it is above the level that was detected of benzene by the EPA in that sample.

EXAMINER CHANDLER: The limited is above what they detected.

A. What they detected is below the regulatory standard.
Q. (By Examiner Montes) And how about the toluene?
A. Toluene, the regulatory standard is 1,000 parts per billion. They detected 3.47 parts per

billion.

Q. So how does that compare to the -- is that above or below the limit?

A. Their detection is considerably less than the regulatory standard.

Q. Okay. And then for the last?

A. For hexane.

Q. For hexane, yeah.

A. Hexane, the regulatory standard is 1470 parts per billion. In their water sample, they detected 31 parts per billion, 31.7 parts per billion which is less than the regulatory standard.

Q. Okay. On the -- one thing that -- that strikes me on the figure they have included here for ethane, is there some nomenclature I am missing, is that 5.27 or the five comma? I realize you didn't put that in there, but is that --

MR. SIMS: Typo.

Q. Do you think it is a typo?

A. It looks like a typo. It looks like 5.27 would be my guess.

Q. How does that compare to what you all found on Attachment A to Exhibit 91?

A. Let's see. Methane. 5.27 parts per billion. On the Lipsky well?

Q. Yeah.

A. Let's see. If we go to Attachment A for the Lipsky Well, we detected 600 parts per billion ethane and they -- assuming that comma is supposed to be a period, 5.27 parts per billion.

EXAMINER MONTES: Okay. That's fine. Okay.

Is there anything further at this time on those questions that you all have?

MR. SIMS: No, sir.

MR. COONEY: No, sir.

EXAMINER CHANDLER: Okay. Now, thank you.

(Witness excused.)

MR. JACKSON: That concludes our direct case, Madam Examiner.

We have some housekeeping matters of some rather voluminous documents that are part of our investigation that we would like to have admitted into the record, and then I think you -- you mentioned that you wanted to give us some instructions on some written briefing that you would like.

EXAMINER CHANDLER: Yeah. What do we need to do about housekeeping?

MR. JACKSON: Yeah, let me do that now.

May I have just a minute to consult with Mr. Sims?

EXAMINER CHANDLER: Yeah. Let's go off the record.

(Discussion off the record.)

EXAMINER CHANDLER: Back on the record.

MR. JACKSON: If I may. We have a book that each of you has been provided that contains Exhibits 103 through 129. We are offering this as part of the record in the interest of full disclosure of all the matters that we have gathered together in Range's investigation of this matter. Generally, Exhibits 103 through 107 are test results gathered by Alisa Rich whose deposition, a portion of this deposition you saw earlier today.

Exhibits 108 and 109 are the only test results we have been able to acquire from the EPA. These were furnished to us recently through the Freedom of Information Act requests although they -- they actually may have been furnished prior to that voluntarily by the EPA not long after the word.

And then Tabs 110 -- Exhibits 110 through 129 -- excuse me -- 110 through 123 are various Range test results.

124 through 129 are additional Alisa Rich reports for test results.

And then, finally, exhibits -- Exhibit 130 is the complete deposition of water well driller, Leland Malone.

Exhibit 131 is the entire deposition of water well driller Larry Peck.

Exhibit 132 is the entire deposition of Steven Lipsky.

And Exhibit 133 is the entire deposition of Alisa Rich.

Those are in these boxes here in front of me and we will provide those to you, make sure you get a set of them, they get in the file.

And we ask that exhibits -- we offer exhibits for inclusion as part of the record, not necessarily for the matter of what's contained in them, but we offer for inclusion in the record Exhibits 103 through 133.

EXAMINER CHANDLER: All right. They are admitted as part of the record.

(Range Exhibit Nos. 103 through 133 marked.

for identification were received in evidence.)

EXAMINER CHANDLER: Done with housekeeping?

MR. JACKSON: Yes, ma'am.
EXAMINER CHANDLER: Mr. Cooney, I think you have something for us.
MR. COONEY: I do. I have one exhibit.
EXAMINER CHANDLER: All right.
MR. COONEY: And I gave a copy of this to Mr. Jackson a couple days ago, a chronology of Railroad Commission staff, primarily involvement, along with columns for EPA action and Lipsky action, just to provide a snapshot of our Staff's involvement since we received the Lipsky complaint in August of 2010. And I would like to offer that as part of the record.
EXAMINER CHANDLER: All right. It is admitted.
(Staff Exhibit No. 1 received.)
EXAMINER CHANDLER: All right. Sounds like there is no more evidentiary issues.
MR. JACKSON: Only remaining issue is what Examiner Montes referred to earlier. We do ask that the record remain open because there is a deposition on Tuesday scheduled of an EPA employee.
EXAMINER MONTES: Yeah. The record is -- will remain open.
EXAMINER CHANDLER: And I think we would like some written closing from Range and from

Mr. Cooney. I don't want anything really extensive and detailed. And I would like it to be no more than, let's say, 15 pages, it may not take five, just setting out your position more generally than specifically. And I don't know how long would you like to have that -- to file that, week, 10 days?

MR. JACKSON: Week to 10 days.

EXAMINER CHANDLER: Let's just do 10 days from, I guess, you will want the transcript in your hand.

MR. JACKSON: Yes, please. We -- we have asked for expedited service on the transcript. There is still going to be in draft form so it may be a couple days before those are finalized.

EXAMINER CHANDLER: What's 10 days from Monday.

MR. JACKSON: Be February 3rd, maybe, 4th.

EXAMINER CHANDLER: Why don't we just say they are due February 4th. And we don't need any kind of provide to each other, just one time.

Is that too long?

MR. JACKSON: No. It happens to be Mr. Sims' birthday, so we think it is very appropriate.

Let me mention one more item about

leaving the record open. It is impossible, it is entirely possible after the deposition on Tuesday, we may actually inform the Commission, here is what we found and here is what we didn't find. And we now think it is appropriate for the Commission to close the record. So I just want to mention that possibility to you. But we do intend to keep in touch with the Examiners and inform you of what transpires on Tuesday.

EXAMINER MONTES: That will be fine.

EXAMINER CHANDLER: Okay. Well, then the record is closed for today.

MR. JACKSON: Very good.

EXAMINER CHANDLER: Thank you all very much.

(Hearing adjourned.)