

BEFORE THE DEPARTMENT OF WATER RESOURCES
OF THE STATE OF IDAHO

IN THE MATTER OF APPLICATIONS TO)
APPROPRIATE WATER NO. 63-32573 IN)
THE NAME OF THE M-3 EAGLE,) VOLUME IV
_____) Pages 740-953

BEFORE

HEARING OFFICER: GARY SPACKMAN

Date: April 23, 2009, 9:20 A.M.

Location: Idaho Department of Water Resources
322 E. Front Street
Boise, Idaho

REPORTED BY:

COLLEEN P. KLINE, CSR No. 345

Notary Public

Page 742

1 APPEARANCES:
 2 For M3 Eagle, LLC:
 3 Givens Pursley, LLP
 4 BY MR. JEFFREY C. FEREDAY
 5 BY MR. MICHAEL P. LAWRENCE
 6 601 W. Bannock Street
 7 P.O. Box 2720
 8 Boise, Idaho 83701-2720
 9 For North Ada County Groundwater User
 10 Association:
 11 BY MR. JOHN THORNTON
 12 5264 North Sky High Lane
 13 Eagle, Idaho 83616
 14 For Eagle Pines Water Users Association and
 15 Individually:
 16 BY MR. ALAN SMITH
 17 3135 Osprey Road
 18 Eagle, Idaho 83616
 19 Appearing Individually:
 20 BY MR. NORMAN L. EDWARDS
 21 884 W. Beacon Light Road
 22 Eagle, Idaho 83616
 23
 24
 25

Page 743

1 APPEARANCES (Continued):
 2 Also Present:
 3 Jerry Peterson
 4 Jason Smith
 5 David Head
 6 Vicky Music
 7
 8
 9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25

Page 744

1 INDEX
 2 M3 EAGLE WITNESSES
 3 TESTIMONY OF SEAN VINCENT PAGE
 4 Direct Examination (Continued) by 747
 5 Mr. Fereday
 6 Cross-Examination by Mr. Smith 750
 7 Redirect Examination by Mr. Fereday 762
 8 Recross-Examination by Mr. Smith 774
 9
 10 TESTIMONY OF EDWARD SQUIRES PAGE
 11 Direct Examination by Mr. Fereday 775
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25

Page 745

1 INDEX (Continued)
 2 EXHIBITS
 3 DESCRIPTION MARKED ADMITTED
 4 70 874 877
 5
 6
 7
 8
 9
 10
 11
 12
 13
 14
 15
 16
 17
 18
 19
 20
 21
 22
 23
 24
 25

1 THE HEARING OFFICER: Okay. We're
2 recording now. The date is April 23rd, 2009, the
3 hour is about 9:20 a.m. in the morning.

4 And we discussed some preliminary
5 matters in the procedure. I appreciate the help
6 of the parties, and I think what we discussed
7 will help us in efficiently moving through the
8 presentation of testimony.

9 Mr. Vincent is in the witness chair.
10 Mr. Fereday, you finished your examination of
11 Mr. Vincent, as I recall.

12 MR. FEREDAY: Yes, I have, Mr. Hearing
13 Officer. And I understand from what Mr. Thornton
14 has said, that Mr. Vincent now will be leaving
15 the stand to return at some later date for
16 questioning by both sides.

17 However, before we started today,
18 Mr. Vincent mentioned to me that there was an
19 element in his testimony yesterday, that he went
20 back and checked on, based on his own files, and
21 that he would like to, if given an opportunity,
22 clarify that single point.

23 And just out of courtesy to him, I
24 would like to inquire as to -- as to that, just
25 so that he feels that he has made a complete

1 statement from -- as far as we did get yesterday.

2 And I recognize we didn't get all the
3 way through his points, but that's something that
4 can wait until later. But I would like to ask
5 him that question.

6 THE HEARING OFFICER: Okay. Sure.

7 DIRECT EXAMINATION (Continued)

8 QUESTIONS BY MR. FEREDAY:

9 Q. Mr. Vincent, you mentioned to me this
10 morning prior to the start of the hearing, that
11 there was an activity that you were engaged in up
12 near the locomotive shop, I believe, in southeast
13 Boise, that may have involved some type of an
14 aquifer test. Do you recall that?

15 A. Yes.

16 Q. Could you explain to the Hearing
17 Officer what you would like to clarify?

18 A. Yes, I believe I testified that I had
19 done some static water level monitoring, and then
20 perhaps also been involved in an aquifer test,
21 but I couldn't recall exactly what the nature of
22 that was, that analysis.

23 And as it turns out, it was one single
24 analysis. It was an evaluation of hydraulic
25 communication between shallow aquifer of the

1 Boise terrace deposit, and the deeper regional
2 aquifer system. And our part was monitoring
3 water levels in the shallow alluvial aquifer
4 system, following pump shut off of a deep
5 regional aquifer system well that was operated by
6 United Water Idaho. And so we just looked for
7 the possible hydraulic communication there.

8 So it was actually, sort of, a recovery
9 test. It wasn't -- it was neither a static water
10 level, or what I would consider standard constant
11 rate aquifer test. But it did involve monitoring
12 water level response to the cessation of pumping.
13 So I just wanted to clarify that point.

14 Q. Okay. I appreciate you clarifying that
15 about your experience. Thank you.

16 A. Thank you for the opportunity.

17 THE HEARING OFFICER: All right.
18 Mr. Fereday has finished his direct examination.

19 Now, Mr. Thornton and we'll work with
20 the other protestants, you may cross-examine
21 Mr. Vincent. Mr. Thornton.

22 MR. THORNTON: What the North Ada
23 County Ground Water Users Association would like
24 to do is hold our questioning, as long as we're
25 assured that we will be able to recall him in the

1 interest of being more efficient through the
2 matters here.

3 THE HEARING OFFICER: Okay. And based
4 on my representations prior to going on the
5 record, I've agreed that when Mr. Vincent
6 narrates his testimony, and discusses the staff
7 memo, and their response to the technical
8 information provided, that both sides will have
9 full latitude to question Mr. Vincent on all
10 matters, both when he discusses and those matters
11 that have been the subject of Mr. Fereday's
12 examination. Okay.

13 MR. THORNTON: And So we'll postpone
14 our cross-examination until later.

15 THE HEARING OFFICER: Okay.

16 THE WITNESS: And I might ask if
17 Mr. Owsley might be afforded an opportunity to
18 speak at that time as well, because there are
19 some issues that he's more familiar with that he
20 would be able to address?

21 THE HEARING OFFICER: I am making
22 Mr. Vincent, Mr. Owsley, and Mr. McVay, because I
23 think they were also subject to some of this
24 discussion.

25 MR. FEREDAY: Right.

1 THE HEARING OFFICER: I am inviting
2 them, hopefully to be able to -- well, I need to
3 make them available.
4 THE WITNESS: Okay.
5 THE HEARING OFFICER: Because they have
6 either written portions of, or all of the staff
7 responses. So they should be available for
8 questioning.
9 MR. FEREDAY: That's our understanding,
10 too, Mr. Hearing Officer.
11 THE HEARING OFFICER: Okay. Mr. Smith,
12 do you want to examine Mr. Vincent at the present
13 time?
14 MR. SMITH: I do have just a very few
15 questions.
16 THE HEARING OFFICER: Okay.
17 CROSS-EXAMINATION
18 QUESTIONS BY MR. SMITH:
19 Q. Mr. Vincent, good morning.
20 A. Good morning.
21 Q. You are, of course, still under oath.
22 I'm not very knowledgeable about
23 hydraulic matters, or geological matters, or for
24 that matter, women, or apparently, wrestling. I
25 do think I recall from grade school what a head

1 lock was.
2 But you mentioned that anything
3 limiting the hydraulic connection is of concern
4 to you in determining the sustainability of an
5 aquifer. Could there be other factors limiting
6 that hydraulic connection, besides just faults?
7 A. Yes, there could. The depositional
8 environment is complicated in the Boise basin.
9 And the sediments are not always laterally
10 continuous. There is an overall gradation from
11 east to west that goes through several different
12 depositional environments that's described well
13 in the 1992 report that was authored by
14 Mr. Squires, Dr. Wood, and Mr. Osiensky. And it
15 talks about those different depositional
16 environments.
17 And there are, for example, there is a
18 major angular unconformity, which is a geologic
19 term that refers to the fact that the deposits
20 are abutted with deposits of a different time at
21 that unconformity, and that can cause a different
22 sort of barrier to flow. And then there is
23 gradational changes that occur in these
24 environments.
25 So the answer to your question is, yes.

1 THE HEARING OFFICER: Mr. Lawrence,
2 could I get you to turn this projector off until
3 we're ready to use it? It's a little difficult
4 to hear the dialog.
5 (Mr. Lawrence complying.)
6 THE HEARING OFFICER: Thank you.
7 Q. (BY MR. SMITH) Do you know why the
8 seismic survey and the magnetometer test -- is
9 it -- why those were done? I think you said,
10 they were trying to figure out what was going on?
11 MR. FEREDAY: Objection. I believe the
12 question assumes -- asks him for an opinion based
13 on the knowledge of others. But I guess if he
14 knows, he can go ahead and answer.
15 THE HEARING OFFICER: Overruled.
16 Q. (BY MR. SMITH) Well, if you know why
17 the seismic and magnetometer tests were done?
18 A. I believe the magnetometer survey was
19 intended to characterize the deeper bedrock
20 system, or at least, that's what it can only
21 directly infer.
22 The seismic survey, according to the
23 report that was offered, the target of that was
24 the shallow subsurface less than a thousand feet.
25 In addition to faulting, and I -- it's not

1 specific as to what depth that might -- that
2 might occur at. That's my recollection.
3 Q. Do you -- do you know why the seismic
4 test was so inconclusive?
5 A. As I testified yesterday, it's
6 sometimes difficult. And I am not a seismic
7 expert by any means, but it's sometimes difficult
8 to get interpretable responses to a seismic
9 source when the source is not large enough. And
10 it's a function in large part of what kind of
11 subsurface materials are present.
12 Q. All right. You started to refer to
13 Exhibit 12, Figure 86, page 225 when Counsel
14 interrupted your answer. Do you want to turn to
15 that and finish your answer? It's Exhibit 12,
16 Figure 86, page 225, I believe, you said.
17 A. (Witness complying.) I don't recall
18 the context of the question from yesterday.
19 Q. Do you recall what you were trying to
20 refer to there?
21 A. Yeah. There is a notation there that
22 the -- that the analytical solution which
23 provided the best fit to the observed data was
24 a -- based on the assumption that there is a no
25 flow boundary, i.e., a fault located 1,500 feet

1 from the pumping well. This is an aquifer test
2 plot for the Kling irrigation well.

3 Q. Was it the Kling well, the pumping
4 well?

5 A. Yes, the Kling irrigation well was the
6 pumping well for this test.

7 Q. And could you explain to us what a no
8 flow boundary is, and how it occurs?

9 A. When an aquifer is pumped, the water
10 level in the aquifer responds by forming a cone
11 of depression, a cone-shaped depression in the
12 potentiometric surface. And with time
13 that -- that cone of depression expands until
14 such time as sufficient recharge is made
15 available within the cone to balance the amount
16 of water that's being pulled from the aquifer.

17 Sometimes as the cone propagates
18 outward, it will encounter a barrier to flow. In
19 this case, it's a no flow boundary that was
20 assumed. And it was assumed to be -- it says in
21 parentheses, a fault.

22 So, apparently, the analysts felt that
23 the best solution for the observed data was based
24 upon their being this -- this barrier to flow at
25 a distance of 1,500 feet from the pumping well.

1 Q. Okay. Do you know who made that
2 notation?

3 A. This is a report done by Hydro Logic,
4 Inc. I don't know who specifically made that
5 notation.

6 Q. Okay. Counsel asked you yesterday
7 whether your comments had been this extensive on
8 any other water applications. Is this the most
9 complex and largest water application you've ever
10 commented on, if you recall?

11 A. Application -- it is the largest
12 application, yes.

13 Q. Going back to that no flow boundary.
14 Would it be your opinion that there is a no flow
15 boundary in what's been called the panhandle of
16 M3?

17 A. I would reiterate what we said in the
18 staff memorandum, that there is some indication
19 that that may be occurring, but I think the data
20 are inconclusive.

21 Q. All right. You were asked, whether a
22 northwest flow to the Payette really made any
23 difference, by Mr. Fereday. Why does it make
24 such a difference to M3?

25 MR. FEREDAY: Objection. It assumes

1 facts not in evidence, and opinions of those not
2 before the Hearing Officer.

3 THE HEARING OFFICER: Sustained.

4 Q. (BY MR. SMITH) Let's go to the
5 ancestral water. I believe you stated how long
6 that water had been in the ground. Could it
7 could be thousands to ten thousands of years?

8 MR. FEREDAY: Objection. I don't
9 believe Mr. Vincent made that statement --

10 MR. SMITH: All right.

11 MR. FEREDAY: -- with regard to those
12 numbers of years. So just a question about
13 mischaracterizing his testimony.

14 MR. SMITH: I'll rephrase the question.

15 Q. (BY MR. SMITH) How long, in your
16 opinion, has that water been in the ground, if
17 you know?

18 A. I don't know. What I said was that, it
19 was Hydro Logic's determination, based on their
20 geochemical evaluation, that the water was old,
21 specifically that it was sourced from the
22 geologically ancestral Boise River. And that I
23 don't know exactly how old that might be.

24 Q. Would you agree with Glanzman and
25 Squires, that the PGSA ground water originated

1 almost exclusively from ancestral Boise surface
2 water?

3 A. I'm -- I'm not a geochemist, and so
4 that's a difficult thing for me to assess. I
5 don't know, and I guess that's why the Department
6 would like to get some clarification with regard
7 to that matter, and why we were thinking that it
8 might be worthwhile to do some further study.

9 Q. But you are aware of Glanzman and
10 Squires' conclusion about that --

11 A. Yes.

12 Q. -- about the ancestral water?

13 If you had a very strong
14 recharge -- asking you a hypothetical question
15 here. If you had a very strong recharge with a
16 PGSA -- or into the PGSA, I should say -- could
17 that ground water retain it's almost exclusive
18 ancestral qualities, if you know?

19 A. I -- I can imagine a scenario where it
20 would. I could imagine a scenario where it is
21 readily recharged provided there is impetus for
22 the recharge. If it was in a dead-end portion of
23 the aquifer, and it basically took on all the
24 water that it could, then it could be old. And
25 after pumping, then a new source of water might

Page 758

1 be induced to flow towards the location of the
2 pumping.
3 What I was trying to point out
4 was that -- and I think this is the main focus of
5 our review, is that there is an inconsistency
6 here between the numerical model and that
7 finding. Because the numerical model doesn't
8 require that there be pumping to induce flow
9 towards M3. The water just flows whether or not
10 there is pumping from the recharge source to the
11 discharge area.
12 Q. All right. Let's go to another
13 hypothetical question. Assuming, as an expert,
14 that the transmissivity is substantial as the
15 applicant asserts, wouldn't that ancestral nature
16 of the PGSA be nowhere near exclusive?
17 A. Could you restate the question?
18 Q. Okay. Well, assuming as an expert,
19 that the transmissivity is substantial, wouldn't
20 the ancestral nature of the water be nowhere near
21 the exclusive ancestral nature that Glanzman and
22 Squires found, is what I'm trying to get at?
23 A. I haven't claimed to be an expert, but
24 I would say that -- that -- that there is an
25 inconsistency. I would reiterate that.

Page 759

1 Q. Okay. Would not a strong recharge and
2 a high transmissivity over all of these years,
3 severely have diluted the ancestral water, if you
4 know?
5 A. Perhaps. There are -- there are
6 locations where -- for example, the Goddard No. 2
7 well, which is in the PGSA, where the -- it's
8 been pumping for a long period of time. I seem
9 to recall, it's been pumping for ten or more
10 years. And one would expect after pumping for
11 such a period of time that perhaps, you know,
12 there would be recharge that had been induced
13 from above or from other recharge sources, and
14 that perhaps, that would start to dilute the
15 water chemistry there.
16 But what we find instead is that, you
17 know, the age of the water is still, I believe,
18 on the order of 3,000 years old is what was
19 indicated by Hydro Logic in their response to our
20 staff memorandum.
21 Q. Okay. Let me ask you as an expert. Is
22 it at all possible that this recharge water,
23 transmissivity through the -- through the
24 aquifer, never commingles with the ancestral
25 water, and changes the nature of it?

Page 760

1 A. It seems that we're -- you are asking a
2 variation of the same question, I think I've
3 already answered. There is an inconsistency
4 that, you know, I'm -- that it hasn't been
5 explained to us to my satisfaction what's going
6 on with the -- with that discrepancy.
7 Q. Why did you and Mr. Owsley conclude
8 that an isotopic study would tell us more about
9 the ancestral nature of this ground water, and
10 also the strength of recharge?
11 A. I -- again, I'm not a -- I'm not a
12 geochemist. But what little I know of it, we
13 were thinking that isotopic study might be a
14 better way of actually estimating the age of the
15 ground water in the PGSA as compared to the major
16 ion chemistry analysis that was performed by
17 Glanzman and Squires.
18 Q. All right. Do you know when the U.S.
19 Geological Service is intending to do this study?
20 A. As soon as we can get a contract in
21 place with the geological survey. We have a
22 proposal. We don't yet have a contract. That
23 could happen, hopefully, this field season.
24 Q. All right. And the Cosgrove study,
25 when will that one be completed?

Page 761

1 A. We do have a contract in place for
2 that, I believe, and it's scheduled to be
3 finished by the end of the year, I believe, as I
4 recall by the end of this year.
5 Q. Is that study the comprehensive aquifer
6 management program that you mentioned?
7 A. That is one of the studies that would
8 be undertaken as part of that program, and funded
9 with monies from that appropriation.
10 Q. All right. Do you have an opinion
11 about approving any water rights before those
12 studies are done?
13 A. I don't.
14 Q. Well, I don't want to get you into
15 politics.
16 A. I'm -- I'm comfortable with the
17 question. I don't concern myself with whether a
18 water right should or shouldn't be approved. I
19 generally just focus on my charge, which as I
20 explained yesterday, was to respond to the
21 request for staff memorandum. And I keep a
22 fairly narrow scope within that -- within those
23 boundaries, so...
24 MR. SMITH: All right. Thank you. I
25 believe that's all.

1 THE HEARING OFFICER: Mr. Edwards?
 2 MR. EDWARDS: I have no questions.
 3 THE HEARING OFFICER: Redirect,
 4 Mr. Fereday?

5 REDIRECT EXAMINATION
 6 QUESTIONS BY MR. FEREDAY:

7 Q. Mr. Vincent, with regard to the 1992
 8 report that you referred to that was authored by
 9 Squires, Wood and Osiensky, could you please
 10 remind us which exhibit that was? Was that
 11 Exhibit 67?

12 A. That's correct.

13 Q. Do you know what the study area was for
 14 that Exhibit 67 report?

15 A. It's entitled, "Hydrogeologic Framework
 16 of the Boise Aquifer System, Ada County, Idaho."
 17 I don't know the exact area. It is east of M3
 18 property, probably south and east. I would
 19 imagine that M3 is outside the study area.

20 But I'm looking sort of at a macro
 21 scale here in terms of the different depositional
 22 environments that might be present in the Western
 23 Snake Plain, and this sort of explains that. And
 24 I guess, I would also point out, that this is
 25 within certainly the M3 numerical model domain.

1 MR. SMITH: Is -- are you going to tie
 2 this into my limited questions, Counsel, or are
 3 we going far afield here?

4 MR. FEREDAY: Counsel, Mr. Smith asked
 5 a question specifically about this, and
 6 Mr. Vincent responded to. It would -- naming the
 7 report itself. I believe that I can inquire into
 8 Mr. Vincent's knowledge about that report.

9 THE HEARING OFFICER: Okay. Is there
 10 an objection, Mr. Smith?

11 MR. SMITH: Pardon?

12 THE HEARING OFFICER: Is there an
 13 objection?

14 MR. SMITH: Yes, I'll let the
 15 Department rule on it.

16 THE HEARING OFFICER: Okay. Overruled.

17 Q. (BY MR. FEREDAY) Mr. Vincent, do you
 18 know whether the wells that penetrate aquifers
 19 evaluated by the 1992 report, are wells into the
 20 Pierce Gulch Sand Aquifer?

21 A. I don't know which ones are
 22 specifically completed in the Pierce Gulch Sand
 23 Aquifer and which ones are not. I do know the
 24 Goddard No. 2 well was identified by Hydro Logic,
 25 in the response to our staff memorandum, as

1 producing water in the Pierce Gulch Sand Aquifer.

2 Q. We can talk about the Goddard well in a
 3 minute. But my question really is, the extent to
 4 which you can tell us your knowledge about that
 5 1992 report, and what part of the Treasure Valley
 6 aquifer system it covered?

7 A. Can you make a more specific question,
 8 please?

9 Q. Did it -- did it cover the Pierce Gulch
 10 Sand Aquifer as that aquifer has been discussed
 11 in this hearing?

12 A. I don't know that it was specifically
 13 identified in the report. I don't -- I don't
 14 recall.

15 Q. When was the last time you read that
 16 report, Mr. Vincent?

17 A. I've read it, or parts of it within the
 18 last month.

19 Q. Had you read it prior to that?

20 A. I had.

21 Q. When was that?

22 A. I'm not sure when I came to have a copy
 23 of the report. It seems to me that I had a copy
 24 of the report and had read it when I came to work
 25 with the Department in 2005. And so -- because I

1 recall putting it on my bookshelf. And I don't
 2 remember when I -- when I would have read it.

3 Q. Okay. With regard to your comments
 4 about the seismic and magnetometer surveys, is it
 5 accurate to characterize your testimony as
 6 follows: That you recognize that a magnetometer
 7 survey cannot evaluate effectively faulting or
 8 other similar characteristics in sediments, and
 9 that magnetometer evaluation is almost
 10 exclusively worthwhile for evaluating deep
 11 bedrock features?

12 A. That's my understanding.

13 Q. And you don't know, do you, why M3
 14 would conduct a magnetometer survey, or were you
 15 told?

16 A. Beyond the stated purpose, and I don't
 17 recall what that might be, in the report for the
 18 magnetometer survey, I don't specifically know
 19 why they may have done that.

20 Q. Just so I'm clear on your testimony on
 21 seismic. You have testified that you are not an
 22 expert in seismic, but you did indicate that you
 23 know a few things about it, I take it. Would
 24 that be -- would that be a proper
 25 characterization?

1 A. I'm familiar with the technology.
 2 Q. And you recognize, do you not, that
 3 depending on the size and nature of the source
 4 used to induce a seismic perturbation in the
 5 geologic section, you may or may not get anything
 6 out of a given seismic exercise; correct?
 7 A. Correct.
 8 Q. For example, if the source you use
 9 doesn't thump the ground hard enough, to put it
 10 simply, it may be that you aren't going to get
 11 anything out of that seismic despite your best
 12 efforts; correct?
 13 A. Any meaningful, interpretable results,
 14 that's correct.
 15 Q. Do you know what kind of seismic source
 16 the Department is intending to use if it does its
 17 own seismic studies in this area?
 18 A. It's a truck-mounted source. It's
 19 referred to as a vibroseis.
 20 Q. And do you know how it works?
 21 A. I've never seen a vibroseis. So
 22 I'm -- I'm not sure on that point.
 23 Q. Okay. Mr. Smith asked you about
 24 impedances to ground water flow in aquifers. Do
 25 you recall that?

1 record.
 2 (Discussion held off the record.)
 3 THE HEARING OFFICER: Let's take ten
 4 minutes.
 5 (A recess was had.)
 6 THE HEARING OFFICER: We're recording,
 7 again.
 8 And I think there was a question
 9 pending before Mr. Vincent needed to do some
 10 reading, referring to the particular exhibit.
 11 So do you know the question that's in
 12 front of you, Mr. Vincent, or do you want to
 13 restate it, Mr. Fereday?
 14 Q. (BY MR. FEREDAY) I had asked
 15 Mr. Vincent about his use of the term
 16 "geologically ancestral," perhaps as opposed to
 17 "ancestral." And I had just asked him where in
 18 the Glanzman, Squires report that appeared.
 19 A. In the first sentence of the third
 20 paragraph on page 5 of the Glanzman report. It
 21 states, "In summary, the acquiesce geochemistry
 22 analytical results indicate that the PGSA is a
 23 distinct regional aquifer containing ground water
 24 originating from the geologically ancestral Boise
 25 River."

1 A. Yes.
 2 Q. You described other geologic conditions
 3 that can cause such impedances to flow. And I'm
 4 wondering whether you have any evidence that any
 5 such of those geologic features exist on the M3
 6 property?
 7 A. Nothing definitive.
 8 Q. With regard to your comments in
 9 response to Mr. Smith about age dating of water,
 10 can you refer us to where Hydro Logic described
 11 the PGSA water as geologically ancestral as
 12 opposed to just ancestral? And if you can, how
 13 does the difference between the two terms impress
 14 you?
 15 A. I'd have to look at the document. I
 16 don't know what exhibit that is?
 17 THE HEARING OFFICER: Exhibit 43.
 18 Q. (BY MR. FEREDAY) That would be Exhibit
 19 43, the Glanzman, Squires report.
 20 A. I'm going to need a minute.
 21 Q. Okay.
 22 MR. FEREDAY: Mr. Hearing Officer,
 23 perhaps, we could just go off the record for a
 24 moment while he reviews that?
 25 THE HEARING OFFICER: Let's go off the

1 Q. Okay. What does the term "ancestral"
 2 mean to you?
 3 A. It depends on context. Ancestral to
 4 you and I, might mean our fathers and
 5 grandfathers. And when we're talking about river
 6 systems and geologic systems, it's a much
 7 different time scale.
 8 That's why I think that the use of the
 9 word "geologically" and "ancestral" both in the
 10 context of a river system, really implies a quite
 11 long time frame.
 12 Q. Perhaps as long as 2,000, 3,000, 4,000
 13 years in this context?
 14 A. Again, I don't know specifically how
 15 old that might be. But certainly at least
 16 thousands of years, if not, perhaps orders of
 17 magnitude more. It's a -- it's a time span that
 18 is significant but undefined.
 19 Q. Did you ever ask Hydro Logic what it
 20 means by the term "ancestral" or "geologically
 21 ancestral"?
 22 A. No, I did not.
 23 Q. Do you know what type of isotope study
 24 would be necessary to age date water?
 25 A. I don't. You -- I think you asked me

1 that yesterday.
 2 Q. And you also, I take it, don't know
 3 what type of isotope study the USGS tends to
 4 carry out?
 5 A. I regret that I didn't take the
 6 opportunity last night to read their proposal.
 7 Q. And I take it then, you don't know the
 8 accuracy limits of isotopic age dating studies?
 9 A. No. And I guess in my mind, I'm -- I'm
 10 focused on the information that was presented in
 11 support of the application. And it wasn't my
 12 determination that the water was geologically
 13 ancestral in age. That was the determination
 14 made by Glanzman and Squires.
 15 Q. Is it your testimony that the
 16 inconsistency that you spoke of in response to
 17 Mr. Smith is an inconsistency between travel time
 18 in the aquifer and an assumed age of that water?
 19 A. It's an inconsistency between the
 20 numerical model, which was used to predict
 21 hydrologic impacts, and this finding. They are
 22 incompatible, seemingly.
 23 Q. Is that based on travel times in the
 24 aquifer as compared to age dating of water?
 25 A. That's based on travel times that can

1 readily be calculated using the input parameters
 2 that were used with the M3 numerical model, yes.
 3 Q. With regard to your comments in
 4 response to Mr. Smith about the Goddard well, you
 5 recognize, do you not, that the Goddard well is a
 6 high production well owned by United Water Idaho?
 7 A. Yes.
 8 Q. And is it your testimony that the
 9 Goddard well is showing the effects of a no flow
 10 boundary in its hydrograph?
 11 A. Again, there is a figure in the 1992
 12 report by Squires, Wood and Osiensky that
 13 indicates that very thing. And, in fact, on the
 14 figure, it's identified that there is a negative
 15 hydrologic boundary.
 16 Now, what that boundary is, as I
 17 mentioned yesterday in my testimony, it is not
 18 determined. There are five options identified on
 19 the figure.
 20 Q. Do you know whether the Goddard well
 21 has suffered any loss of productivity over time
 22 due to any boundary?
 23 A. I don't.
 24 Q. Okay. With regard to Mr. Smith's
 25 questions about recharge to the aquifer from the

1 Boise River area, have you considered in your
 2 evaluation, the question of hydrodynamic
 3 dispersion of water of one chemistry as a plume
 4 into water of another?
 5 A. The statement that's made on page 4 --
 6 Q. Well, first, if you could just answer
 7 my question. I'm wondering if you've done any
 8 study on hydrodynamic dispersion?
 9 A. No.
 10 Q. Go ahead and explain.
 11 A. Well, mixing certainly is a
 12 possibility. But the statement on page 4 of the
 13 Glanzman, Squires report says that -- and I
 14 quote, "PGSA ground water originated almost
 15 exclusively from ancestral Boise River surface
 16 water." That's in the third paragraph.
 17 So it wouldn't appear using -- based on
 18 the terminology "almost exclusively," that there
 19 has been a lot of mixing.
 20 Q. I think you testified yesterday,
 21 though, that water of a younger age, or from a
 22 different source can provide head to an aquifer
 23 if it seeps to that aquifer; correct, even though
 24 it doesn't mix?
 25 A. Yeah. I'm not sure what your question

1 is.
 2 Q. Is it just a question about recharge
 3 and head? Recharge provides head; does it not?
 4 A. Sure.
 5 Q. As well as actual water molecules that
 6 eventually move into that aquifer; correct?
 7 A. True.
 8 Q. Now, with regard to age dating of
 9 water, the age of water in an aquifer does not in
 10 itself have any bearing on the amount of water in
 11 the aquifer; does it?
 12 A. No.
 13 Q. And the age of the water also does not
 14 have any effect on the transmissivity of the
 15 aquifer; does it?
 16 A. No.
 17 MR. FEREDAY: No further questions.
 18 THE HEARING OFFICER: Okay.
 19 Mr. Thornton?
 20 MR. THORNTON: No. We'll be holding
 21 our questions.
 22 THE HEARING OFFICER: Okay. Mr. Smith,
 23 further questions?
 24 MR. SMITH: Mr. Vincent, I just have a
 25 couple here.

1 RE-CROSS-EXAMINATION
 2 QUESTIONS BY MR. SMITH:
 3 Q. Aren't we splitting hairs here between
 4 ancestral and geologically ancestral, and what it
 5 means?
 6 A. Again, these terms have meaning in
 7 context. And the context is the Boise River.
 8 And in combination, the terms "geologically
 9 ancestral," I think it's fairly clear that
 10 it's -- I -- it's a long time ago.
 11 Q. Would you say, ancient?
 12 A. I have no comment.
 13 Q. What do the terms "almost exclusively"
 14 mean to you?
 15 A. Just what they say.
 16 Q. I agree to anyone with commonsense.
 17 MR. SMITH: That's all I have.
 18 THE HEARING OFFICER: Okay. Thank you,
 19 Mr. Vincent. And as I mentioned before, you are
 20 subject to recall.
 21 (Witness excused.)
 22 THE HEARING OFFICER: The next witness,
 23 Mr. Fereday.
 24 MR. FEREDAY: We call Mr. Ed Squires.
 25 THE HEARING OFFICER: Mr. Squires, if

1 Exhibit 32 A, accurately describe the studies
 2 that you've done in this matter? And
 3 I'd -- we'll be talking about them. But I would
 4 just like you to verify that that is an accurate
 5 description?
 6 A. Yes.
 7 Q. Mr. Squires, could you describe your
 8 educational background, please?
 9 A. I have a bachelor's of science in
 10 geology from Boise State University, and I have a
 11 master's of science from Boise State University,
 12 as well.
 13 Q. And when were those awarded?
 14 A. In 1990 and 1992 respectively.
 15 Q. What was your master's thesis on?
 16 A. The hydrogeologic framework of the
 17 Boise aquifer system.
 18 Q. Was Exhibit 67, that's been discussed
 19 in this hearing already, essentially, your
 20 master's thesis?
 21 A. Yes, it was.
 22 Q. And what area of the aquifer regime did
 23 your master's thesis, Exhibit 67, cover?
 24 A. It was essentially on the west
 25 Cloverdale Road, and on the east, I would say,

1 you'll come forward, please.
 2 EDWARD SQUIRES,
 3 first duly sworn to tell the truth relating to
 4 said cause, testified as follows:
 5 DIRECT EXAMINATION
 6 QUESTIONS BY MR. FEREDAY:
 7 Q. Please state your name and give your
 8 business address.
 9 A. Edward Squires, 1002 West Franklin
 10 Street, Boise, Idaho.
 11 Q. And where are you employed,
 12 Mr. Squires?
 13 A. I'm an employee of Hydro Logic,
 14 Incorporated, a small geological consulting firm
 15 in -- here in Boise.
 16 Q. You say you are an employee. Are you
 17 also a principal in that company?
 18 A. Yes.
 19 Q. And what is that position?
 20 A. I'm the president.
 21 Q. You can speak up a little bit.
 22 MR. SMITH: What was your answer?
 23 THE WITNESS: I'm the president of that
 24 company, sir.
 25 Q. (BY MR. FEREDAY) Does your narrative,

1 Barber Dam, perhaps a little bit farther to the
 2 east. On the north, the Boise foothills. And on
 3 the south, I would say, the State Penitentiary,
 4 Ten Mile Ridge.
 5 Q. Did that master's thesis evaluate the
 6 North Ada geologic setting that has been the
 7 subject of this hearing so far?
 8 A. No.
 9 Q. What experience do you have with
 10 Treasure Valley geology, Mr. Squires?
 11 A. I've been studying it for somewhere
 12 around 20 years, a little over 20 years.
 13 Q. Could you describe some of what those
 14 studies have involved?
 15 A. Well, I was very fortunate to fall in
 16 with Spencer Wood and Will Burnham early in my
 17 career, and I spent a lot of time visiting
 18 outcrops, and looking at geology in the Boise
 19 area.
 20 Q. Who is Mr. Burnham?
 21 A. The late Will Burnham is one of the
 22 leading authorities on the Boise area geology,
 23 the hydrogeology; especially, the hydrogeology.
 24 Q. Where was he employed?
 25 A. He was a long-term employee of the

1 USGS, at various locations throughout his career.
2 And he then became a principal with Anderson &
3 Kelly, the consulting firm, which was kind of the
4 original hydrogeologic consulting firm in this
5 area. He worked for them for a number of years
6 before he retired. And then he and I formed a
7 very close relationship.

8 Q. A close professional relationship?

9 A. Yes.

10 Q. Could you describe what kinds of work
11 you did in evaluating the Boise area geology with
12 Mr. Wood, Mr. Burnham, or others?

13 A. Well, Spencer Wood, in my opinion, is
14 the preeminent researcher of the geology of the
15 Boise foothills. And I think that he is -- he
16 has worked really hard for a long time to
17 characterize that and map it geologically.

18 And my -- my charge, if you would say
19 that, was to try and take that geology into the
20 subsurface. Because what is present along the
21 edge of the basin should give some clues as to
22 what we have underneath us. So I've spent my
23 time trying to study the subsurface --

24 Q. When you say taking --

25 A. -- and the --

1 number of wells, done aquifer tests on wells,
2 re-analyzed previously done aquifer tests.

3 We have looked at geology, surface
4 geology, that is. We have done a lot of -- many
5 numerous field trips along the Boise front,
6 looking at the geology, and speculating about its
7 existence in the subsurface. We have --

8 Q. And, Mr. Squires, with regard to your
9 personal experience, even prior to M -- your work
10 for M3, what kinds of studies have you carried
11 out?

12 A. Well, when I was with United Water
13 Idaho, I was the head of the geoscience
14 department there for about six years. United
15 Water Idaho was entering into the Eagle area at
16 that time. And I did some ground water
17 development potential evaluations for them.

18 I've designed many of the wells, and
19 tested many of the wells in the Eagle area,
20 including most of the test wells that have been
21 discussed for this -- in this proceeding.

22 Q. Could you describe which of those wells
23 that you have personal involvement with?

24 A. I'll try to remember them. The State
25 Street test well, exploratory test well, now

1 Q. Excuse me. When you say, taking that
2 into the subsurface, do you mean looking at the
3 hydrological characteristics of the subsurface?

4 A. Yes, and the geological aspects to the
5 continuation of the units that we see and map in
6 the foothills down as it goes into the basin.

7 Q. Now, does Dr. Wood also have experience
8 that you have worked with in terms of evaluating
9 the subsurface?

10 A. Yes.

11 Q. So what studies have you personally
12 carried out with regard to the Boise, Eagle area
13 geology?

14 A. Do you want me to recount from a list
15 or --

16 Q. Well, why don't you just give us an
17 idea. You don't need to be exhaustive.

18 A. Okay.

19 Q. But give the Hearing Officer an
20 indication of what you've done in this area.

21 A. Well, we've measured a lot of water
22 levels in wells. We've done a significant amount
23 of exploratory drilling. We've constructed a
24 number of long-term designated monitoring wells.
25 We have conducted geophysical surveys in a great

1 long-term designated, monitoring well. It's also
2 referred to now as the Treasure Valley Hydrologic
3 Project well No. 1. Because United Water
4 actually, myself, was able to work out an
5 agreement for that to become a long-term
6 monitoring well for the Treasure Valley
7 Hydrologic Project.

8 Q. Does that penetrate the Pierce Gulch
9 Sand Aquifer?

10 A. Yes, it does.

11 The State and Linder test well --

12 Q. What did you do with that well? Did
13 you help design it?

14 A. I sited it. I was responsible for the
15 drilling of both wells, the completion of both
16 wells, the design of both of those; the
17 development, sampling, testing, reporting and
18 drafting of it, as in all the wells that we work
19 on.

20 Two of the City of Star wells; the
21 Floating Feather well; the River Vine well, the
22 Eagle Stake Center well; Goddard, United Water
23 Goddard; United Water Hewlett-Packard; the Swift
24 well, the United Water Idaho Swift -- Swift test
25 well; the four new test wells, exploratory and

1 long-term test wells drilled by M3 Eagle.
 2 Q. How about the Lexington Hills well?
 3 A. I worked on the Lexington Hills well,
 4 but I did not design it. I worked with Spence
 5 Wood on that examining the cuttings, and we ran
 6 the geophysics in that well. I could say
 7 that -- you know -- no, that's fine.
 8 Q. How about other wells in the area, such
 9 as in the Dry Creek area, are you familiar with
 10 wells there?
 11 A. Yes.
 12 Q. Could you explain?
 13 A. I -- I worked on some of the some of
 14 Julius Jeker's wells on his ranch; his geothermal
 15 wells and his cold water wells. I geophysically
 16 logged some of those. I was present when the
 17 driller was repairing them.
 18 I have worked on other wells for
 19 clients there, for the Terteling Company. I've
 20 drilled wells, exploratory test wells, and done
 21 surface geophysical surveys in the Seimans Gulch
 22 area, for example. And that pretty much sums it
 23 up.
 24 Q. With regard to geologic mapping, is
 25 this something that you have done?

1 A. Yes.
 2 Q. Could you explain?
 3 A. Well, it's something that I like to do.
 4 It's something that I do as an avocation. And so
 5 on the many field trips with Spence and Will
 6 Burnham, that's what we would do as sort of a
 7 backdrop for our -- for our outings.
 8 And I have specifically looked at
 9 mapping of the geology in the east Boise area,
 10 where I have identified the east Boise fault, and
 11 mapped in the various units over in that area;
 12 the Terteling Springs formation, the Boise
 13 Volcanic Assemblage. I've mapped geology on the
 14 Terteling Ranch in Stewart Gulch.
 15 Q. Have you mapped the geology in other
 16 parts of the Boise front?
 17 A. Yes, but not -- not formally and not in
 18 published reports, per se. I've contributed to
 19 published reports. But my main interest is in
 20 the subsurface.
 21 Q. Have you authored peer review reports,
 22 Mr. Squires?
 23 A. If you mean in the context of the
 24 academic sense of peer review, where you send
 25 your papers out to people you don't know as to

1 have it reviewed, the answer is, no.
 2 Q. What about peer review of local
 3 experts?
 4 A. I agree with Mr. Vincent. That, to me,
 5 the most important peer review is the review of
 6 my peers. And so I'm -- I'm more interested in
 7 what the people who have experience in the area
 8 know, and what their feelings are. And I think
 9 that goes right up to, I would consider the IDWR
 10 staff memo a peer review of our work. And that's
 11 the kind of stuff we appreciate, constructive
 12 comments that help us.
 13 Q. How about geologic structural analysis?
 14 What can you tell us about that? And have you
 15 had any experience with this?
 16 A. I am not a structural geologist. If
 17 you mean structure in the terms of fault, and the
 18 base of the basin, different various -- the
 19 bottom, if you will, of the aquifer system. I'm
 20 familiar with that. I've tried to map that.
 21 I've tried to locate faults.
 22 Q. Have you mapped faults in the Boise
 23 front?
 24 A. Yes.
 25 Q. With regard to the wells that you have

1 drilled, could you describe to us what you do in
 2 terms of designing, and constructing, and testing
 3 wells?
 4 A. Well, that's evolved over my career,
 5 but I could tell you what -- where we are at our
 6 current status. We often site wells for their
 7 most -- for most effectiveness. We oversee the
 8 drilling process. We obtain bore hole
 9 geophysical logs in almost every case.
 10 We obtain the cuttings on regular
 11 intervals, usually about five feet of the entire
 12 drilled section. We analyze and do sieve
 13 analyses, and grain size percentage of those
 14 cuttings; design the future well; specify the
 15 screens, the slot size, the filter pack, the
 16 placement of the screens, the seals, the annular
 17 seals in the well; and the development of the
 18 well; and the pump testing of the well; and the
 19 sampling of the water chemistry of the well.
 20 Q. Are these the kinds of things you
 21 carried out for M3 in your work for them?
 22 A. Yes, they are.
 23 Q. What about hydraulic testing? Have you
 24 conducted hydraulic tests or aquifer tests? And
 25 can you describe, generally, how many, and what

1 kinds of tests?
 2 A. Well, I make a differentiation between
 3 an aquifer test and a well test. And so if you
 4 mean an aquifer test -- and I think of that more
 5 regionally. If you mean an aquifer test such as
 6 we did for M3 for Spring Valley 7, where you have
 7 a pumping well for a prolonged period with
 8 multiple observation wells, I would estimate that
 9 I've done 15 to 20 of those in my career. If you
 10 mean well tests, and we almost always try to have
 11 more than a single well test. And in most -- in
 12 most cases we do.
 13 Q. Is a well test just an exercise in
 14 pumping this particular well that you've just
 15 built to see what kinds of data you can get from
 16 that experience?
 17 A. I think of that as a test that is more
 18 relative to determining the sustainable yield of
 19 the well itself. But as I say, we always try to
 20 measure other wells whenever we can. So if you
 21 are referring to that sort of aquifer test, I
 22 would say -- or well tests, I would say that I've
 23 done several hundred of those.
 24 Q. How many wells would you say you've
 25 designed in your career so far?

1 A. I don't know for sure. I would say if
 2 you are referring to large bore production wells,
 3 I would guess somewhere between 200 and 250.
 4 Q. Okay. What about domestic wells, have
 5 you designed those as well; smaller capacity
 6 wells?
 7 A. I've probably designed less than a
 8 dozen domestic wells.
 9 Q. Do you have any formal training in
 10 geophysics?
 11 A. Yes, I do.
 12 Q. And what can you -- what is that
 13 training?
 14 A. I have taken college course work in
 15 bore hole geophysics -- bore hole geophysics.
 16 And I've attended many seminars over the years on
 17 bore hole geophysics. I am a 15 to 18 year
 18 member of the society of professional well log
 19 analysts. And I have taught courses in bore hole
 20 geophysics at Boise State University.
 21 Q. Okay. Could you describe what
 22 geophysical analysis is?
 23 A. Well, if you are referring to bore hole
 24 geophysics, it was a technology that was
 25 developed for the oil industry beginning about

1 1930; whereby, a series of probes are lowered
 2 down bore holes. And they measure a variety of
 3 physical parameters, such as the radioactivity of
 4 the rocks, the resistivity, the resistance of the
 5 rocks; and other things, such as, temperature,
 6 caliber.
 7 And they provide an objective
 8 representation of the rocks that's not
 9 subjective. They -- in other words, they read
 10 very similar in similar environments, subsurface
 11 environments. And they point to things, such as,
 12 rock type, whether it's sediments, or basalt, or
 13 sand and gravel, or clay. They can point to the
 14 permeability of rocks, the temperature. The
 15 permeability of aquifers, I should have said,
 16 those sorts of things.
 17 And I would also point out that, bore
 18 hole geophysics is a very broad field. And there
 19 is a lot about bore hole geophysics that I don't
 20 know, because it's a -- it is a -- it is an ever
 21 expanding field, especially in petro physics and
 22 petroleum industry. I have used bore hole
 23 geophysics mainly toward applications in water,
 24 in ground water, and that's a little bit
 25 different.

1 Q. How accurate are bore hole geophysical
 2 logs in your opinion?
 3 A. I think they are very accurate if done
 4 properly and calibrated.
 5 Q. Do they provide us with a reliable
 6 signature, if you will, of the subsurface?
 7 A. They can.
 8 Q. What about the geophysics that you've
 9 conducted in your career? Have they turned out
 10 to be reliable in your business?
 11 A. Very much so. We depend upon them. I
 12 was -- I was the bore hole technician for Boise
 13 State for about seven years. I built two bore
 14 hole geophysical systems while I was in
 15 attendance at Boise State.
 16 And then I had a hands-on part, in with
 17 the manufacturer of Mount Sopris, developing the
 18 current geophysical logging unit that we have,
 19 which was kind of the first prototype that they
 20 did, of having down hole TV cameras in the same
 21 system, the same winch, and the same electronics
 22 as the geophysics.
 23 And so we've used that unit
 24 for -- well, back from my days at United Water
 25 Idaho, we had that unit when I was at United

1 Water Idaho. And when I left United Water, I
2 carried that unit with me into my business, and
3 we still operate that on a regular basis today.

4 We use that for all the test wells for
5 M3 Eagle, and all of the aforementioned wells
6 that I worked on in the Eagle area. When I was
7 with United Water Idaho, we operated that as a
8 service to the valley. So we weren't just
9 logging United Water Idaho wells. We were really
10 the only -- well, we were the only bore hole
11 geophysics unit in the region. And so we worked
12 on a lot of other company wells, a lot of other
13 utility wells. And basically every chance we
14 got, any hole that we could go get data out of,
15 that's what we did.

16 Q. In all of that experience, did you ever
17 have any of your geophysical data proved to be
18 inaccurate or inconsistent with what you found
19 from a pumping well, or some other feature or
20 data?

21 A. I'm not sure I understand that
22 question.

23 Q. Did you -- how accurate, based on all
24 of that, do you find your geophysical logging to
25 be? Is it reliable?

1 A. One of our guiding principles is that
2 we believe strongly in calibrated geophysical
3 logs. So we calibrate our geophysics virtually
4 every time we use them. So that we have a great
5 deal of confidence in what they are recording.

6 But I -- you know, they -- I believe
7 that they are very accurate. I believe that they
8 can be relied upon. I think they are an
9 essential record for a water well. And some
10 states require that they be done for wells that
11 are drilled, and I would like to see our state go
12 the same way. I think they should be a
13 requirement.

14 Q. What is this device? What does it do;
15 this logging device, this Mount Sopris logging
16 device that you described?

17 A. Well, as I said, it's like a -- you
18 have a long cable that you lower down bore holes.
19 And so, in sort of a layman's analogy, you could
20 think of one of the probes as a Geiger counter on
21 a string. You lower it down, and it records the
22 natural radioactivity that's inherent in all
23 rocks.

24 And, for example, clays would have a
25 higher radioactivity. Depending on the

1 composition of the gravels, they would have a
2 characteristic signature of radioactivity. Sand
3 from a granitic terrain, such as we have,
4 generally has a very low radioactivity.

5 But the real -- the real beauty of the
6 geophysical logs is that they measure -- a suite
7 of them measure six or seven separate physical
8 parameters. So I mentioned that you run one log
9 in a bore hole, and it measures the
10 radioactivity. And then you run another probe in
11 the bore hole, and it measures the electrical
12 resistivity. Well, those are two completely,
13 distinct physical parameters.

14 And when you see similar
15 characteristics on the geophysical logs
16 that -- through a series of geophysical logs,
17 that gives you a great deal of physical
18 confidence in what you are reading, because they
19 support each other, or they don't. And in most
20 cases, they support each other with some
21 exceptions.

22 Q. And what are those exceptions?

23 A. Well, one of the -- one of the tools
24 that we run is a caliber log. And that is a
25 device that measures the bore hole diameter.

1 It's a very important tool for the interpretation
2 of geophysics. Because if you have voids in the
3 bore hole, which you often do have, that means
4 that there is less rock in the zone of influence
5 of the probe. It only reads so far into the
6 formation. So if you have a void, a caved area
7 in the bore hole, you are only reading half as
8 much, say, rock as you are in an area where it's
9 a thin bore hole. So we run tools like that to
10 make sure that we don't misinterpret the signal.

11 Q. You mentioned down hole video. Do you
12 use this as well, and could you describe it?

13 A. Down hole video is -- we have a suite
14 of cameras for various different bore hole
15 diameters, some of them color, some look
16 sideways. They rotate. They are just like a
17 fancy video camera that also goes on the same
18 winch, and is able to go down to the tool, down
19 the well or the bore, and to view the nature of
20 the bore hole wall, or the inside of the casing,
21 screens.

22 We do a lot of well reconstruction and
23 well rehabilitation, and so we use that camera
24 almost on a daily basis.

25 Q. Does the camera help to augment the

1 data that you have from geophysical logs?
2 A. It has in many cases, because we've run
3 camera surveys in open holes whenever we can,
4 so -- that we can actually see the geologic
5 formations that we're logging as well.

6 Q. And have you found that the camera
7 survey agrees with the geophysics?

8 A. Yes.

9 Q. Do you rely on well drillers data from
10 well drillers reports of what their finding as
11 they proceed down through the section?

12 A. Yes.

13 Q. And what is your view about drillers
14 logs in terms of how you use them in your
15 business?

16 A. I find that the -- I find that the
17 quality of drillers reports to be pretty uneven
18 and unreliable, and mainly because it's very
19 subjective. Most drillers do not have any formal
20 training in geology, and geological formation
21 recognition, and that's not their concern.

22 They are concerned with getting a water
23 well. And, you know, to them it's -- it's sand
24 or clay pretty much. We find that in many cases,
25 that drillers reports inaccurately portray the

1 geologic section. And that for the most part,
2 they -- they lead us astray in many cases.

3 Q. What about running geophysics in a well
4 that is already cased, such as with a steel
5 casing? Could you comment on that?

6 A. There are logs that can be run in cased
7 holes. The radioactive logs can read, if you
8 will, through casing. Of course, temperature,
9 caliber, there is a number of logs that you can
10 run in cased wells. But not the resistivity
11 logs, because the electrical currents are short
12 circuited by the casing.

13 And most small bore diameter wells in
14 the Boise area are drill-and-drive steel cased
15 wells. So there is not -- there is not a great
16 deal of information geophysically that you can
17 obtain from cased wells.

18 Q. You could not run a caliber log in such
19 a well; correct?

20 A. No, you could. And we often do,
21 because it tells us where the bore reduces in
22 diameter, or if there is a constriction, or a
23 hole.

24 Q. But that would be just inside the
25 casing; correct?

1 A. Correct.

2 Q. And that caliber could not read out
3 into the formation; correct?

4 A. No, it's a physical.

5 Q. It could not find a void outside of
6 that casing; could it?

7 A. No.

8 Q. What do you do with these geophysical
9 logs in your -- in your work? And maybe we can
10 talk some here about what you've done for M3
11 Eagle with these kinds of geophysical logs.

12 What's the importance of them?

13 A. Well, they are very accurate with
14 respect to depth. I mean, when you are drawing
15 the probes up through the bore hole, they very
16 accurately tell you the depths of these various
17 changes that I explained before that we measure
18 with a various -- with a suite of probes.

19 And in our system, we're able to run
20 seven distinct measurements at once. So we lower
21 a series of probes all on one string, if you
22 will, down to the bottom of the hole. And we
23 draw that up, and they are all recording at once,
24 these six various parameters.

25 And then we take those, and we plot

1 them out. And we then compare them to the actual
2 cuttings, the drill cuttings from the well. And
3 that helps us to adjust the depth of the well
4 cuttings, which are often not that precise,
5 because they are -- you know, they are coming up
6 with a lag time out of the well.

7 And that helps us to put the
8 stratigraphic section together, the drilled
9 stratigraphic section. It's -- so we don't just
10 rely -- we don't like to rely on just one set of
11 information. We like to put the geophysical logs
12 alongside the geological data and compare them.

13 Q. I would like you to refer to Exhibit 7,
14 which I believe is reproduced a couple of places.
15 I think it's also Figure 10 in Exhibit 44, but
16 let's try Exhibit 7.

17 A. (Witness complying.)

18 Q. Did you prepare this exhibit,
19 Mr. Squires?

20 A. Yes, with the help of my staff.

21 Q. And what is it?

22 A. This is a -- what we call a composite
23 diagram. It is a representation of all of the
24 geological, geophysical, hydrogeological, and
25 geochemical, and well construction details for

1 one of the wells; the first one, actually, that
2 we drilled for M3 Eagle in the so-called
3 panhandle area of the project.

4 And on the left are the suite of
5 geophysical logs that I spoke of, the squiggly
6 lines, the strip charts. Next to that, to the
7 right, are the drill cuttings that we drilled and
8 analyzed.

9 And these, by the way, are all on the
10 same depth scale. If you look there at the
11 depth, you'll see zero, 100, 200, 300. That's
12 the depth below ground level. And all of the
13 data is calibrated to ground level. And then --

14 Q. And so does that mean that one can look
15 from left to right across this, and be at the
16 same depth for all of these different features?

17 A. That is correct, with the exception of
18 the tables on the right, which are the chemistry
19 tables. Also, if you look at the as-built well
20 construction that this is -- this shows a
21 designated piezometer nest, a long-term
22 monitoring station, and it has five tubes;
23 essentially, five separate tube wells
24 that -- constructed to various depths of the
25 subsurface, and those compare over to the

1 geophysical logs and the lithology.

2 Q. Have you created similar as-built well
3 construction charts with geophysical logs for the
4 other wells that you have drilled on the M3
5 property?

6 A. Yes. This is -- this is where we
7 really start in earnest when we want to
8 characterize an area. We start with individual
9 wells, and get as much information as we can
10 about individual wells. And this becomes a
11 reference for us.

12 And as you put together a series of
13 these wells, as we have done in Eagle, it was
14 really started back in the United Water Idaho
15 days, where we have these kinds of records for
16 the wells that Roger Dittus talked about, the
17 test wells that we've talked about this morning,
18 all of their supply wells, the other cities'
19 supply wells.

20 And as you begin to accumulate a
21 lexicon or, you know, a good group of these, then
22 that helps you -- then you've got good
23 information, not drillers data, at a variety of
24 points. And then we begin to expand these
25 diagrams into cross-sectional diagrams.

1 So we'll take the geophysics, or the
2 lithology from this point, and compare it to the
3 next point, and then to a series of points.

4 Q. Mr. Squires, I would like you to refer
5 to Exhibit 44, Figure 3. Exhibit 44 is entitled,
6 the nine day aquifer test of the SVR 7 well. And
7 I would like you to refer to Figure 3 in that,
8 and tell us what that is, please?

9 A. (Witness complying.) Well, this is one
10 such cross section. That is sort of the next
11 step from the individual data points, the
12 individual well drilling operations. And where
13 we have put -- done a cross-sectional, sort a
14 slice of the earth along the line of section that
15 includes -- that includes several of these wells
16 in succession in their representative
17 geographical location with respect to their
18 elevation, again. Along the top, you'll see the
19 elevation of ground surface, the dark line.

20 Q. Yes. And what does this show us?
21 Could you expound on some of the features of this
22 Figure 3, Mr. Squires?

23 A. Well, it starts out at the top of the
24 diagram showing the topographical relief along
25 the line of section, which essentially, in the

1 southwest is the city of Star. And in the
2 northeast is the Spring Valley Ranch area above
3 M3, above Willow Creek Road.

4 And it's, essentially, a line of
5 section that goes down Big Gulch in the Boise
6 foothills, that is across the M3 proposed site.

7 Q. Mr. Squires, on that point, the line of
8 section, is it accurate to say, that Figure 1 of
9 this same Exhibit 44, the map shows that line?
10 If you could just flip to Figure 1, briefly.

11 A. (Witness complying.) That is correct.
12 There is two dashed or dotted black lines. One
13 that extends from southwest to the northeast, and
14 the southwest end member is the city of Star.
15 And it -- the line moves upward, goes through the
16 so-called panhandle, through the main body of M3
17 property, and up into the Spring Valley Ranch
18 area, or the Sun Corp. property.

19 MR. FEREDAY: Mr. Squires, if you could
20 just hold up a minute there. I want to make sure
21 that the Hearing Officer has Figure 1 of Exhibit
22 44 in front of him.

23 THE HEARING OFFICER: And maybe I'm not
24 back far enough.

25 THE WITNESS: It's right here

1 (indicating). This (indicating) is the one.
 2 THE HEARING OFFICER: I have it. I
 3 thought he was looking at a larger map. So okay.
 4 Q. (BY MR. FEREDAY) Okay. So Figure 1 is
 5 an eight-and-a-half by eleven map; correct?
 6 A. Yes.
 7 Q. Okay. Continue.
 8 A. With Figure 3?
 9 Q. Yes. So Figure 3 then, is the
 10 cross -- is the subsurface depiction of the cross
 11 section that it stems from Star, essentially, up
 12 through SVR No. 6 and on up to the northeast; is
 13 that correct?
 14 A. That is correct.
 15 Q. Well, we can return then to Figure 3.
 16 And would you please tell us what it shows us.
 17 A. Well, this is a cross-sectional
 18 representation of six wells that were drilled
 19 along that line of section; some by us, some by
 20 others. And it -- we show -- we've selected one
 21 of the -- actually, three of the geophysical logs
 22 that we spoke about. These are the normal
 23 resistivity logs. And we have plotted them with
 24 the lithologies from the drill cuttings for each
 25 of the six wells at their respective locations

1 and elevations.
 2 And then we've done a correlation
 3 through those based on the geophysics and the
 4 cuttings, and our understanding of the surface
 5 geology. And those are the -- those are the
 6 connecting lines.
 7 And I guess I could say that if you
 8 look at the test well that we looked at earlier,
 9 the test well No. 1, which is the second well
 10 from the left, the lithologic log, or the
 11 stratigraphic section that represents the
 12 cuttings, you would say that beginning at the
 13 bottom of the well, there is a -- there is mud
 14 stone, low permeability class. There is a small
 15 relatively thin sand layer there. More mud stone
 16 up to the base of the Pierce Gulch Sand Aquifer.
 17 And then you can see that there is a distinct
 18 change in the geophysical log at that same time.
 19 Q. And what does that change show you?
 20 And what is resistivity?
 21 A. Well, resistivity measures the ability
 22 of the formation to transmit electricity. So
 23 clays transmit electricity very well. So they
 24 have very low resistivity to flow. That is, they
 25 conduct electricity.

1 So on a resistivity log, it has very
 2 low resistivity. And so this -- the parts of
 3 this log that are just proposed or adjacent to
 4 these clays, they have very low reading and
 5 resistivity. They are over an excursion to the
 6 left in the log.
 7 And then you'll see at the base of the
 8 aquifer, there is a very large and recognizable
 9 excursion to the right. And that is -- that is
 10 an indication of the resistivity of the water
 11 filled aquifer. Because the aquifer is comprised
 12 of quartz, which is a non-semiconductor, a
 13 nonconductor.
 14 The water is very fresh in this
 15 aquifer, so it's resistive. So we get a very
 16 strong contrast with an excursion to the right.
 17 It shows high resistivity when we're in the
 18 saturated sands of the aquifer.
 19 And I think you can see that the nature
 20 of those logs -- even if you are not a
 21 geophysicist, you can see that there is a lot of
 22 similarity between the logs.
 23 Q. And what does that tell you as a
 24 hydrogeologist?
 25 A. I think that it's very easy to

1 correlate between these logs. I think it's easy
 2 to coordinate between these cuttings, and the log
 3 character, that these units extend and connect
 4 between these wells.
 5 Q. Do you see any evidence of faulting
 6 here? And could you speak to the question of
 7 faulting that might show up in a cross section?
 8 A. I -- I really can't see any suggestion
 9 of -- you really can't say that these logs show
 10 faulting or not. This -- the lines that are
 11 between the individual data points are an
 12 interpretation. Those are drawn through
 13 experience.
 14 There is a fault drawn on the map.
 15 It's over between the two righter most wells.
 16 That fault is based on surface mapping. And as
 17 we do when we dash things, that means that they
 18 are less certain than if we draw solid lines.
 19 And so that's our representation of the
 20 west-Boise Eagle fault from the known expression
 21 of the west-Boise Eagle fault. In this case,
 22 particular case it -- the location from the
 23 magnetometer survey that we did, and from other
 24 surface mapping by S.H. Wood.
 25 Q. Now, did the magnetometer survey then

1 help you determine more about that west-Boise
2 Eagle fault?

3 A. Yes, it did.

4 Q. On the --

5 A. -- helped, because we already had
6 several -- several sections of the fault based on
7 surface mapping and hydraulic tests. So it's
8 another -- another data point out in the middle,
9 if you will. So it helps to connect the dots.
10 And it was -- it was confirmation.

11 Q. What does this cross section, Figure 3,
12 show us about aquifer water levels?

13 A. Within the first four wells on the
14 left, there is a dashed line toward up near the
15 line of land surface. And you'll see that there
16 are little upside down triangles in blue. And
17 that is a representation of where the water
18 level -- the artesian water level in the wells
19 are at each of these wells. And the dashed lines
20 are the inferred pressure level between the
21 wells.

22 You can see down, for example, in the
23 Star, the letter most well, that the water level
24 down there is above ground. That's a flowing
25 artesian well. And if you shut in the pressure

1 in that well, that is where the water level would
2 stand above ground.

3 Q. Are these water levels accurately
4 measured, Mr. Squires?

5 A. Yes.

6 Q. So even though there is a dashed line
7 between these wells, those water levels in the
8 wells are accurate?

9 A. Yes.

10 Q. Accurate to how many feet?

11 A. We try to measure to a hundredth of a
12 foot.

13 Q. .01 feet?

14 A. Yes.

15 Q. What about over on the right hand of
16 this figure? Mr. Squires, I see a very different
17 aquifer level there. Could you explain what that
18 depicts?

19 A. In the -- in the two wells on the right
20 side of the diagram, those are completed into a
21 different geologic unit. And they have lower
22 water levels. They have deeper water levels in
23 this area by 140 to 160 feet.

24 Q. And why is this?

25 A. It is because there is some kind of

1 hydraulic discontinuity or disconnect between the
2 M3 Eagle test well No. 2 and the SVR well No. 6.

3 Q. Do you know what that is?

4 A. We believe that there is a low
5 permeability unit, the mud stone facies of the
6 Terteling Springs formation that separates the
7 Pierce Gulch Sand Aquifer from the sands of the
8 Terteling Springs.

9 Q. So as the Pierce Gulch Sand Aquifer, if
10 you will, moves up dipped to the northwest, it
11 encounters those low permeability muds from yet
12 another formation; is that right?

13 A. It's better to think about it -- the
14 Terteling Springs formation is an older
15 formation. So it was laid down first. And the
16 Pierce Gulch Sand Aquifer was laid on over the
17 top of the Terteling Springs formation.

18 And so as the Terteling Springs
19 formation was laid down, there is a clay
20 separating -- an overlying clay separating the
21 Pierce Gulch Sands, which are overlying and
22 younger, from the sands of the Terteling Springs.
23 And the Terteling Springs are recharged from a
24 different source, and they have different heads
25 driving the aquifer levels. So they are at a

1 lower level for a variety of reasons.

2 Q. Does the Pierce Gulch Sand Aquifer
3 remain saturated throughout this entire cross
4 section, or does it become unsaturated at some
5 point?

6 A. It becomes unsaturated at some point.

7 Q. Could you describe, please?

8 A. As this cross section depicts, and as I
9 think you've discussed several times, the Pierce
10 Gulch Sand Aquifer is recognized as an aquifer
11 that is not flat lying. It dips. That is, it
12 tips toward the basin.

13 Q. Why does it dip?

14 A. It is a combination of -- it's a
15 combination of structural -- there is some
16 structural component to the fact that the basin
17 is compacting and settling, that tends to tip
18 down toward the center of the basin.

19 But it's also a depositional dip.
20 Because the Pierce Gulch Sand Aquifer was laid
21 down on an old lake bed. And if you can imagine
22 a lake bed that goes from the shore to the deep
23 part of the lake -- I think everyone recognizes
24 from their wading days, that it gets deeper as
25 you go out into the lake.

Page 810

1 And so the sand was laid down over the
2 top of a lake bed, so it dips. And so it dips at
3 a -- in this particular diagram, it is somewhere
4 in the order of about 100 feet per mile.
5 But what is significant with respect to
6 the saturation of the aquifer, is that at some
7 point, that dip comes up to land surface. And it
8 grows, if you will, out of the water.
9 So the same sands that house the Pierce
10 Gulch Sand Aquifer, that is the Pierce Gulch
11 Sand, those are present in the Boise foothills,
12 but they are unsaturated. They are just dry at
13 that location. But where they dip down, and they
14 are able to receive recharge, they have water in
15 them. And so if you look at this diagram, the
16 third well from the left, the M3 Eagle test well
17 No. 2 --
18 Q. You mean from the right?
19 A. Or from the right. I'm sorry. You
20 will see that in that well, we have the same
21 excursion on the geophysical log that goes to the
22 right that suggests sand, that we have down in
23 the M3 Eagle test well number 1.
24 Q. And the cuttings also support that;
25 isn't that correct?

Page 811

1 A. Yes. But down in M3 Eagle test well
2 No. 1, the Pierce Gulch Sand Aquifer is all
3 underwater. And it's all saturated with a head
4 that is, you know, 200 feet or more above the top
5 of the aquifer.
6 But in the test well No. 2, the upper
7 part of the aquifer is unsaturated, which is
8 shown by the little upside down triangles. And
9 by another -- yet another really strong excursion
10 on the geophysical logs, you'll note that on this
11 one, on the water table, there is a very, very
12 strong excursion to the right. And that's
13 because air is less conductive than water. So
14 it's even more resistive.
15 So it shows up in the geophysical logs,
16 and it shows up in our measured water level. And
17 so at that location, approximately half of the
18 Pierce Gulch Sand Aquifer is dry, or it doesn't
19 exist.
20 Q. I would like you to refer now to Figure
21 2 in Exhibit 42. And it's -- here's another one
22 of those complex numbering systems. But it's
23 Exhibit 42. I believe, it's Tab A 4.
24 A. (Witness complying.) The May 4th, 2007
25 report?

Page 812

1 Q. Yes. First of all, before we -- let's
2 just digress here just for a moment, if you
3 would.
4 Would you describe for us what this A 4
5 document is? It's entitled, "M3 Eagle Regional
6 Hydrologic Characterization North Ada County and
7 Gem Counties, Idaho, Year One Progress Report by
8 Hydro Logic," dated May 4th, 2007.
9 Could you just describe how this came
10 about; just briefly?
11 A. We were contacted by M3 Company, by
12 Mr. Bill Brownlee and Gerry Robbins, to
13 characterize the ground water under their
14 property in the north Eagle foothills.
15 And we did a fair amount of work on
16 that characterization. And then we decided -- or
17 they decided that we wanted to file a water right
18 for that area, because we felt that the
19 indications were that there was water underneath
20 the site.
21 So this report is a -- it's a first
22 year characterization report that we used to
23 supplement the M3 water right application with.
24 But it was a first reporting in kind of a
25 layman's report, if you will, that's easy to

Page 813

1 read, that discusses the geology. We used it to
2 try to educate people, to educate the various
3 city governments, other large water users in the
4 area, domestic well owners, the NACFA, the local
5 interest group, legislators, et cetera. We used
6 it as a tool to portray what our conceptual model
7 was for the north Eagle area.
8 Q. Is this report accurate, Mr. Squires?
9 A. I believe it is.
10 Q. I would like you to refer to Figure 2
11 in that report, if you would?
12 THE HEARING OFFICER: Okay.
13 Mr. Fereday, before we go on, I know we took an
14 early break. And I wonder if we ought to take
15 another one just briefly?
16 MR. FEREDAY: Yes.
17 THE HEARING OFFICER: I think for
18 everybody just to get up and stretch and do a few
19 things. And before we launch into this. For me,
20 as much as anything, I want to be able to
21 remember.
22 Be back in about ten minutes.
23 (A recess was had.)
24 THE HEARING OFFICER: Okay. We are
25 recording again after a brief recess.

1 Okay. Mr. Fereday, we were just
2 discussing the details of, I think, a portion of
3 Exhibit 42.

4 MR. FEREDAY: Correct.

5 Q. (BY MR. FEREDAY) Mr. Squires, before
6 the break, I believe I asked you to look at
7 Figure 2 in that July 2007 report, that was
8 included with the water right application.

9 Do you recognize that?

10 A. I do.

11 Q. Can you please explain what this Figure
12 2 shows us, and how it was organized and laid out
13 here?

14 A. As I said previously, we consider this
15 somewhat of a layman's report. And we intended
16 to use it as an educational tool. And because
17 the squiggly lines of geophysical logs tend to
18 intimidate people, I guess I would say, or they
19 just go, oh, it's too complicated to read.

20 What we tried to do here is take a
21 series of seven wells from the North Ada County,
22 and plot the logs, the same logs, again, using
23 the normal resistivity log. All at the
24 same -- we placed --

25 I guess I would start out by saying

1 that, in this diagram, there is the line that
2 says, the base of the Pierce Gulch Sand Aquifer.
3 And it goes back to that excursion of higher
4 resistivity above the line and lower resistivity
5 below the line, representing the clay, which is
6 the lake bed, the underlying Terteling Springs
7 formation, and the overlying sand, that's the
8 Pierce Gulch Sand Aquifer. And --

9 Q. By the way, with regard to that
10 transition between the clay and the sand, would
11 you -- how do you characterize that? Is that
12 distinctive? Is it indistinct? How clear is
13 that to you in -- as a person expert in these
14 areas?

15 A. It's very distinctive. It is the
16 signature of a pro-grading delta. And that's how
17 the Pierce Gulch Sand Aquifer formed. There was
18 a lake bed. And the lake drained. The water
19 came out of the lake. So a lot of sand that was
20 stranded along the edge of the lake was
21 distributed out over the top of the lake bed.

22 Q. By what source forces?

23 A. By fluvial forces.

24 Q. You mean rivers and streams?

25 A. Yes. And so what it is an indication

1 of is you can -- it's the gradation, a continual
2 change between clay materials and sand materials.
3 And it's a gradual. So it shows that it was not
4 abrupt. It happened over some period of time.

5 But even more distinctive than this
6 signature of the delta, is that in these logs, I
7 would point out, that there is another signature
8 that even makes it more distinct, and more
9 recognizable beyond a shadow of a doubt, in my
10 opinion.

11 Q. And what is that?

12 A. And that is the addition -- you'll see
13 in the lower portion of these logs, that we have
14 this thick clay, this dead resistivity that's
15 underneath the Pierce Gulch Sand Aquifer. And
16 then there is some blips, if you will, some small
17 sand out layers, the excursions in the logs that
18 are down beneath within the clay. Okay.

19 And we've recognized that that is
20 present over a very, very wide area of the
21 Treasure Valley, and even beyond the Treasure
22 Valley. And we see this signature in the
23 geophysical logs of deep exploration holes that
24 were drilled out here in the '80s and before.

25 Q. And where are those?

1 A. Those are -- those are scattered all
2 around the Treasure Valley, and across the Snake
3 River into Oregon, and Weiser, south to Lake
4 Lowell, the Payette River Valley, Meridian. And
5 these wells, some of them are 14,000 feet deep.

6 And we're actually, very, very lucky,
7 and fortunate in this valley, that we have that
8 kind of information available. And I -- and
9 Dr. Wood has submitted exhibits and testimony
10 with respect to those geophysical logs that we'll
11 hear about.

12 Q. What else can you tell us about Figure
13 2?

14 A. Well, what I tried to do here is plot
15 these logs so that they are not elevationally
16 correlated. I just -- I tried to put all these
17 wells together so that the base was at the same
18 level. So that one could see that there is a
19 pretty strong correlation between the signatures
20 of these geophysics from these widely separated
21 wells. And I think that's pretty clear.
22 I -- it -- it doesn't get a whole lot better than
23 this in my experience. Okay?

24 Q. Could this -- could I describe this
25 then as, taking this dipping aquifer section, and

1 setting it up on a table -- a flat table so that
 2 all that aquifer is now sitting horizontally with
 3 that same signature in it?
 4 A. That's a good analogy.
 5 Q. Okay. So this is -- this does not show
 6 the dip; correct?
 7 A. Correct.
 8 Q. But it overcomes the dip to show the
 9 comparison of each of these well sections one to
 10 another; correct?
 11 A. Correct. And we ran all these
 12 geophysics in these wells over the years.
 13 And --
 14 Q. Are they accurate?
 15 A. Yes.
 16 Q. I would like you to return now to
 17 Figure 3 that we discussed in Exhibit 44. And
 18 you'll recall there is a map that's Figure 1 in
 19 that same exhibit that's associated with it.
 20 I would like to ask you a few questions
 21 about that. And I also would like to ask you a
 22 few questions about the next figure in Exhibit
 23 44, which is Figure 4.
 24 But first, Figure 3, Exhibit 44. This
 25 is the 11 by 17 cross section showing some six

1 wells; correct?
 2 A. That is correct.
 3 Q. Did you hear Mr. Vincent's testimony
 4 with regard to the inferred fault in the
 5 panhandle area of M3?
 6 A. Yes, I did.
 7 Q. Would that fault -- where on this cross
 8 section, if anywhere, would that fault location
 9 be?
 10 A. If you look at the M3 Eagle test well
 11 No. 1, and then to its right, the M3 Eagle test
 12 well No. 4. That inferred fault from the
 13 magnetometer survey would be between those two
 14 wells, closer to the M3 Eagle test well No. 1,
 15 and 2,000 or more feet below there.
 16 Q. 2,000 or more vertical feet down into
 17 the basement rocks?
 18 A. Correct.
 19 Q. Does this cross section -- and maybe I
 20 already asked you this. And if I did, I
 21 apologize. But does this cross section indicate
 22 any influence from that fault up into the Pierce
 23 Gulch Sands?
 24 A. You did ask me that. And I think I
 25 indicated that these sections -- these lithologic

1 logs and the geophysical logs aren't capable of
 2 determining that. But I could expound a bit.
 3 That our interpretation in connecting
 4 the dots on these sand layers, if there was a
 5 fault plain or offset between those two wells at
 6 that location, it couldn't be very much, because
 7 there is hardly any offset anyway. It's a very,
 8 very low dip, so...
 9 Q. And by "low dip," what do you mean?
 10 A. I mean --
 11 Q. It's a shallow angle?
 12 A. -- a very shallow gradient.
 13 Q. A shallow gradient?
 14 A. Uh-huh.
 15 Q. Would you refer now to the next figure,
 16 Figure 4, another pull out 11 by 17. And would
 17 you explain what this is? And, please, also
 18 refer back to the map on Figure 1, because I
 19 believe it's shown there as well on the ground as
 20 a cross-sectional line.
 21 A. So I should go to Figure 1, first?
 22 Q. Perhaps so.
 23 A. Yes. Well, Figure 1, as we spoke about
 24 before, is the cross section we were just looking
 25 at from southwest to Star up to the foothills to

1 the northeast. The second cross section is the
 2 other stippled or dotted line that runs from the
 3 south to the north. And specifically, from the
 4 United Water State and Linder well, test well,
 5 that's been mentioned several times here, and up
 6 through the M3 test well No. 3, on the western
 7 side of that property.
 8 Q. Is that test well No. 3 right up on the
 9 further -- the western extension of the M3
 10 property?
 11 A. Yes, it is.
 12 Q. Okay. What does Figure 4, the cross
 13 section itself tell you about the nature of the
 14 aquifer? And I would like to know whether you
 15 think it is consistent with what you've testified
 16 to so far?
 17 A. I think it is consistent. I think we
 18 see the distinctive signature that we described
 19 on the base of the Pierce Gulch Sand Aquifer.
 20 And we show that that same unit is continuous
 21 from the valley floor, the State and Linder test
 22 well, which is located in the vicinity of State
 23 Street and Linder. And through the middle of Big
 24 Gulch, which is M3 Eagle test well No. 4. And to
 25 the western most well that we drilled on the

1 property, M3 Eagle test well No. 3.
 2 And test well No. 3 has the same
 3 hydrogeologic character condition as the test
 4 well 2 that we spoke about. In that it also goes
 5 up, dips, and grows out of the water, and it's
 6 only partially saturated at that point.
 7 Q. Is this consistent with your earlier
 8 testimony of your conceptual view of the Pierce
 9 Gulch Sand Aquifer?
 10 A. It's very consistent. And I think this
 11 is also a good point to -- a good place, rather
 12 to point out the small relatively thin aquifer of
 13 the Terteling Springs down within the mud stone.
 14 And --
 15 Q. Yes. Explain what that is, please.
 16 A. Well, it's a -- it's a thinner sand
 17 unit within the Terteling Springs formation
 18 itself. It's very, very different from the
 19 Pierce Gulch Sand. It's a reduced aquifer.
 20 Q. And by reduced, you mean it doesn't
 21 have much oxygen?
 22 A. Correct. And I think it's appropriate
 23 to point out here, that these test wells were not
 24 drilled all at the same time, rather they were
 25 drilled in a succession of learning.

1 So we did test well No. 1 based on test
 2 wells that were already existing on the property,
 3 and our current knowledge. And then from that,
 4 we went to the next well. And from there, we
 5 went to the next well.
 6 And to answer your question, I would
 7 say that as we went forward, and as we developed
 8 additional data, it all fit the conceptual model
 9 pretty well. It confirmed the conceptual model.
 10 Q. Have you seen any data from any of
 11 these lithologic or geophysical investigations
 12 that would contradict your conceptual model of
 13 the PGSA?
 14 A. No, sir.
 15 Q. Anything else about the Terteling
 16 Springs aquifer formation?
 17 A. Well, again, it's older, so it's
 18 deeper. It's -- and the younger stuff is over
 19 the top of it. The thin aquifer, it's not -- in
 20 its current condition, it's not potable. Its
 21 chemistry is such that it's not really usable
 22 without real expensive treatment.
 23 And so I consider the base of the cold
 24 water bearing section to be the Pierce Gulch Sand
 25 Aquifer. Now, that doesn't mean that you can't

1 drill wells into the Terteling Springs formation.
 2 And I've drilled and supervised the drilling, and
 3 designed many wells in the Terteling Springs
 4 formation. Many of those by United Water Idaho,
 5 and we have producing wells that produce from
 6 Terteling Springs formation, but...
 7 Q. Right. Is that further to the east of
 8 the Eagle area?
 9 A. Yes. But, you know, some -- for
 10 instance, you can -- if you look over here at the
 11 United State and Linder test wells, 1 and 2, that
 12 have come up several times in this proceeding.
 13 To the left of the stratographic diagrams, we've
 14 tried to depict the completion intervals of the
 15 well, these tube wells, piezometers, by the
 16 dashed lines to the left of the lithologic logs.
 17 Q. The blue hashed lines there?
 18 A. There is blue and red. And the red
 19 ones are screens that are in the Terteling
 20 Springs aquifer. And the blue ones are those
 21 that are in the Pierce Gulch Sand Aquifer.
 22 And we have completed -- the Swift No.
 23 3 well was completed in the Terteling Springs
 24 aquifer. That's another well location. We
 25 drilled three wells at that location. And we

1 know that the chemistry is extremely reduced. It
 2 has really high pneumonia. There is arsenic in
 3 it. It is the function of the fact that it's
 4 sandwiched into this thick clay. So it gets a
 5 lot of negative quality attributes from the clay,
 6 so...
 7 Q. Now, the Swift well also has screens
 8 completed in the Pierce Gulch; correct?
 9 A. Both the piezometer test well and the
 10 Swift No. 3 well, production well.
 11 Q. Did you hear Mr. Dittus' testimony
 12 yesterday?
 13 A. Yes.
 14 Q. When he was referring to United Water
 15 Swift production well, was he referring to the
 16 one that was, to your knowledge, was completed in
 17 the Pierce Gulch?
 18 A. Yes, Swift No. 1.
 19 Q. Why is the head on the Terteling
 20 Springs aquifer higher than the head in the
 21 Pierce Gulch Sand Aquifer? Could you explain
 22 that?
 23 A. It's under more pressure. This is an
 24 area of increasing potential with depth. So the
 25 deeper you drill, the deeper you complete, the

1 higher the water level in the well, the higher
2 the aquifer pressure.

3 And as you can see by State and Linder,
4 the pressures are above ground flowing. They are
5 artesian, but they are also above ground at this
6 location. And it's not that well represented on
7 here, or at least, it doesn't come through. But
8 the deep zone that we've been discussing, that's
9 some 40 feet above ground level. It's hard to
10 measure without a pressure gauge.

11 Q. Mr. Squires, I want you to refer now to
12 Exhibit 26, which is a series of cross sections.

13 A. (Witness complying.)

14 Q. And also, I would like you to refer to
15 the very next exhibit, 27, which is a series of
16 cross sections. Could you turn to those, please?

17 A. (Witness complying.)

18 Q. And while you are looking, I will just
19 state that I don't want to ask you a lot of
20 questions at this point. But I would like you to
21 point out to the Hearing Officer, there, the
22 existence of these cross sections. And give us
23 just a brief overview of what they are, and when
24 they were developed, and who developed them?

25 A. This is Figure 26 or Figure 27?

1 Q. Exhibit 26.

2 A. Yeah. Okay. Well, it's a series of
3 four draft cross sections that we developed on
4 the data on what we consider to be quality
5 information only. Really using no drillers data,
6 using the data that was obtained by on site
7 hydrogeologists and geophysicists directly from
8 the drilling operations. And they came about
9 after a series of 17 or so other cross sections
10 that were developed from drillers data.

11 Q. Who developed those?

12 A. We did, Hydro Logic.

13 Q. And were those developed to
14 characterize the Pierce Gulch Sand Aquifer?

15 A. They were developed to characterize
16 what we knew about the basin. As we spoke
17 before, we don't place a whole lot of stock in
18 drillers data, but it's what's out there.

19 And so the very first thing that you do
20 when you are going to characterize an area, is
21 that you go and you find all the information that
22 you can possibly find about it that's existing.

23 That includes the drillers database at IDWR,
24 previous researchers, reports, aquifer tests.

25 Basically everything you can get your hands on,

1 so you don't have to re-invent the wheel.

2 And so the Exhibit 27, which preceded
3 these four cross sections that we drew with our
4 own data, is a series of cross sections that are
5 based on drillers reports.

6 Q. The --

7 A. The same -- the same concept. And I
8 would also say, I'm -- and I'm kind of changing
9 exhibits on you now; is that all right? I'm --

10 Q. You are looking at Exhibit 27?

11 A. -- looking -- yes.

12 Q. You say, Exhibit 27 is based on
13 drillers reports?

14 A. Yes.

15 Q. Your own --

16 A. Correct. And that's -- well, Exhibit
17 26 came first. Okay? You look at what's
18 available first, and then you go to
19 getting -- developing your own information.

20 Q. Let me ask you a question or two about
21 Exhibit 26.

22 I notice that it's denoted as "Draft"
23 on each of these pages. Could you describe what
24 is intended by that, and whether these remain
25 drafts, or what their reliability is?

1 A. And if I can, I'll start with -- I'll
2 start with Exhibit 27?

3 Q. That's fine.

4 A. First of all, these aren't just any
5 drillers reports of --

6 Q. In Exhibit 27?

7 A. Yes. They are the result of looking
8 through over 2,000 drillers reports for this
9 area, and selecting the most reliable logs from
10 the most reliable drillers from our experience
11 over the years. And, of course, with emphasis on
12 the deeper wells, because they pierce more
13 section.

14 And so we hand picked the information
15 that we thought, not only the deepest, but also
16 the most reliable based on our experience with
17 the drillers, which we have over the years
18 experienced with most of the local area drillers,
19 and how they think, how they -- what they write
20 on their logs, and how they do things.

21 And so these are -- we developed these
22 as a tool. And this is a series of, I think, 17
23 cross sections. What doesn't seem to be in this
24 exhibit is the accompanying cross section map,
25 like we had in the previous figure, that shows

1 where these lines of sections run. This actually
2 should have a map right in the front of it.
3 But be that as it may, you can take my
4 word for it, that this -- these cross sections
5 look like a spiderweb across this whole area
6 (indicating). Not just the M3 property. They go
7 down into the valley. They go over toward the
8 Payette Valley. They go to the east. They go to
9 the west.

10 And so this was the first attempt at
11 looking at the subsurface from the available
12 data. And we still use this as a tool. Because
13 as we begin to develop our own information, now
14 we can refer back to these, and go, geez, it
15 looks like this is there.

16 And even though I consider this
17 information to be once removed from good data,
18 there is still a lot you can infer from it. So
19 it's in draft, because it is a draft. It's a
20 tool. And you'll see that you don't have any of
21 the interpretation lines drawn between here
22 (indicating).

23 But as we have continued to move along,
24 we do have an understanding that we could connect
25 a lot of these dots now. But we prefer to do it

1 in Exhibit 26 with good information.

2 Q. Okay. With regard to Exhibit 27,
3 though, is it your opinion that despite the fact
4 that these are marked as "Draft," that they are
5 accurate and reliable figures?

6 A. Oh, all the information on here
7 is -- is -- there is nothing draft about that.
8 It's the best information that's available. This
9 is an accurate portrayal of what the driller
10 wrote on his log, and what we know about the well
11 construction.

12 In many cases, we're familiar with many
13 of these wells. So we may have run a camera
14 survey in it. We may have done a geophysical log
15 for it. We may have worked on it. And if so,
16 they are improved to that extent. But there is
17 nothing draft about the data.

18 And it's a very valuable database in
19 itself, in that it synthesis all the information
20 that's on a well drillers report, which for most
21 people is hard to interpret. And so this
22 clarifies things.

23 Q. So --

24 A. It let's you see it visually.

25 Q. So would you consider Exhibit 27 final

1 for purposes of your testimony today, and as
2 something you would rely upon?

3 A. Definitely.

4 Q. Okay. Returning to Exhibit 26. Those,
5 too, are marked "Draft"?

6 A. Yes.

7 Q. Could you describe whether -- how that
8 affects the reliability, or finality for purposes
9 of this hearing for these figures?

10 A. Well, we marked these "Draft," because
11 we -- originally we started working on this
12 project in response to M3 Eagle wanting to know
13 about the water availability beneath the site.
14 Not for water right entitlement, or anything like
15 that. It was strictly a water -- an aquifer
16 characterization study, a ground water
17 development potential study.

18 And as we became involved, and the
19 director asked me to be on the North Ada County
20 technical working group, we -- M3 was committed
21 to support that effort. So we began to
22 contribute information to that.

23 But along the line, as the water right
24 materialized and was developed, and it became
25 more of a formal procedure, it to a certain

1 extent, in my opinion, inhibited us a little bit.

2 And we felt that we had to get stuff in, and
3 there wasn't -- there were certain time frames in
4 which it had to be in. And so we submitted this
5 in the condition it was in at that time. And we
6 marked it "Draft," because we weren't done with
7 it.

8 Q. Have you done further work on this
9 since then?

10 A. Yes --

11 Q. And has --

12 A. -- continued.

13 Q. -- that been submitted?

14 A. Yes.

15 Q. And where was that submitted? I would
16 like you to refer to Exhibit -- Exhibit 44. Are
17 these cross sections included in Exhibit 44?

18 A. Two of them are.

19 Q. Okay. And are those Figures 3 and 4
20 that we discussed earlier?

21 A. Yes, they are.

22 Q. Okay. How do they differ? What did
23 you add to them, or take away from them going
24 from draft to final?

25 A. Well, I think they are refined

1 somewhat. And we -- as I've heard you say a
2 couple of times, we try to put a little finer
3 point on it. We started to correlate some of the
4 smaller units.

5 But the basic message is still there.
6 The correlation of the thick and extensive Pierce
7 Gulch Sand Aquifer, and the underlying is -- you
8 know, it has not changed dramatically. But you
9 will see, if you can, that there is a little
10 finer correlation of some of the units overlying
11 the Pierce Gulch Sand Aquifer.

12 What we're referring to, and by no
13 means naming, the undif- -- as yet,
14 undifferentiate aquifers with a more fluvial
15 influence that overlie the Pierce Gulch Sand
16 Aquifer. I think you can see there are some
17 faint lines there where we started to correlate
18 the geophysics to a finer level. And there is no
19 question that it can be defined even further.
20 It's just a matter of the scale that you plot
21 them out on, and the scale that you work with
22 them on.

23 For example, as we talked about in the
24 depositional history, the base of the Pierce
25 Gulch is relatively straightforward and easy to

1 map. The overlying part of the Pierce Gulch
2 grows less distinctive, because it's a -- more of
3 a fluvial process than a lake process. Lakes are
4 fairly static. But the fluvial process has the
5 interaction of rivers and switching rivers and
6 streams, and et cetera. So it's more
7 complicated.

8 So if we were going to make an attempt
9 at differentiating those overlying aquifers, we
10 would plot these geophysics out at a different
11 scale, and we would look at them in a smaller
12 scale, because they are a little more erratic, if
13 you will. The signatures are a little bit more
14 complicated.

15 Q. Of those upper sections of the aquifer
16 or overlying sections?

17 A. Correct. But we felt that there were
18 certain signatures in here. And I'm speaking of
19 myself and Loren Pearson, our geophysicist on
20 staff, that we felt comfortable in drawing some
21 of these other lines.

22 And I think there is also more
23 information on this. I mean, there is a figure
24 caption. There is a better key. There is some
25 color added. And some of the text identifying

1 the aquifers is better. So it's an improvement.

2 Q. But it's not a substantial change;
3 would you --

4 A. It's an improvement.

5 Q. Okay.

6 A. But, no, there is nothing significant.

7 Q. I noticed -- I noticed on Figure 4,
8 that you designate looking around 2,200 and 2,000
9 elevation level, an upper and a lower section on
10 the Pierce Gulch. Could you comment on that,
11 please?

12 A. Sure. We think that there is a change
13 in the geophysical character of the Pierce Gulch
14 between the initial pro-gradational part of the
15 bottom of the aquifer. And it has a distinctive
16 change in the geophysical character.

17 And what we later found, when we
18 started to work on the geochemistry, because
19 there are a number of wells, there are a number
20 of piezometers there completed deep -- you know,
21 as you -- as the Hearing Officer, himself, noted,
22 we have tubes within the aquifer at various
23 depths of the same aquifer.

24 And we noted that there is a
25 geochemical difference, and a geochemical

1 signature also between these two aquifers. And
2 so we have further subdivided it into an upper
3 and lower section. Because when we plotted those
4 geochemistries, they showed a clear clustering, a
5 difference in a similarity based on whether it's
6 the upper and lower. That everything fell into
7 place for us. So we felt comfortable further
8 subdividing it.

9 Q. But those two different geochemistries,
10 do they denote different water qualities in any
11 significant way for drinking water or any other
12 parameter?

13 A. No, not really. It's somewhat
14 academic.

15 Q. Would you say that those geochemical
16 differences are small, medium, large, what?

17 A. Yeah, in the Pierce Gulch Sand Aquifer,
18 they are relatively small. But in the overall
19 picture, it does tend to support this idea that
20 there is something different there, and it's
21 significant. It helps to -- if I can elaborate
22 on that?

23 It helps to -- when there -- I guess,
24 I'm going to digress a little bit. That Dick
25 Glanzman and I wrote the report on the

1 geochemistry for this area. And Dick knows about
2 the geochemistry, and I know about the physical
3 hydrogeology. And those two are -- the
4 combination of those two are essential to make
5 sense out of the geochemistry. In fact, what I
6 would call "Glanzman's law," is that when the
7 hydrogeology, the physical hydrogeology and
8 geochemistry clash, throw the geochemistry in the
9 trash. Okay?

10 So it's really interesting that when
11 Dick had the geochemistry data, and when he
12 plotted the geochemistry data, he first, just
13 plotted it all as a big mass. And then as we
14 begin to go through -- to go through it based on
15 the geochemistry, and where I thought, which
16 aquifers they were in, these groupings fell right
17 into place. And that's supportive. It's kind of
18 gratifying. It's conformational with the
19 conceptual model.

20 MR. FEREDAY: Well, Mr. Squires, we'll
21 be talking about the geochemistry report here
22 probably this afternoon.

23 But at this point, maybe it's
24 appropriate to take a break for lunch, if that's
25 the Hearing Officer's pleasure?

1 THE HEARING OFFICER: Yes, it's a good
2 time. It's about five after 12:00. Let's give
3 you an hour and five minutes. So how about 1:10.
4 (A lunch recess was had.)

5 THE HEARING OFFICER: We're recording
6 again.

7 Mr. Fereday you are examining
8 Mr. Squires.

9 Q. (BY MR. FEREDAY) Mr. Squires, we've
10 been talking about the two exhibits, 26 and 27,
11 which contain a number of cross sections that
12 you've developed. And you've also mentioned in
13 your testimony about the use of cross sections in
14 identifying faulting.

15 Could you tell us whether in either of
16 these exhibits, the cross sections give us some
17 example of where faulting shows up? How about
18 referring to Exhibit 27, for example?

19 A. Okay. Exhibit 27 is the driller data,
20 the early cross sections. I do recall one
21 of -- one of the things that you can -- you have
22 a little bit more reliable feeling about in
23 drillers data is; oftentimes, their
24 interpretation of the drilled sediments is not
25 correct. But when they drill into basalt

1 volcanics and indurated rocks --

2 Q. "Indurated" meaning really hard?

3 A. Very hard, cemented crystal and rocks.
4 They notice that for sure, because it's really
5 hard drilling.

6 And if you just bear with me a minute.

7 Q. Okay.

8 A. Over along the basin margin --

9 Q. And when you say --

10 A. -- to the east --

11 Q. And when you say "basin margin," what
12 do you mean?

13 A. I mean, where we begin to get into
14 these types of crystal and rocks, the granite,
15 the granitic rocks, the basalt, and the volcanic
16 rocks, that are not part of the aquifer. They
17 are not part of the sedimentary basin, so to
18 speak. They are along the edge of the basin.

19 Q. Would this be generally speaking
20 from -- with the reference to M3, northeast of
21 M3?

22 A. Yes, the highlands, the higher -- the
23 higher foothills, and hills above town, are the
24 granitic rocks. And they are the oldest rocks.
25 So the same thing we said before. They are

1 underneath everything. And overlying them is a
2 series of what we call the Boise volcanic
3 assemblage. It's a series of rhyolite, basalt
4 flows, flow rocks, you know, lavas.

5 But if you go to Exhibit 27, page 12, I
6 could give you an example of something that we
7 might infer as a fault. Did I say page 12?
8 Yeah.

9 Q. Yes, you did. And before you start on
10 this. Where is this geologic function at K-K
11 prime on page 12?

12 A. Well, one thing about these cross
13 sections that you will see, is that in sort of
14 another layer, these notations with arrows at the
15 top of the page, they give you an indication
16 where the line of cross section is.

17 So on the left side, you'll see where
18 the line of section crosses Floating Feather
19 Road? Do you see the arrow pointing down there?

20 Q. Yes.

21 A. And then here (indicating) is where it
22 crosses Beacon Light Road. And I'm now referring
23 to the area where it says, "Woods Gulch," and you
24 can see the topographic expression of Woods
25 Gulch.

1 Q. So would this cross section then go
2 from, roughly, from the vicinity of Eagle Hills
3 Golf Course to the northeast?

4 A. Yes.

5 Q. Okay. All right. Continue.

6 A. Well, anyway, as we plot the drillers
7 data in cross section, you will see the deepest
8 well on the section. It's a thousand foot well
9 in the name of Wallace Connolly. Do you see
10 that? It's at the very center of the cross
11 section.

12 And you will see that that well was
13 reported by the driller to have, you know, over
14 800 feet of what he characterized as blue shale.
15 And underlying the blue shale, besides the small
16 sand layer, the lower hundred feet of the hole,
17 approximately, is basalt volcanics, lava flows.

18 But the next log to the right, under
19 the same name "Connolly," only Collin Connolly,
20 shows a 400 foot well with very little distance
21 between them. And I'm embarrassed to say -- oh,
22 here (indicating) it is.

23 The horizontal scale is one inch equals
24 3,000 feet. And I would say, that those
25 lithologic sections is what we normally go by.

1 They are no more than one inch. I -- you know,
2 let's say, that they are, you know, a half a mile
3 apart.

4 Well, the basalt volcanics, the thick
5 basalt volcanics in the Collin Connolly well is
6 at 300 feet. And yet, they are only a half mile
7 apart. So assuming they are the same volcanics,
8 which we can't say for sure, but one
9 would -- might suspect a -- that a fault occurs
10 between those two wells where the basalt
11 volcanics in the Collin Connolly well at 300
12 feet, have been offset down to 900 feet in the
13 Wallace Connolly well.

14 And if you then look over farther to
15 the right, to the John Busack well. The basalt
16 encountered in that well is, you know, not
17 too -- not too far different than it is in the
18 Collin Connolly well.

19 The same situation between Busack and
20 Corrington. The basalt lavas appear to be fairly
21 high near the surface. Yet, they are down over a
22 relatively short distance, you know, 300 feet in
23 the Busack well. And this is over along the
24 basalt margin of the plains.

25 So those are the kind of things that

1 start you looking about the possibility of
2 faults, significant offsets of something that is
3 recognizable.

4 And in drillers data, the most
5 recognizable thing is when they are drilling hard
6 rock, basalt mechanics. Because it often means
7 that they have to change bits, or change the
8 drilling method, or give up, or whatever.

9 Q. Mr. Squires, with regard to the Wallace
10 Connolly and Collin Connolly comparison in these
11 two wells on Exhibit 27, page 12, I note that
12 there is a large sand unit just on top of the
13 basalt in -- in appears to be both cases.

14 Although in the Collin case, the sand unit is
15 separated by some blue shale. Do you see that?

16 A. Between Wallace and Collin?

17 Q. Yes.

18 A. Yes.

19 Q. Would it be reasonable
20 hydrogeologically, if that sand were saturated,
21 to assume that the aquifer represented by the
22 sand in the Wallace Connolly well, is continuous
23 and unbroken through the sand above the basalt in
24 the Collin Connolly well?

25 A. Well, in the first place, that's not a

1 very thick sand. So just intuitively, in given
2 the kinds of processes that lay down these units,
3 you wouldn't necessarily expect that that sand
4 would go too far anyway, because it's not a
5 really thick unit.

6 So it -- and especially, in this
7 section (indicating), this really thick blue
8 shale section, I think the answer to your
9 question is, no.

10 Q. Let's go back then to Figure 3 of
11 Exhibit 44, that we've discussed at some length
12 already. And compare the trend of the Pierce
13 Gulch Sand in that cross section with what you've
14 just described in Exhibit 27.

15 And I had asked you about the
16 reasonableness of connecting sand units between
17 the two Connolly wells. What about the
18 reasonableness hydrologically, in your opinion,
19 of connecting the sand units between these
20 several wells here; especially, between test well
21 No. 1, and test well No. 4?

22 A. I would say, it's a certainty.

23 Q. What can you tell us about -- since
24 we've been talking about just now -- about some
25 of the granitics, and some of the area to the

1 northeast of the M3 property. What can you tell
2 us about the property that may be generally
3 described as the Sun Corp. property, or the
4 property up near what has been deemed by other
5 witnesses, as the Willow Creek Aquifer, and so
6 forth?

7 Could you give us an overview, for the
8 benefit of the Hearing Officer, what the
9 relationship is between the M3 PGSA area and the
10 areas to the northeast? Could you give us a
11 description of how that lays out?

12 A. Well, we have some familiarity with
13 that area, because we worked on almost all of
14 those wells. We've run geophysics in those
15 wells. We ran the original geophysics for the
16 Spring Valley Ranch wells.

17 Q. And when you say "those wells," could
18 you be more specific?

19 A. Sun Corp. commissioned a series of test
20 wells. In fact, they approached us to do a study
21 up there early on. And we didn't do that study.
22 They ultimately engaged Scanlan Engineering and
23 Feast Geosciences to do that study. And they
24 drilled a series of exploratory test wells up
25 there high on the Boise front. But they hired us

1 to do the geophysical logs in those.

2 Q. Who hired you?

3 A. Scanlan Engineering. So we have some
4 familiarity with it. And we have looked at those
5 cuttings, and we have looked at the geophysical
6 records from those wells.

7 But I'm familiar with the geologic
8 section up there to a certain extent as well.
9 And it starts with the oldest rocks, the granitic
10 highlands, which is the Idaho batholith, which
11 are the higher -- which is the highest terrain up
12 there, older, deep. Even though it's at the
13 surface, it's underlying the rest of this stuff.

14 Then overlying the top of that is a
15 series of volcanic rocks, that include rhyolite
16 flows, which are sort of more explosive; basalt
17 flows; lava flows; and a series of altered
18 volcanic sediments, that include basalt tuffs,
19 and just volcanic-clastic type sediments, mostly
20 impermeable. They are very -- a lot of them are
21 altered. They look more like dense clays when
22 drillers drill them.

23 And most of the higher Sun Corp. wells
24 are drilled in that -- what is informally called
25 the Boise Volcanic Assemblage. Overlying that is

1 the sand facies of the Terteling Springs
2 formation.

3 Q. What are sand facies?

4 A. Well, a facies is a -- it is a -- it's
5 like a gradation. It's a -- you would have a
6 similar unit that was laid down at the same time.
7 But up near where the rivers run into the basin,
8 it would be coarse sand. And gradually down and
9 down getting finer and finer to where out in the
10 lake, it's mud.

11 They are really laid down at the same
12 time. They are the same stratigraphic unit, but
13 they are -- they are different based on their
14 depositional. So the Terteling Springs is
15 characterized by a near shore delta, really
16 extremely coarse sand formation, that grades
17 rather quickly into muds and clays. But they are
18 the same unit. They are just right next to each
19 other.

20 And so the Terteling -- the sand facies
21 of the Terteling Springs formation above M3 and
22 beneath the -- well, it's actually beneath a good
23 part of M3, and beneath the -- well, it's
24 actually beneath a good part of M3 and beneath
25 part of Sun Corp. It lays there along, you know,

1 with Willow Creek Road. It's a very, very coarse
2 grain, near shore sand deposit.

3 And it has been informally named the
4 Willow or -- yeah, the Willow Creek Aquifer,
5 because it's underneath Willow Creek. And in
6 this cross section, Figure 3, it's
7 depicted -- it's the area that you spoke of
8 earlier with the deeper water levels.

9 Q. Yes.

10 A. And it straddles the -- one of the
11 faults that we know about, the west-Boise Eagle
12 fault. And then above that is the Pierce Gulch
13 Sand Aquifer.

14 Q. How is the Willow Creek Aquifer best
15 described in relation to the Pierce Gulch Sand
16 Aquifer?

17 A. Well, stratigraphically it's underneath
18 it. It's --

19 Q. It's underneath it, because it is, in
20 fact, part of the Terteling Springs sand facies?

21 A. Yes. And it's older. It was laid down
22 prior to the Pierce Gulch Sand. The Pierce Gulch
23 Sand was actually derived from the delta deposits
24 along the highest stand of the lake.

25 So you have this delta that's getting

1 deposited in still water. Think of it, if you
2 will, sort of a bathtub ring around the basin
3 this deposit of really coarse, thick sand. And
4 then when the -- when an outlet to the lake was
5 found, and the water began to drain out of lake
6 Idaho --

7 Q. In which location or direction; do you
8 know?

9 A. Well, it drained off to the northwest.
10 But what happened then, is the lake bed was
11 gradually exposed by the declining water level.
12 And now these deltaic deposits that were
13 stranded, if you will, along the shore of the
14 lake, they became exposed to erosion.

15 Because when rivers run into lakes,
16 they lose all their carrying power. They run
17 into still water. So they can't carry sand and
18 gravel. It just drops out along the shore. So
19 that's why I say they were stranded there.

20 But then when the lake level dropped,
21 now you have fluvial processes in rivers that are
22 able to winnow the sand, and drag it out across
23 the exposed lake bed. And that became -- that
24 was the start, at least, of the Pierce Gulch Sand
25 Aquifer, especially, in the vicinity of M3.

1 And I believe that that's in part
2 responsible for the really high transmissivities
3 at -- in the Pierce Gulch near M3. Because it
4 means that these sands were re-worked more than
5 once.

6 First, they were re-worked into this
7 delta, and the fines were winnowed out and went
8 farther to basin-ward. But then they got
9 winnowed again. And that cleans the fines out,
10 and makes them very permeable.

11 Q. Mr. Squires, I would like you to refer
12 back to Exhibit 42. And this time -- and again,
13 that's the M3 water right application, and it
14 includes a number of figures, including Figure 6
15 under, I think, it's Tab A 4.

16 A. (Witness complying.)

17 Q. Is it accurate to say, that that Figure
18 6 was included in that original, you call it a
19 lay -- a study for the layperson that you
20 produced in July of 2007?

21 A. Figure 6?

22 Q. Yes.

23 A. (Witness complying.) And the question,
24 please?

25 Q. The question was: Is that part of that

1 first hydrologic report you produced?

2 A. It is.

3 Q. And could you explain to the Hearing
4 Officer some of the features on this Figure 6,
5 including the Willow Creek, the granitics, the
6 Pierce Gulch Sand Aquifer, this green line that
7 goes through the middle of the diagram and the
8 dashed red line?

9 A. Okay. The light blue section, which is
10 essentially the -- we'll say, 45 percent of the
11 map on the lower left, labeled the "Pierce Gulch
12 Sand Aquifer," that's the aerial extent as, we
13 believe, it exists of the Pierce Gulch Sand.

14 Q. That is the aerial extent, at least as
15 this map shows. Does it extend further to the
16 south, and/or west, and/or southeast?

17 A. Yes, it does.

18 Q. Okay. Continue.

19 A. And to explain the -- well, I'll just
20 continue along with this figure then.

21 It also shows in the dark blue, this
22 Willow Creek Aquifer that we're talking about.
23 It appears as a wedge that terminates near the
24 southeast edge of the M3 property. It's bounded
25 on the north by a red dashed line. And it's

1 bounded on its southwestern side by the green
2 line that you reference.

3 Q. What is that green line? And if you
4 would like to refer to one of your cross
5 sections --

6 A. Well, you know, what I would like
7 to --

8 Q. -- please, feel free.

9 A. What I would like to refer to is of
10 this same exhibit, Figure 3.

11 Q. Yes.

12 A. It's just one page back. Figure 3, and
13 actually Figure 2, that we spoke about before.

14 Q. Yes.

15 A. I'll start with Figure 2. Figure 2, as
16 you recall, is your table top representation of
17 the base of the Pierce Gulch Sand Aquifer. Well,
18 we took the elevations -- the actual elevations
19 of the base of the Pierce Gulch Sand Aquifer in
20 Figure 2, and we plotted them on this map, which
21 is Figure 3. And those well locations are shown
22 on Figure 3 by the triangles, the labeled
23 triangles that are across the map.

24 We plotted the elevation. And then we
25 contoured that, which we consider to be the base

1 of the Pierce Gulch Sand Aquifer. And the dark
2 lines of Figure 3 are our best understanding of
3 the base of the Pierce Gulch Sand Aquifer. That
4 is the contact between the bottom of the Pierce
5 Gulch Sand Aquifer and the underlying mud stone
6 of the lake bed, the Terteling Springs formation.

7 Q. So am I reading this correctly then,
8 that the Pierce Gulch Sand Aquifer, if I imagine
9 it as a thick plain, a few hundred feet thick,
10 actually is tipping toward the southwest --

11 A. Correct.

12 Q. -- tipping down toward the southwest?

13 A. That is correct. So now to -- with
14 reference to the green line, which takes some
15 explanation, because the green line is a concept.
16 But Mr. Vincent testified yesterday, correctly,
17 that the green line is -- it is several things.
18 But one of the things that he testified to is
19 that it is the contact.

20 That it does represent, at least in
21 part, the contact between the Terteling Springs
22 mud stone and the Pierce Gulch Sand Aquifer.

23 Q. And the base of the Pierce Gulch Sand
24 Aquifer?

25 A. Yes. And what it -- what it is meant

1 to signify in this diagram, is that if you extend
2 these contours up from these well locations that
3 we've located, and there is quite a few of them.
4 And they include all the wells that are on Figure
5 2, plus many more. If you project that the base
6 of the aquifer, the dipping lake bed upwards,
7 this is where it would essentially break the land
8 surface. Now, of course, it doesn't look like a
9 line on the land surface, because it's a really a
10 topographical surface. So the line would be
11 contorted.

12 Q. And the line would be contorted,
13 because that surface has been eroded --

14 A. Correct.

15 Q. -- by many forces over many eons;
16 correct?

17 A. Yes. But for the conceptual purposes,
18 that would mean that the Pierce Gulch Sand
19 Aquifer ceases to exist at that location. And
20 the other -- one of the other images to have
21 about the green line is that it's also
22 representative of the unsaturated edge of the
23 aquifer. Where we pointed out in the previous
24 cross sections, that the sand grows out of the
25 water. If you recall, that in the test well No.

1 2 and the test well No. 3, that only half of the
2 aquifer was saturated. That green line also is
3 to signify that.

4 So another -- a third thing that you
5 could think about the green line, is that the
6 green line represents a boundary to the aquifer,
7 clearly.

8 Q. Anything else about that figure, or
9 maybe Figure 5, that you would like to refer to
10 in this exhibit. That is in the Exhibit 42.

11 A. Well, I guess you were asking me about
12 Figure 6, and I took you off.

13 Q. I was, originally --

14 A. Yeah.

15 Q. -- Figure 6 of Exhibit 42.

16 A. So that explains the green line of
17 Figure 6. That's the edge of the aquifer. It's
18 where the Pierce Sand surfaces and ceases to
19 exist on the M3 property.

20 Q. Now, Figure 6 also has some blue arrows
21 on it, a number of them. I think this is a
22 question that I want to take up with you later.
23 But could you just give -- while we're there,
24 could you give the Hearing Officer an
25 understanding of how those arrows were derived?

1 A. Yes. If you -- if you look a little
2 deeper into this diagram, you'll see that there
3 is a scattering by -- this is Figure 6. You will
4 see that there is a scattering of red colored
5 diamonds throughout the diagram. Quite a more
6 dense cluster of them in the vicinity of Eagle
7 and Star, but a few scattered out around, you
8 know, up north of Middleton, and over to the
9 Payette Valley, and some up in the granitic and
10 volcanic bedrock area that we talked about
11 earlier on the center right side of the diagram,
12 the Sun Corp. and the Spring Valley Ranch wells
13 that we just talked about.

14 Well, those red diamonds represent
15 wells that we measured as a part of our first
16 initial water level measuring program out in this
17 area. And just like we took the -- the triangles
18 that form the base of the aquifer in the previous
19 figure, we plotted these wells as to where they
20 are, and their elevation of the measured water
21 level. And from that, we derived a second
22 contour map, that are these dark lines here
23 (indicating) across the diagram. And those are
24 the water level contours.

25 Q. That is the top of the aquifer?

1 A. No, it's the artesian head, or the
 2 pressure, or the water table of the aquifer
 3 itself, the surface of the Pierce Gulch Sand
 4 Aquifer.
 5 Q. So just so I have this straight. This
 6 would be the potentiometric surface of the
 7 aquifer, not the top elevation of the sand unit
 8 itself?
 9 A. That is correct. It's the level at
 10 which water levels rise in a well.
 11 And then the arrows that you discussed,
 12 because ground water flows normal or
 13 perpendicular to these contour maps, the arrows
 14 are drawn on there to give an indication of the
 15 general direction of ground water flow. And that
 16 was our -- and this is an interpretation of the
 17 way we see ground water moving beneath the site,
 18 based on these 167 wells that we measured.
 19 Q. Okay. We will return to this question
 20 of ground water flow in -- later in your
 21 testimony. But I just wanted to make sure that
 22 the Hearing Officer had a sense of how the
 23 geology is arranged in this part of North Ada
 24 County.
 25 Is there anything else about the Willow

1 Creek Aquifer, the granitics, or the PGSA in this
 2 location, that this figure, or the one that you
 3 had referred to previously tells us, that you
 4 feel you would like to explain to the Hearing
 5 Officer at this point?
 6 A. Perhaps we could just turn one page
 7 back to Figure 4. I guess that's two pages back.
 8 It's an attempt at showing a -- the cross
 9 sections that we've been looking at in three
 10 dimensions.
 11 Q. And this is Figure 4 of Exhibit 42;
 12 correct?
 13 A. Correct. These kinds of
 14 representations are referred to as block
 15 diagrams. And it's an attempt to try to look at
 16 it in 3-D. And they are difficult to do. But I
 17 think this gives an indication. I think this may
 18 help to go from this flat map to what the aquifer
 19 actually looks like underground.
 20 And we've depicted the Pierce Gulch
 21 Sand Aquifer here (indicating). And
 22 these -- this is a conceptual diagram, but it's
 23 not too far from reality. I mean, the aquifer is
 24 drawn, essentially, in the correct place.
 25 It's --

1 And the Pierce Gulch Sand Aquifer, as
 2 you can see, it shows it up dipping. I mean, it
 3 shows that it grows closer to the surface to the
 4 east and deeper to the west. Do you see that?
 5 And also on this diagram, although it
 6 may not be that clear, are -- there are a series
 7 of wells that you see there represented as
 8 vertical blue lines. They are labeled Star 3, M3
 9 1, United Water Idaho, that's the State and
 10 Linder well, Lexington Hills, and others.
 11 Well, those are the wells that are
 12 tried to be shown in there, according to their
 13 location. And those go down and encounter the
 14 Pierce Gulch Sand Aquifer. And, of course, you
 15 can't see that in this diagram, because they are
 16 inland.
 17 But two things that are important about
 18 this diagram. They show the granitic and
 19 volcanic rock in the uplands. That sort of
 20 grayish pink shaded area labeled. And then you
 21 see the red dashed line that is the
 22 representation of the west-Boise Eagle fault,
 23 which is the most significant basin bounding
 24 fault that we've identified, that Dr. Wood has
 25 identified. That is represented in Figure 6 by

1 the red line -- the red dashed line.
 2 But I think of significance there, is
 3 that you also see the dashed green line that
 4 departs from the red line right there, where it
 5 says "M3 2." That's the surface expression of
 6 where the Pierce Gulch Sand Aquifer ends. That's
 7 the edge of the boundary there, remember. That's
 8 the edge of the aquifer at M3.
 9 Now, more to the southeast, and in the
 10 west-Boise Eagle area that's not so much depicted
 11 on here, we believe that a boundary is formed by
 12 the west-Boise Eagle fault. So there are
 13 two -- there are two separate boundaries is what
 14 I'm pointing out. And the west-Boise Eagle fault
 15 does not form a boundary to the aquifer in the M3
 16 area. That's something I would point out.
 17 And the only other thing I would
 18 comment on. Back on Figure 6, and it's not
 19 labeled or indicated on this map, but you see
 20 that there is kind of a serrated edge to the
 21 Willow Creek Aquifer on its northwestern side?
 22 Well, that's because the Willow Creek Aquifer is
 23 not nearly as well characterized as the Pierce
 24 Gulch is. It's kind of a -- it's a much smaller
 25 feature in this area. It appears to grade to

1 sands that may be related to the Payette River,
2 as well as the Terteling Springs formation. And
3 that's not clearly understood yet.

4 What we do know is that as you move to
5 the north from M3, and as you move north of
6 Middleton, and towards Pierce Gulch Sand Aquifer
7 toward the Payette River in the area of Letha and
8 Emmett, that all the surface outcrops that we
9 see, and all the wells that we look at, tend to
10 show a preponderance of sand. It grows more sand
11 dominated in that direction.

12 So we're not sure exactly how those
13 aquifers intermingle and grade into each other.
14 But for us, those aquifers, and especially, the
15 granitic volcanic bedrock, some stranded sands up
16 in that area, the Willow Creek Aquifer, those are
17 not -- those are not big picture aquifers to our
18 application. We're not so much concerned with
19 those. We're more concerned with the regional
20 aquifer, the extensive aquifer that is the Pierce
21 Gulch Sand.

22 Q. Would you say that the Willow Creek
23 Aquifer is a productive aquifer?

24 A. I would say it's very productive. It's
25 even more productive than the Pierce Gulch Sand

1 Aquifer.

2 Q. What about its recharge potential?

3 A. Well, in this area, I feel it's in the
4 area of M3, and somewhat to the northwest from
5 there. I feel that it's re- -- it is
6 characterized by pretty low amounts of recharge.

7 Our geochemistry studies have shown
8 that it's pretty much recharged by precipitation.
9 That would be --

10 Q. That would be precipitation running
11 down off of the mountain front?

12 A. Yeah. The thing about the Willow Creek
13 Aquifer is the Terteling Springs sands come to
14 the surface there. I mean, it's very easy for
15 runoff to get into the aquifer. It's very, very
16 permeable all the way to the surface.

17 But it's -- it is a highly bounded
18 aquifer, we believe. Because it has the granitic
19 rocks close at hand. The volcanic rocks close at
20 hand to the northeast. It's bounded by its own
21 facies changed to mud to the southwest. And it
22 also is impacted by the west-Boise Eagle fault.

23 But, we believe, it's pretty strongly
24 connected to recharge -- well, I won't call them
25 recharge sources. It's connected to water in the

1 Payette Valley.

2 And if you'll look at the Willow Creek
3 Aquifer -- and I don't mean to get off on a
4 tangent here with this -- with this aquifer. But
5 if you compare the ground water contours in the
6 Willow Creek Aquifer, you'll see that they are
7 quite a bit different than those in the Pierce
8 Gulch Sand Aquifer. That is, the contour
9 interval in the Pierce Gulch Sand Aquifer are 50
10 foot contours.

11 In the Willow Creek Aquifer, they are
12 10 foot contours. And so that indicates that
13 it's a very, very low gradient. The water level
14 in the Willow Creek Aquifer is very, very flat.
15 That indicates very high transmissivity.

16 Q. Is that one of the reasons why you say
17 it is maybe more productive than the Pierce Gulch
18 Sand Aquifer?

19 A. Yes, it's very high transmissivity.
20 It's a very clean coarse sand, very thick.
21 Transmissivity is also affected by thickness of
22 aquifer, and it's thick.

23 Q. But in terms of productivity of the
24 Pierce Gulch Sand Aquifer, what would you -- how
25 would you compare it to the -- excuse me -- the

1 Willow Creek Aquifer, how would you compare it to
2 the Pierce Gulch Sand Aquifer in terms of its
3 ability to maintain sustainable supplies over the
4 long term?

5 A. Well, as you noted on the previous
6 cross sections, the water levels in the Willow
7 Creek Aquifer are substantially deeper than they
8 are in the Pierce Gulch. So on the M3 property,
9 the Willow -- the water level in wells on the M3
10 property and the Sun Corp. test wells are, you
11 know, 450 to 550 feet below ground. They are
12 very deep. If memory serves, that's very close.
13 So, obviously, if the non-pumping water level is
14 500 feet below ground, you've already got a
15 pretty high pumping lift.

16 Q. That's in the Willow Creek?

17 A. In the Willow Creek. And in order to
18 get substantial recharge for the Willow Creek, I
19 believe it would be possible to do so by pumping
20 the Willow Creek, and ultimately reversing that
21 flat gradient. So that you now have a gradient
22 back away from the Payette River basin toward
23 wells under M3.

24 I believe that could be done. And I
25 think you'd have, for example, let's see 23, 20,

1 23, -- I mean, you would need to perhaps drawdown
2 water levels at least 50 feet to cause water to
3 flow from the northwest to the southeast in the
4 Willow Creek.

5 Q. Mr. Squires, with regard, again, to
6 Figure 6, the little red diamonds. The diamonds
7 over in the Payette River Valley have water
8 potentiometric heads that appear to be lower than
9 those in the Pierce Gulch Sand Aquifer to the
10 southeast. Is that a correct inference?

11 A. Yes.

12 Q. So ground water levels are lower, for
13 example, in the well near Letha, than they would
14 be in a well on M3 in the Pierce Gulch; is that
15 right?

16 A. That's correct. The valley floor, of
17 course, because the Payette has a base level
18 lower down on the Snake River, the valley floor
19 of the Payette Valley is much lower than the
20 valley floor of the Boise Valley. And so
21 it's -- so the well head elevations in the land
22 surface in the Payette Valley is significantly
23 lower than those in the Boise Valley.

24 Q. Mr. Squires, do you understand the M3
25 application as seeking any kind of water

1 production out of the Willow Creek Aquifer?

2 A. You know, I honestly can't recall that.

3 Q. What --

4 A. I would have to look at the water right
5 application to see if we have points of diversion
6 in the Willow Creek Aquifer. There may be some.
7 But our target aquifer is the Pierce Gulch Sand.

8 Q. The target aquifer, to your knowledge,
9 is the Pierce Gulch Sand, and not the Willow
10 Creek; right?

11 A. Well, another attribute of the Willow
12 Creek Aquifer is it has also some questionable
13 water quality issues, namely arsenic. And so not
14 only would it have very high pumping lifts, but
15 it would also have treatment costs associated
16 with that.

17 And because we believe that there is
18 ample water available in the Pierce Gulch Sand
19 Aquifer, there would be no economic incentive to
20 draw from the Willow Creek Aquifer. But it would
21 be there, providing we have sources, points of
22 diversion in it, which I believe, we do as a
23 source. Just as the aquifer -- the smaller
24 aquifer underlying the Pierce Gulch Sand Aquifer
25 would be present underneath the site as well.

1 Q. I would like to switch gears a little
2 bit here, Mr. Squires, and discuss your
3 experience with water right applications where
4 there have been concerns about the productivity
5 of an aquifer.

6 Is it your experience that you
7 have -- you've always been on the side of trying
8 to prove that there is more ground water
9 available?

10 A. I think we've been on the side of
11 determining what the ground water development
12 potential is.

13 Q. Can you -- do you have some experience
14 that might help the Hearing Officer understand
15 your experience with determining potential limits
16 to aquifers?

17 A. Well, I would say that one of the major
18 things that we do in my company is characterize
19 aquifers, and determine the ground water
20 development potential of aquifers. We've done
21 many, many projects like that. I've done those
22 kind of projects for United Water Idaho. Some
23 examples would be the southeast Boise ground
24 water area, the south of Boise fan aquifer.

25 Q. What is the southeast Boise ground

1 water area, and how does it relate to this
2 question?

3 A. Well, it is an area on the east side of
4 Boise, in the Micron area, I guess, I would say,
5 northeast of Interstate 84, generally speaking,
6 and over to the foothills. And it is -- it's a
7 separate aquifer. It's a separate hydrogeologic
8 framework. It -- it's a fan aquifer. It's
9 characterized by alluvial fans, fluvial materials
10 entering the basin.

11 Q. What did you do there? Did you
12 determine that there was some limit there?

13 A. Well, there was a history of -- long
14 before I came along, of problems with wells
15 there.

16 Q. Problems of what type?

17 A. Well, initially, I think a lot of the
18 problems were well construction problems. But
19 United Water Idaho was having difficulty -- there
20 were a lot of complaints about declining water
21 levels in that area.

22 And there was -- during one of the
23 growth periods of this valley, there was an
24 emphasis on development out there, the Columbia
25 Village development, some golf courses. Micron

1 was expanding. United Water had interest in the
2 area. They wanted to know if there was
3 additional water. The Les Bois Soccer League
4 Invitation, that is now the Simplot Sports
5 Complex, wanted to -- quite a bit of water for
6 irrigation. So there was quite a push for ground
7 water development beneath that area.

8 United Water Idaho hired me to
9 characterize that area. It was before I worked
10 for them. And we found through our monitoring,
11 and through our characterization of the area,
12 that you could, indeed, get very large productive
13 wells there. But that the aquifer was limited.
14 Its recharge was limited. And its drawdown
15 potential was limited.

16 So we prepared a research report, and
17 submitted it to the Department, I think, it was
18 in 1990. And based on that research, which was
19 brought forward by United Water Idaho, the
20 southeast Boise ground water management area was
21 delineated.

22 And, basically, what we found was that
23 you could put more wells in the area, but you
24 couldn't take out more water, because the wells
25 could not be deepened. And the water levels that

1 were such already at what, I guess you could say,
2 was at a reasonable level to allow the production
3 there. And so new appropriations have been cut
4 off from that area of town.

5 And since that time, the monitoring has
6 showed that the aquifer has stabilized, and there
7 haven't been problems out there. I am still on
8 the advisory committee for that aquifer. I have
9 been since the aquifer -- the ground water
10 management area was declared. And we meet -- the
11 committee meets once a year, and there is no
12 longer any problems out there.

13 I also worked on a similar ground water
14 characterization study for the south Boise area;
15 Ten Mile Ridge south of -- south of the airport
16 between the airport and the prison for United
17 Water Idaho.

18 Q. Did you file or prepare any water right
19 applications in connection with that?

20 A. Yes, a number.

21 Q. And could you describe what those
22 involved? How much water?

23 A. Well, one of the -- one of the goals of
24 United Water Idaho was to develop more water in
25 the southeast Boise area. But when the research

1 showed that we couldn't obtain additional water
2 for their wells in that area, then I suggested
3 that we begin to look at this area south of the
4 airport.

5 So we did a ground water
6 characterization study out there. And ultimately
7 drilled four -- a set of four wells, known as the
8 Ten Mile Ridge wells, they are all high
9 producers. And we developed about a 12 -- give
10 or take -- 12 cfs water right out there, that I
11 also did the beneficial use on.

12 Q. You did the beneficial use exam?

13 A. Yes.

14 Q. Are you a certified beneficial use
15 examiner?

16 A. A certified water right examiner, yes.

17 And I don't know if that answers your
18 question? But we -- those are the kind of
19 studies that we do for business.

20 Q. And how are those Ten Mile Ridge wells
21 producing today; do you know?

22 A. Yes. Well, in the beneficial use exam,
23 we showed the pumping at the -- all at the same
24 time, they could produce 12 cfs, slightly under
25 12 cfs.

1 They have caused an imprint on the
2 water table certainly, not a large one, though.
3 In fact, in contrast in the southeast Boise area,
4 where you had large interference effects between
5 wells, we -- for example, we did a 30-day aquifer
6 test in the southeast Boise ground water
7 management area, and we saw drawdown effects
8 seven miles away in, you know, in the course of
9 that test, you know, on the order of seven feet.

10 In the southeast Boise -- or the south
11 Boise area, we did an aquifer test, it was
12 intended to be 30 days, but it didn't make it
13 because of complications. We hardly -- we saw
14 very little drawdown, you know, less than a foot
15 in many cases.

16 So it's a very productive and stable
17 area. The water levels in the monitoring there
18 have remained almost unchanged in the 30 years
19 since the first wells were drilled out there, I
20 mean, almost to the nearest foot.

21 Q. Out in the South Ridge?

22 A. In the South Ridge, yes. And those
23 wells, although they caused a cone of depression
24 around the four wells -- and there have been
25 other wells they have added out there. We've

1 worked on wells -- recent wells for the
2 Penitentiary, the ISCI, Idaho State Correctional
3 Institution. And we've brought some wells online
4 out there. We're working on a new well out there
5 now. That cone of depression has stabilized.
6 It's caused X number of feet of drawdown, and
7 it's no longer drawing down.

8 Q. Mr. Squires, with regard to Exhibit 27,
9 you mentioned -- just to return once again to
10 that. You mentioned that the cross sectional map
11 showing where those cross sections were laid out
12 looks kind of like a spiderweb?

13 A. The map, I said was missing. There is
14 a map that shows these lines of sections, as the
15 previous map that we referred to.

16 (Exhibit 70 marked.)

17 Q. (BY MR. FEREDAY) I'm having handed to
18 you what is -- what I'll mark as Exhibit 70. And
19 ask you to identify that, please.

20 A. This is the map of the -- that I
21 referred to, that is corresponded to this set of,
22 I think, it's 17 cross sections that we drew from
23 available drillers data. And these -- this map
24 is -- shows the lines of sections. So, for
25 example, if you look at Exhibit 27, the first

1 page. That's cross section A-A or A 8 -- well,
2 let me make a different example here. Something
3 that's a little easier to follow.

4 Okay. If you go to page 6 of Exhibit
5 27, you will see at the upper left-hand side of
6 the page, it says, "Geologic cross section E-E
7 prime."

8 Q. Upper right-hand side?

9 A. Do you see that?

10 Yeah. Did I say left?

11 Q. Yes.

12 A. The upper right hand corner, it says,
13 "Geologic Cross Section East-East Prime," E-East
14 prime at the top of the page.

15 Q. Yes.

16 A. Well, if you refer to this map that was
17 just passed out. If you look in the upper left
18 corner of that map, you'll see that there is an E
19 prime up there, and the well is labeled "Gem
20 County," "Gem C-O." Do you see that in Jackass
21 Gulch?

22 Well, that's the E prime that
23 occurred -- that corresponds with the E prime of
24 this cross section. That's the well. If you
25 look there on the right -- the right side of page

1 6, you'll see Gem County Board of Commissioners,
2 that's that well. Do you see that?

3 Okay. And then if you follow that line
4 down --

5 Q. I see that the line continues down and
6 ends right there at Star No. 3?

7 A. Correct.

8 Q. Is that --

9 A. So that --

10 Q. -- is that that cross section, E-E
11 prime?

12 A. Yes.

13 Q. And are -- is this map, which I've
14 marked as Exhibit 70, accurately depict the
15 locations of wells and the cross-sectional lines
16 in Exhibit 27?

17 A. I hope so. I think so. Yes, it does.

18 Q. Did you prepare this, or was it
19 prepared at your direction?

20 A. Yes, I prepared it.

21 Q. And why wasn't it -- why was it not
22 included with the Exhibit 27, as they were
23 provided on -- in November of '08?

24 A. I don't know. I thought it was.

25 Q. So was it an inadvertent omission, or

1 do you know?

2 A. Apparently, so. I don't know why it's
3 not there.

4 MR. FEREDAY: Mr. Hearing Officer, we
5 offer Exhibit 70 as some -- as an exhibit to
6 further explain Exhibit 27.

7 THE HEARING OFFICER: Mr. Thornton,
8 have you reviewed this map?

9 MR. THORNTON: Well, just -- I don't
10 have any objection to it. Obviously, we just got
11 it. So I haven't reviewed it. But we don't have
12 any objection.

13 THE HEARING OFFICER: Okay. Mr. Smith?

14 MR. SMITH: No objection.

15 THE HEARING OFFICER: Mr. Edwards?

16 MR. EDWARDS: No objection.

17 THE HEARING OFFICER: Document marked
18 Exhibit No. 70 is received into evidence.

19 (Exhibit 70 admitted into evidence.)

20 Q. (BY MR. FEREDAY) Mr. Squires, I know
21 we've been through quite a bit of laying some
22 preliminary ground work about the geology of this
23 area in the Pierce Gulch Sand Aquifer.

24 I would like to ask you some questions
25 about what specifically you have done in pursuit

1 of this, of your studies for this application.
 2 But before we get to that, I would like to ask
 3 you a few preliminary questions about -- about
 4 your experience here in this application process.

5 First of all, when you were approached
 6 by Mr. Brownlee of M3 Eagle, what were you asked
 7 to do?

8 A. I was approached by Mr. Brownlee to
 9 determine the available water supplies for his
 10 proposed project.

11 Q. Did Mr. Brownlee indicate to you that
 12 he knew that there was ground water under his
 13 property?

14 A. No. In fact, one of the -- one of the
 15 avenues that we were free to pursue was
 16 developing surface water supplies, if necessary.
 17 I think Mr. Brownlee used -- was familiar with
 18 the projects in other parts of the west,
 19 particularly the southwest, where surface water
 20 is used routinely, and in some cases
 21 transported -- as it would have to be in this
 22 case, many miles to get to the site. But it was
 23 not out of the question.

24 Q. Did you help prepare the water right
 25 application?

1 A. Yes, I did.

2 Q. Did you work with any other consultants
 3 with regard to the amounts of water that would be
 4 needed for various purposes?

5 A. Yes, I did. I worked with Steve Holt
 6 and Scott Wonders, and both of their staffs, all
 7 the way through the development of the water
 8 right application, and the spreadsheet that is in
 9 the water right application.

10 Q. That spreadsheet is the one that
 11 Mr. Holt testified to? Did you hear his
 12 testimony?

13 A. Yes, I did, that's correct.

14 Q. Did you hear the Hearing Officer's
 15 questions to Mr. Wonders about fire flows?

16 A. I did.

17 Q. What do you understand about fire flows
 18 as a part of this water right application?

19 A. My understanding is that water rights
 20 are not needed for fire flows. And in our
 21 development of the spreadsheet, no part of the
 22 instantaneous diversion rate is attributed to
 23 fire flows. There is a small storage component
 24 attributable -- in the two tanks, that is
 25 attributable to fire flows, a residual amount

1 that remains in the tank. It's a very small
 2 amount.

3 Q. Okay. With regard to Mr. Dittus'
 4 testimony yesterday, did you hear that?

5 A. Yes, I did.

6 Q. Did you hear his description of the
 7 State and Linder test well?

8 A. I did.

9 Q. Was his characterization correct as far
 10 as you are concerned?

11 A. I thought he did a very good job of
 12 describing it. I -- we worked on that well
 13 together. Roger was part of my staff when I was
 14 at United Water Idaho, and he had an integral
 15 part in building that well, which I designed.

16 Q. Do you recall discussions that I had
 17 with Mr. Dittus yesterday, about the hydrograph
 18 of the State and Linder well, that included the
 19 downward spike just fairly recently, I think,
 20 within the last year or so? Do you recall that?

21 A. Yes.

22 Q. I would like you to refer to
 23 exhibit -- I believe, it's Exhibit 12. And it's
 24 figure -- Mr. Squires, excuse me, I'm not quite
 25 sure which figure that is.

1 MR. FEREDAY: And if we can go off the
 2 record for just a minute, because I want to
 3 return to that figure.

4 THE WITNESS: If I recall, Mr. Fereday.

5 MR. FEREDAY: Yes.

6 THE WITNESS: I think it was the figure
 7 that was included in the M3 response to the staff
 8 memorandum.

9 MR. FEREDAY: That's right.

10 THE HEARING OFFICER: Do you want to go
 11 off the record, Mr. Fereday?

12 MR. FEREDAY: Yes, let's do.

13 THE HEARING OFFICER: Let's go off the
 14 record.

15 (A recess was had.)

16 THE HEARING OFFICER: Okay. We are
 17 ready to go on.

18 Q. (BY MR. FEREDAY) Mr. Squires, prior to
 19 the break, I was asking you some questions to
 20 Exhibit 45, Figure 18. And I would like to refer
 21 to that, please, and answer a few questions about
 22 it.

23 You testified, I believe, that you are
 24 quite familiar with the State and Linder test
 25 well, and agreed with what Mr. Dittus said about

1 it yesterday. And I had asked Mr. Dittus about
2 that downward spike in -- sometime in 2008 on the
3 hydrograph in Figure 18.

4 Do you have that in front of you?

5 A. I do.

6 MR. FEREDAY: Could -- I just want to
7 make sure that the Hearing Officer has that in
8 front of him as well. It's --

9 THE HEARING OFFICER: I have it.

10 MR. FEREDAY: -- Figure 18 of Exhibit
11 45.

12 Q. (BY MR. FEREDAY) What can you tell us
13 about this hydrograph in Figure 18 for the State
14 and Linder test well, with particular reference
15 to that downward spike?

16 A. Well, first of all, there is two data
17 sets depicted in this hydrograph. One data set
18 is the symbols, the small triangles, and those
19 represent hand measurements that we've taken over
20 the years; some by my staff, some by BSU interns
21 that worked for me, some by Roger Dittus in more
22 recent years. And those represent hand
23 measurements at the well, just spot measurements,
24 just generally speaking, once a month.

25 Then in 2007, it looks like, judging

1 from the map, maybe in the winter of 2007;
2 January, something like that, we -- that is, M3
3 Eagle placed a continuous data logger in this
4 well to record continuous readings. And if
5 memory serves me, we have those readings on about
6 a one-hour interval. That is every hour it takes
7 a water level reading and stores it in its own
8 little memory chip.

9 And what I think you are focusing on is
10 the electronic data on the right side of the
11 graph. And what that shows, is that you'll see
12 there is an oscillation in there where the water
13 levels are highest in the early months of the
14 year and the late months of the year. And so
15 say, December to January, the water levels are
16 generally at their highest. And they are at
17 their lowest, say, in the late fall of the year,
18 say, October to November.

19 And that represents the annual
20 fluctuation, that approximate five foot
21 fluctuation, and that's very prevalent in almost
22 all wells in this valley. They are on an annual
23 cycle due to some stress or influence, whether it
24 be irrigation water you talked about in a
25 previous figure, or drawdown from other wells in

1 the regional aquifer, or whatever. But that
2 oscillation of approximately five feet, is the
3 annual -- what I call the annual fluctuation of
4 water levels within the aquifer.

5 Now, the spike that you are referring
6 to is an event separate from that. And it looks
7 like over a fairly short period, and I can't tell
8 you how long that period was, but if memory
9 serves me, it was over a period of two to -- two
10 to three days.

11 And so when we see something like that
12 in our monitoring data, of course, we try to see
13 what it is, because that gives us insight to
14 what's connected to what. And we were able to
15 determine what that spike was. And we contacted
16 the City of Eagle, Chris Duncan over there at the
17 City of Eagle.

18 Q. Is Mr. Duncan a hydrogeologist?

19 A. Yes, he is. And it turns out that one
20 of the City of Eagle's new wells was being tested
21 at that time. And it was being tested in
22 response to water system requirements imposed by
23 the DEQ. I think -- don't -- I'm not positive,
24 but I think to show maximum capacity, and perhaps
25 fire flow. I'm not sure.

1 But anyway, we obtained data from
2 Chris, who was monitoring the well. And it
3 appeared to us that the drawdown spike was
4 correlative with the time period of that test.
5 It's not surprising, because the State and Linder
6 test well was one of the monitoring wells in the
7 Eagle field test that we wrote up and reanalyzed
8 in our 16 -- reanalysis of 16 aquifer tests in
9 the -- as part -- for M3. And so it's not
10 surprising that it would show up there. And
11 that's what we think it's attributed to.

12 Q. Okay. Thank you.

13 You've been testifying with reference
14 to an exhibit -- or a figure in Exhibit 45. With
15 regard to Exhibit 45, Mr. Squires, would you
16 please identify what this exhibit is?

17 A. The exhibit or this figure?

18 Q. The exhibit in toto.

19 A. This is a response document we
20 submitted to the Hearing Officer in this case on
21 February 10th, two-thousand- -- well, actually,
22 on April 1, 2009, in response to the Hearing
23 Officer's February 10th, 2009, authoring
24 us -- authorizing us to respond to the technical
25 staff memorandum.

1 Q. Did you prepare this?
 2 A. Yes, I did.
 3 Q. Did your staff assist you?
 4 A. Yes, as others. As mentioned here in
 5 the first paragraph, we received input from
 6 Dr. Wood, from Dr. Osieny, Richard Glanzman and
 7 Peter Schwartzman.
 8 MR. FEREDAY: We offer Exhibit 45.
 9 THE HEARING OFFICER: Okay. This one
 10 was not stipulated to, as I recall.
 11 MR. FEREDAY: By Mr. Smith, that's
 12 correct.
 13 THE HEARING OFFICER: You stipulated to
 14 it?
 15 MR. THORNTON: We did.
 16 THE HEARING OFFICER: Mr. Smith, any
 17 objection to it?
 18 MR. SMITH: We would object that it's
 19 argumentative and self-serving.
 20 THE HEARING OFFICER: Okay. Well,
 21 Mr. Smith, most documents and evidence that comes
 22 in is of that nature in one -- on one side or the
 23 other.
 24 It's received into evidence.
 25 (Exhibit 45 admitted into evidence.)

1 Q. (BY MR. FEREDAY) Mr. Squires, in
 2 response to a colloquy that we had off the record
 3 with the Hearing Officer, there were a few
 4 questions raised about exactly what this green
 5 line is on, for example, Figure 6 of Exhibit 42.
 6 Could you, again, run through that
 7 exhibit, and also Exhibit 26, Figure 3
 8 was -- excuse me -- Exhibit 44, Figure 3, was
 9 raised in this same context. Perhaps with
 10 reference to those two figures, you could clarify
 11 some things about -- about the green line.
 12 It appears from Exhibit 44, Figure 3,
 13 that the Pierce Gulch Sand Aquifer rests upon the
 14 Terteling Springs mud stone; is that correct?
 15 A. Yes.
 16 Q. How then does the green line get
 17 designated on the map of -- based on the Pierce
 18 Gulch Sand Aquifer's relationship to the
 19 Terteling Springs mud stone?
 20 A. Well, I think I will be repeating what
 21 the Hearing Officer surmised that the green line
 22 represents, and I'll do that.
 23 As I explained before, that we
 24 base -- we base this contour map on the -- that
 25 is the base, as he correctly surmised, that is

1 the base of the Pierce Gulch Sand Aquifer in
 2 contact with -- this is Figure 3 of Exhibit 42?
 3 Q. 44, I believe.
 4 A. Oh, I think it's 42. I pulled --
 5 Exhibit 42. No, I'm referring to the Figure
 6 2 -- or Figure 3 on Exhibit 42.
 7 THE HEARING OFFICER: And this would be
 8 under 42 A 4?
 9 THE WITNESS: Correct.
 10 THE HEARING OFFICER: 43?
 11 THE WITNESS: Correct. And I would
 12 like to start there, if I could to explain this?
 13 Q. (BY MR. FEREDAY) Yes, that's fine. So
 14 you are on -- once again, you are on Figure -- or
 15 excuse me -- Exhibit 42 A 4, Figure 3?
 16 A. Correct.
 17 Q. Which is an 11 by 17 map?
 18 A. Yes. And the contours here -- recall
 19 that I testified, that that represents, as the
 20 Hearing Officer said, that is the base -- the
 21 contact -- the continuous contact of the Pierce
 22 Gulch Sand Aquifer with the underlying Pierce
 23 Gulch Sand. That's what that represents where
 24 these two rock units are --
 25 Q. With the underlying?

1 A. Terteling Springs mud stone, if I
 2 misstated that.
 3 And as the Hearing Officer also
 4 correctly inferred, the green line is a
 5 projection. Because we have a fairly good idea,
 6 from the geophysical logs, where the contours are
 7 in the subsurface. But because outcrops are not
 8 very clear, in fact, they are practically
 9 nonexistent in this part of the foothills on the
 10 M3 property, that is outcroppings of rock that
 11 can be seen beneath the surface soils.
 12 Q. Or outcroppings of sand?
 13 A. Outcroppings of sand, outcroppings
 14 really of any kind.
 15 Q. And that's because they have been
 16 eroded away?
 17 A. Yeah, there is a gentle topography, and
 18 they are mantled with soil, so they are not
 19 obvious.
 20 So determine where -- so they are not
 21 geologically mappable on the surface. They are
 22 not geomorphologically or geologically
 23 observable. We projected the base, that contact
 24 up to where it would break, the line of the land
 25 surface, as you surmised. And I agree, that over

1 in Figure -- I believe, it was Exhibit 44, Figure
2 3.

3 THE HEARING OFFICER: Yes.

4 THE WITNESS: We -- it is our -- I
5 believe it is confusing that we talked
6 about -- or was it --

7 THE HEARING OFFICER: I think maybe
8 it's --

9 THE WITNESS: Where we talked --

10 THE HEARING OFFICER: The figure, at
11 least that I was referring to, was 44 -- or 42 A
12 4, Figure 6.

13 THE WITNESS: Yes.

14 THE HEARING OFFICER: Which was
15 just --

16 THE WITNESS: Yes, where we -- where we
17 stated that the green line represented the
18 contact in the key to the map.

19 THE HEARING OFFICER: Yes.

20 THE WITNESS: And I think that you have
21 found that we could have better defined that.
22 That it's the contact where it breaks land
23 surface, just as you said. It's the same
24 contact, only where it breaks the line of the
25 surface of the ground. Where -- you know, and

1 again, I explained earlier, that it's not really
2 a straight line.

3 But to follow up on that, because I
4 think you also questioned about the idea of it
5 being the end of the aquifer. And that also is a
6 little bit confusing. And if I could refer to
7 one page earlier, Figure 5 of Exhibit 42. It's
8 an eight-and-a-half by eleven cross-sectional
9 diagram that was part of our year one
10 hydrogeologic characterization, our layman's
11 report.

12 That's a very similar cross section to
13 some additional cross sections. In fact, they
14 are almost the same wells as some of the other
15 cross sections we've looked at. This was done
16 before we had drilled any other test wells, and
17 we were using drillers data for this. So those
18 original cross sections, I believe, it was
19 Exhibit 26, that we drew from drillers data
20 before we had geophysics.

21 Q. (BY MR. FEREDAY) I believe that was
22 27.

23 A. 27. And this is an improvement from
24 one of those cross sections, the A-A prime cross
25 section. All right.

1 I think this helps to demonstrate the
2 idea of the green line. There is a -- there is
3 sort of a pipe looking -- the Pierce Gulch Sand
4 Aquifer in blue, comes across from the lower
5 left, and is rising up to the upper right.

6 And then you'll see one of the upside
7 down triangle symbols again, where the aquifer
8 changes, the color changes from blue to yellow.
9 Well, that's the top of the water table there.

10 And if you follow -- and you can see in that
11 well, which is Spring Valley Development No. 7.

12 If you can read that very fine print.

13 You can see the aquifer depicted as the -- in the
14 blue section of the pipe looking structure, there
15 is a sand layer there. It's depicted by a
16 stippled light color area, and it's sandwiched in
17 by clays top and bottom.

18 Well, the base of that is the same
19 contact that we've been talking about, the sand
20 with the contact, with the underlying mud stone.
21 And if you continue up along the base of that
22 aquifer, where it meets land surface, up there
23 just to the left, of Spring Valley Development
24 Well No. 6, that would be the green line. That
25 would be where a point in the green line -- at

1 that place.

2 But I also said that the green line is
3 a bit of a conceptual model. Because not only
4 does the sand end there, but also there is
5 another boundary there that is the surface of the
6 water table. So at the green line itself, at
7 that one point at land surface, that's not an
8 aquifer. That's sand. It's -- it's dry there.

9 So it's really hard to depict too many
10 lines on the scales of this map. But it
11 really -- I would say, you can think of it as a
12 double boundary in a way. I mean, it's the base
13 of the aquifer, but it's also the edge of the
14 saturation of the aquifer. And it is the main
15 boundary condition, in my view, of the Pierce
16 Gulch Sand Aquifer at this location.

17 MR. FEREDAY: Mr. Hearing Officer, I
18 would welcome any questions that you would have
19 of Mr. Squires at this point.

20 THE HEARING OFFICER: Okay. Well, the
21 explanation was very helpful to me, particularly
22 I think the reference of Figure 5, after we
23 talked to the definition in what contact really
24 refers to in the legend definitions.

25 I guess the only other question I have

1 in looking at Figure 6, this would be of Exhibit
2 42 A 4. The map actually shows a portion of
3 Pierce Gulch Sand Aquifer extending on the other
4 side of the M3 property. And this would be on
5 the northeast side of the Willow Creek Aquifer,
6 and on the northeast side of the M3 property.
7 And it's also on the northeast side of the green
8 line.

9 So, I guess, I just had a question
10 about that characterization, given the definition
11 of the green line as it's been explained.

12 THE WITNESS: Yes. Yeah, I would like
13 to --

14 MR. FEREDAY: Thank you.

15 Q. (BY MR. FEREDAY) Mr. Squires, the
16 Hearing Officer has just pointed out that there
17 is some blue shading, perhaps depicting the same
18 shade as the Pierce Gulch Sand Aquifer on the
19 northeast side of the Willow Creek Aquifer
20 designation, including on the northeast side of
21 the red dashed line indicating the west-Boise
22 Eagle fault.

23 Could you explain why that's shaded
24 that way?

25 A. I would be glad to. I think it's an

1 astute observation. And I would then come back,
2 again, to Figure 5 to explain that. First of
3 all, the shading is a -- that's a relic of
4 reproduction. It wasn't intended to be the same
5 color. It does appear to be the same color. But
6 that is not part of the Pierce Gulch Sand
7 Aquifer.

8 But to demonstrate why that is, and I
9 think that's a good observation. But it leads us
10 to two really good points, and they can be
11 explained in Figure 5 of Exhibit 42 A 4, Figure
12 5.

13 And what I would -- again, going back
14 to this point, that the green line is the surface
15 expression where the base of the aquifer is
16 there. Well, if you look then down from that
17 point just to the lower right, you'll see that
18 there is a section with a label on the left
19 called -- that says, "Willow Creek Aquifer," and
20 there is two shades of yellow there: a deeper
21 zone with one of those inverted triangles, again,
22 in Spring Valley Ranch No. 10 well on the -- I'm
23 looking --

24 THE HEARING OFFICER: I'm looking at
25 Figure 6.

1 THE WITNESS: Figure 5.

2 THE HEARING OFFICER: Oh, Figure 5.
3 I'm sorry. Two shades of yellow?

4 THE WITNESS: Yes, there is -- I guess
5 I would direct your attention to what's called
6 the west-Boise Eagle fault, which is the red
7 dashed line. The vertical, somewhat vertical.

8 THE HEARING OFFICER: Yes.

9 THE WITNESS: Well, and you'll see the
10 water table in the Willow Creek Aquifer depicted
11 by the upside down blue triangle.

12 THE HEARING OFFICER: Yes.

13 THE WITNESS: And again, if you recall,
14 it's deeper than it is in the Pierce Gulch,
15 because it's under different hydrogeologic
16 conditions.

17 Well, the two shades of yellow there,
18 that go all the way really almost to the surface
19 of the right most well, the Spring Valley Ranch
20 No. 10.

21 THE HEARING OFFICER: The two shades of
22 yellow being separated by the --

23 THE WITNESS: Water table.

24 THE HEARING OFFICER: Yes.

25 THE WITNESS: That's all a continuous

1 sand, but it's really only an aquifer beneath the
2 water table. That's the reason for that being a
3 separate shade of yellow, to kind of illustrate
4 that.

5 Well, the blue shading that you noted
6 on Figure 6, the next page, that shows the
7 inferred offset of the Willow Creek Aquifer to
8 the right of the red dashed fault. It's still
9 Willow Creek, but it's different there. It's
10 shallower there. It's only saturated for
11 perhaps, you know, 150 feet.

12 Wherein the Spring Valley Development
13 No. 6 well, it's saturated from approximately 450
14 feet to as deep as the well. Does that make
15 sense?

16 THE HEARING OFFICER: All right.

17 THE WITNESS: And that's what we were
18 trying to depict there. Is that the Willow Creek
19 Aquifer does exist on this side of the red line,
20 but only in part.

21 THE HEARING OFFICER: Okay. But I
22 think that explanation is satisfactory to me. I
23 don't know that we need to delve into that
24 subject matter any more deeply. Other
25 than -- other than that I understand that the

1 blue shading on the northeast side of the red
2 line is not a part of the Pierce Gulch Sand
3 Aquifer.

4 THE WITNESS: Yes, and -- and really,
5 if I could just add one final thought, is we're
6 not too focused on the Willow Creek Aquifer.
7 Right. And --

8 Q. (BY MR. FEREDAY) Excuse me. Mr.
9 Squires, I've handed you a copy of your July 2004
10 report, which is the exhibit you folks have been
11 talking about here. But it's an original copy.
12 And I would like you to refer to Figure 6 on
13 that, and note the shading on that area to the
14 right.

15 And perhaps, you could show that to the
16 Hearing Officer?

17 A. (Witness complying.)

18 Q. Isn't it, in fact, that the shading
19 he's referring to the right, is actually kind of
20 a green color, and it apparently, did not color
21 photocopy accurately in the exhibit that's in the
22 official record? Would that be an accurate
23 description?

24 A. Yes.

25 THE HEARING OFFICER: Okay. I

1 understand. Thank you.

2 MR. FEREDAY: If the Hearing Officer
3 has any further questions on this, I would
4 certainly entertain them at this point?

5 THE HEARING OFFICER: Thank you,
6 Mr. Fereday. It's been helpful to me. We can
7 move forward.

8 MR. FEREDAY: Okay.

9 Q. (BY MR. FEREDAY) Mr. Squires, a bit
10 ago I asked you about points of diversion that we
11 planned for the M3 development, and your role in
12 preparing the application; correct?

13 A. Yes.

14 Q. Do you know what the thought was
15 originally with regard to potential points of
16 diversion in filing that application?

17 A. Yes.

18 Q. And what was that?

19 A. Well, as is often the case in the
20 future needs applications, the municipal
21 applications that I've been involved with, one
22 likes to have the flexibility to put wells where
23 we best know they should be.

24 For example, we might drill the first
25 well here (indicating). And then based on how

1 that well behaves, we may change our idea where
2 the other wells are positioned.

3 Q. Do you know whether the application
4 lists virtually every quarter,
5 quarter -- quarter, quarter section as a
6 potential point of diversion?

7 A. I believe it does, yes.

8 Q. Is it your understanding that M3
9 intends to develop water from the Willow Creek
10 Aquifer --

11 A. No.

12 Q. -- from any point of diversion?

13 A. No.

14 Q. Your understanding --

15 A. I think it's my understanding that they
16 do not.

17 Q. Okay. And when you testified about the
18 Willow Creek Aquifer being even more productive
19 than the Pierce Gulch Sand Aquifer, what did you
20 mean by that?

21 A. Well, I meant that it's -- it's
22 a -- it's a more coarse grained, more
23 transmissive sand deposit.

24 Q. By stating that, did you intend
25 anything with regard to the long-term

1 productivity, or overall usefulness of that
2 aquifer?

3 A. No. In fact, I don't think that that
4 has been explored.

5 Q. Okay. Thank you.

6 A. I think I mentioned that it -- I think
7 of it as a highly bounded aquifer, and a very
8 finite limited area.

9 Q. Okay. Thank you.

10 I would like you to refer to Figure 13
11 of Exhibit 67, which is the Squires 1992 report
12 that Mr. Vincent referred to yesterday.

13 THE HEARING OFFICER: I think that's
14 loose, Mr. Squires.

15 THE WITNESS: Okay.

16 THE HEARING OFFICER: It's the
17 larger -- it's right there in front of you, I
18 think.

19 THE WITNESS: This (indicating)?

20 THE HEARING OFFICER: Yeah.

21 THE WITNESS: Okay. Thank you. Yes.

22 Q. (BY MR. FEREDAY) With regard to Figure
23 13, do you recall yesterday, Mr. Vincent and I
24 had a colloquy about the well there, which is the
25 Goddard well, and the possibility of a

1 boundary --
 2 A. Yes.
 3 Q. -- showing up on that?
 4 A. Yes.
 5 Q. Do you have any opinions with regard to
 6 what this hydrograph shows? And could you
 7 describe what it shows, in your opinion?
 8 A. Yes. This is a semi logarithmic plot
 9 of water level drawdown in the Goddard No. 2
 10 well, part of the United Water system of wells in
 11 west Boise. And it shows the drawdown in the
 12 well on an arithmetic scale, compared to the log
 13 of time on the X axis.
 14 And that's the common way that the
 15 water level drawdowns are plotted, especially to
 16 explore for boundary effects. And in this
 17 particular drawdown plot, there is at least one
 18 boundary that's encountered somewhere in the
 19 neighborhood of perhaps 180 minutes into the
 20 test, perhaps -- yeah, approximately 180 into the
 21 test, where the rate of drawdown increased from
 22 the rate prior to that time.
 23 Q. Do you find this type of a plot unusual
 24 in the wells that you've seen in the Treasure
 25 Valley?

1 A. Not particularly, no.
 2 Q. What type of hydraulic barrier might
 3 have been encountered here? Do you have an
 4 opinion about that with regard to this
 5 hydrograph? I note that it does say, "hydraulic
 6 boundary barrier encountered" --
 7 A. Correct.
 8 Q. -- on the figure?
 9 A. And I think as Mr. Vincent pointed out
 10 correctly, that there are five potential -- we
 11 advanced five potential situations that could
 12 result in that type of a boundary in the aquifer
 13 system.
 14 Q. And those are listed in the note --
 15 A. In the text of the figure.
 16 Q. Okay. Do you know whether the Goddard
 17 well has suffered at all in terms of productivity
 18 due to any boundary effects?
 19 A. I think over the years, the Goddard
 20 well has -- it's been -- come to -- come to my
 21 knowledge that there have been wells drilled in
 22 the area that have caused some water level
 23 drawdown, some minor water level drawdown in the
 24 Goddard well.
 25 But in terms of its productivity, no.

1 There is plenty of available drawdown in the
 2 Goddard well. And it's a very strong well in
 3 the -- in the United Water system. It produces
 4 all the time, every day.
 5 Q. Okay. Thank you.
 6 Mr. Squires, I would like to now turn
 7 to what you've done for M3 in terms of preparing
 8 your hydrogeologic studies. And I know we've
 9 gone over a fair amount of it with regard to, for
 10 example, cross sections.
 11 But I would like you to, if you would,
 12 start at the beginning, and explain to the
 13 Hearing Officer what has been done in this case,
 14 and what each element represents in terms of your
 15 understanding of the aquifer, and the potential
 16 for development of a water right at this site of
 17 this size.
 18 So what did you start with? Were those
 19 measurements that you took, or what did you do to
 20 begin with in this project?
 21 A. Well, there were two things that we --
 22 actually, three things that we did immediately
 23 out of the chute. As we indicated before, the
 24 first thing that any researcher would do on a
 25 project like that, is to try and ferret out all

1 the available existing documents, research, water
 2 levels, et cetera.
 3 The second thing, we've already
 4 discussed, is to try and synthesize that data,
 5 particularly the drillers data into something
 6 that's a little more usable; a useful tool, like
 7 the cross sections that we talked about. I
 8 believe that's Exhibit 27, the 17 cross sections
 9 drawn from drillers reports.
 10 Thirdly, we went immediately out, and
 11 with Hydro Logic and intern students from the
 12 University of Idaho, measured -- began measuring
 13 every well we could measure in the area in June,
 14 and I think it was, 2006.
 15 Q. I would like you to refer in this
 16 connection to Exhibit 1, which is an 11 by 17 map
 17 with lots of information on it. Could you tell
 18 us what this -- what this well is -- or excuse
 19 me -- what this map in the exhibit depicts?
 20 A. It must be that one in there
 21 (indicating).
 22 THE HEARING OFFICER: This is Exhibit
 23 1?
 24 THE WITNESS: Yes.
 25 THE HEARING OFFICER: I should have

1 brought my reading glasses.
2 MR. FEREDAY: Mr. Hearing Officer,
3 we're going to switch on the PowerPoint here,
4 just so that -- because we -- maybe that will
5 help.

6 THE HEARING OFFICER: Sure.

7 Q. (BY MR. FEREDAY) Could you explain
8 what Exhibit 1 is, and who prepared it?

9 A. Yes. And I -- I don't think you really
10 need your reading glasses to see that fine print
11 in my explanation, Mr. Hearing Officer.

12 This is also -- this goes -- this is
13 actually the -- what I would say, is the
14 precursor to the cross-sectional diagrams. As I
15 indicated before there is somewhere between
16 2,200 -- actually, I just got a number on this
17 map of 2,386 wells within this map that we looked
18 and examined the drillers reports for. That's
19 all the drillers reports that are in the western
20 regional office of IDWR's drillers report
21 database.

22 Q. Now, Mr. Squires, I notice that there
23 are a number of these wells and drillers reports
24 that are to the north and -- or west and
25 northwest of the M3 property. Those are all

1 And it shows the -- either the five deepest wells
2 in every quarter, quarter section. As I
3 indicated before that, obviously, we're
4 interested in the deepest wells, because the
5 domestic wells, which I would just estimate that
6 90 percent of the wells in this area are domestic
7 wells, small six-inch domestic wells, I think,
8 that's what Mr. Dittus testified to.

9 If memory serves me, I would say, 60
10 percent of the domestic wells are shallower than
11 150 feet in this area. So we're, obviously,
12 focused on the deeper wells. We've plotted the
13 five deepest wells in each section.

14 Q. Mr. Squires, as you are looking for
15 that, would you say that at least generally
16 speaking, wells that are shallower than 150 feet
17 in this area, are generally speaking, not in the
18 Pierce Gulch Sand Aquifer?

19 A. Because of the dip of the aquifer, some
20 are. Because as we keep talking about, and it's
21 worth reemphasizing, that the Pierce Gulch Sand
22 Aquifer comes up dipped to the northeast and to
23 the east. And so if you are over in the vicinity
24 of, say, the Lexington Hills well, the City of
25 Eagle Lexington Hills well in the east side, you

1 wells that you looked at, whose information you
2 looked at?

3 A. Yes. And we actually looked at many
4 more wells than this. But in the context of this
5 map, and this study area in the -- you know, the
6 four or five miles surrounding the M3 site, we
7 looked -- we obtained and downloaded and printed
8 all of the drillers reports, and we reviewed
9 every single one of them.

10 Q. Okay.

11 A. And that was the culling process that I
12 spoke to you about, that resulted in picking a
13 select number of those for our cross-sectional
14 diagrams.

15 Q. Now, how do we know that your selection
16 wells to get from 2,300 wells down to 169 to
17 measure was a scientifically sound process?

18 A. Well, I think it's based on experience
19 over the years of examining well drillers reports
20 for virtually every project we've ever done. But
21 this map, obviously, you can look at it, and see
22 that there is not 2,386 wells on this map. And
23 that's a space consideration.

24 What's shown on this map are the wells
25 sorted by quarter section -- quarter section.

1 are likely to have your feet wet in Pierce Gulch
2 if you have 150 foot well. Under most of the
3 property, and especially, the upland properties,
4 you are less likely to be in the Pierce Gulch.

5 Q. Okay. Thank you.

6 A. But there is another exhibit, that's in
7 the water right application.

8 Q. Would that be 42 A 4, Figure 11?

9 A. That I think is worth referencing.
10 Would you say those numbers again?

11 Q. Figure 11 in that water right
12 application.

13 A. And what exhibit was that?

14 Q. 42.

15 A. 42. Thank you. (Witness complying.)
16 Yes, that's correct.

17 Q. How --

18 A. This -- this --

19 Q. How does Figure 11, 42 A 4 compare to
20 Figure 1 -- or Exhibit 1?

21 A. Well, this is a well density map. And
22 this actually shows the distribution of all the
23 wells in the area. So rather than just depicting
24 the names and the depth of the five deepest wells
25 of each quarter, quarter section, we've prepared

Page 910

1 a map that show the density of wells by square
2 mile, and by quarter -- and further by quarter
3 section.
4 So, for example, if you were to look
5 at --
6 Q. Let's say, the extreme left, lower
7 left-hand corner.
8 A. Well, you know, a better reference
9 point to start would be the dead center of the M3
10 property. Right in the middle of the yellow
11 shaded area that is the M3 property, you'll see
12 there is a big "1" there. That's section 13.
13 There is one well in that section.
14 And then you -- you know, and another
15 layer in the upper left-hand corner of that
16 section, the northwest quarter, there is also a
17 1. That indicates that that well is in that
18 section.
19 So if you go down a couple of sections
20 below there, below Homer Road, you'll see there
21 is a large "58" in the center of the section.
22 That means in that section, which it looks to me
23 is Section 32, perhaps. It's obscured. But
24 there is 58 wells in that square mile in the
25 entire database. That's all the wells. There is

Page 911

1 58 square miles within that quarter -- or within
2 that full section, the 640 acres.
3 And then by quarter, quarter, starting
4 in the upper right-hand corner, there is 13 of
5 those wells in the upper -- in the northeast --
6 Q. In the northeast quarter?
7 A. -- quarter and there is 12 in the
8 northwest, 15 in the southwest, and 18 in the
9 south.
10 Q. And did you look at the data from each
11 of these wells?
12 A. Yes, we did.
13 Q. And from those you selected 169 to --
14 A. No, from those.
15 Q. -- measure?
16 A. Yeah, just -- no, I think you are
17 getting confused. We selected the -- 169 comes
18 from how many wells we were actually able to go
19 out and measure in our water levels. We knocked
20 on 170 doors, and we got 169 water levels in that
21 June of the year.
22 But what we did between Figure 11,
23 which is the well density map, and the previous
24 Figure 6.1, that you asked us to look at, that
25 shows the 5.

Page 912

1 Q. 6.1?
2 A. It's Exhibit 6 or --
3 Q. Is it --
4 A. -- 42 A 6.
5 Q. Figure 6, in Exhibit 42?
6 A. Yes.
7 Q. Thank you.
8 A. That shows the map of the five deepest
9 wells in each quarter, quarter, or in each
10 quarter section, correct?
11 Q. Excuse me, Mr. Squires. I admit --
12 A. Okay.
13 Q. -- I'm lost here.
14 A. Okay.
15 Q. But what exhibit are you referring to?
16 A. Well, I see, Exhibit 1. It's Exhibit
17 1.
18 Q. Okay.
19 A. They are the same map.
20 Q. Exhibit 1, where we started?
21 A. Yes.
22 Q. All right.
23 A. So from the 2,386 wells that we looked
24 at, and downloaded the data from the well base,
25 IDWR's database. We then plotted the five

Page 913

1 deepest in each section, in each quarter section
2 on this map, Exhibit 1. Okay?
3 And then we reviewed those in more
4 scrutiny based on our experience with knowledge
5 of the specific drillers, the depth of the well,
6 and the quality of the drillers report. And that
7 was judgmental in our case based on our
8 experience. And from those --
9 Q. Was that an effort that you typically
10 undertake --
11 A. Yes, always.
12 Q. -- when you do this kind of review?
13 A. Yes, always.
14 And then from these wells then, we
15 selected another subset to become the
16 cross-sectional diagrams of Exhibit No. 27. And
17 that's --
18 Q. I see.
19 A. -- how we culled down to the best
20 available data that we had for those cross
21 sections to use as a tool for our analysis.
22 Q. Which wells did you measure with
23 the -- using the U of I students?
24 A. The first summer in June of 2006 every
25 well we could.

1 Q. Did that --
 2 A. They went door to door for several
 3 weeks, knocked on every door that they could.
 4 And whenever they got permission, they took a
 5 water level.
 6 Q. And were those -- where is the
 7 depiction of those water level measurement sites?
 8 A. It's in the --
 9 Q. It's Figure 6?
 10 A. -- water.
 11 Q. It's Figure 6, I believe, of Exhibit 42
 12 A 4.
 13 A. That's -- that's one place. That's the
 14 diamonds that we referred to earlier. But, of
 15 course, we also tabulated this on an Excel
 16 spreadsheet with all the data that's important to
 17 us, well depth, water level, driller, completion
 18 interval. And that is also information that is
 19 available, and has been submitted to the
 20 Department.
 21 Q. Okay. What did you do next? After you
 22 had those 169 water level measurements?
 23 A. Well, we plotted the measurements and
 24 contoured them, contoured the -- depicted the
 25 water levels in the aquifer on this map.

1 Q. Okay. Then did you do further
 2 measurement?
 3 A. Well, those water levels were used for
 4 a number of purposes. One of which was the
 5 computer model that was developed by the
 6 University of Idaho graduate students, Stacy
 7 Douglas, under the -- under Dr. Jim Osiensky, her
 8 advisor. And that was used to -- in her
 9 numerical model that was also developed as part
 10 of this project as her master's thesis that was
 11 funded by M3 Eagle.
 12 Q. We'll talk about that U of I model a
 13 little bit later.
 14 But did you do any ground surface
 15 surveying, or any other measurement with respect
 16 to these ground water levels?
 17 A. Well, there were two things that we
 18 observed when we plotted what is now Figure 6
 19 that we're referring to. First of all, the
 20 contours had some perturbations in them, in that
 21 they weren't really smooth contours. And you'll
 22 see in the vicinity of Star and to the northwest
 23 of Middleton, they -- the contours ended up
 24 having some switchbacks in them, if you will.
 25 And because the gradients are

1 relatively flat in this area, and because we
 2 observed that the water gradient appears to be to
 3 the northwest. And even though our water levels
 4 were measurement -- were measured, as you asked
 5 for earlier, to a hundredth of a foot, our ground
 6 water elevations are really only to the nearest
 7 10 to 20 feet based off of topographic maps, U.S.
 8 Geological topographic maps.
 9 So to make sure that -- there were two
 10 things that we did the next year. And that was,
 11 we went out, and we culled through the 169, I
 12 think it was, or 167 water levels and wells. And
 13 we tried to select wells that were within the
 14 Pierce Gulch Sand Aquifer, or as close as we
 15 could get them. So it was more representative of
 16 the Pierce Gulch Sand.
 17 In other words, when the graduate
 18 students went out and measured wells, they
 19 measured 40 foot wells, and 400 foot wells, and
 20 30, you know, a whole range of well depths. And,
 21 of course, we've shown already in the piezometer
 22 nests, that well depths have potentiometric heads
 23 in them. So if you are trying to compare the
 24 heads in one aquifer, you'd like to develop water
 25 levels from that aquifer.

1 So we culled through the wells that we
 2 measured, the 169 the first summer, and we came
 3 up -- again, I may not be exactly right, but I
 4 think it was 67 or 69 wells that we thought best
 5 represented the Pierce Gulch Sand Aquifer.
 6 And because of the flat gradients and
 7 the uncertainty in the land surface elevation, we
 8 hired a professional surveyor, Idaho Survey
 9 Group, to go out with my staff, and we set up a
 10 station. And we measured all the key wells, the
 11 well head elevations with a survey grade
 12 instrument.
 13 Q. Now, you mentioned 69. Could it have
 14 been maybe 57?
 15 A. 57 sounds look more like it, yeah.
 16 Q. Does that sound more like it?
 17 A. Yes.
 18 Q. So each one of these 57 you measured
 19 there, actually ground surface to survey grade?
 20 A. No, not each one. But the key wells
 21 that we had time -- and we didn't measure every
 22 single one of them, but a good share of them.
 23 Q. Do you know how many?
 24 A. I would have to look in our memo.
 25 There is a memo to the department. I don't know,

1 offhand. But besides those in this area, we did
2 measure other wells outside of this area in
3 Meridian and -- just to get a better handle
4 on -- to ensure that our gradients were correct.

5 And when we replotted that data, we
6 came out with a much smoother contour map that I
7 think is more accurate. And we confirmed that
8 the gradient, the contours were actually slightly
9 steepened toward the northwest.

10 Q. I would like you to refer to Exhibit
11 18, Figure 1, please?

12 A. (Witness complying.)

13 Q. Would you describe what Figure -- or
14 Exhibit 18 is to begin with.

15 A. Exhibit 18 is the memorandum submitted
16 to the Department to Dennis Owsley, the hydrology
17 section, that includes an explanation and the
18 revised water level contour map from the
19 synthesis of the water level data that I just
20 explained.

21 Q. And that's -- that memo is dated March
22 of 2008; correct?

23 A. Yes, that's -- that's correct.

24 Q. With regard to Figure 1 in that
25 exhibit, could you describe what this is?

1 A. Well, it is a reconstitution of the
2 ground water contour map based on the more
3 refined wells, water levels, and survey points
4 that we just finished describing.

5 Q. Okay. In this Figure 1, I note that
6 the Willow Creek Aquifer is denoted as more or
7 less a gray-shaded area in roughly the same
8 location as we've discussed previously. Is
9 that -- am I correct in making that assumption?

10 A. That is correct.

11 Q. And I notice that the green line that
12 we've talked about at some length now, actually
13 seems to end or be -- I guess seems to end right
14 there at the Ada County -- Ada Canyon County
15 line.

16 Could you describe what that is, and
17 what the curve line going up from there denotes?

18 A. Well, as I indicated before, when we
19 have dashed lines on the map, the difference
20 between solid lines, which we feel more confident
21 about, to dashed lines, and then perhaps even
22 dotted lines, that is a representative -- a
23 representation of our certainty. It's a
24 standard, you know, technique in geologic mapping
25 as well.

1 And so the green line still indicates
2 the same things that we've talked about. But
3 now, we have -- if you are asking, why does it
4 end right there at the Ada Canyon County line?

5 Q. Yes, I am.

6 A. Well, it's because that was a fair ways
7 beyond our -- our key, our core study area.

8 Q. Okay.

9 A. And so ending it there, doesn't
10 necessarily mean that it ends there. It's just
11 that we don't have as detailed of an information
12 over there. So we didn't extend it beyond there.

13 Q. With regard to Figure 2 of Exhibit 18,
14 would you describe what this is?

15 A. This is a map showing the wells that we
16 measured during our closely spaced measurements
17 in 2007.

18 Q. When you say, "your closely spaced
19 measurements," do you mean --

20 A. Well, we tried to measure them as close
21 together as possible over the -- over as short a
22 period as possible. So that we were -- as you
23 recall, we talked about the annual fluctuation
24 within the aquifer. So you like to get
25 measurements for the purposes of contouring as

1 closely spaced together as possible in terms of
2 days, or at the most weeks, so that you are in a
3 similar place on that annual fluctuation.

4 In other words, you wouldn't want to go
5 out and measure some of the wells at the top of
6 the fluctuation, and then measure some other
7 wells at the bottom of the fluctuation, because
8 it would not necessarily -- you are introducing
9 some variability that doesn't need to be there.

10 Q. So when you say, "closely spaced," you
11 mean closely spaced in time?

12 A. Correct.

13 Q. I notice that you measured the
14 Johnson -- the T. Johnson and JDH Builders, and
15 the Claire Ridge wells, Willow Brook bond out to
16 the west, northwest of M3. What can you tell us
17 about those wells?

18 A. Hard to measure. I mean, they are just
19 nothing in particular. They are just other well
20 measurements.

21 Q. Okay. And --

22 A. No real difference. There is a cluster
23 of wells that are measured in the Eagle area,
24 because there is more wells there. There is
25 fewer wells off to the west, and, you know, they

1 take more time to get to. And a lot of times if
2 people aren't home, you know, it takes return
3 visits. And water levels are generally deeper
4 over there. So they're -- they take more time to
5 measure.

6 Q. So when you say, they are hard to
7 measure, that's what you meant? They are just
8 hard to get to, and --

9 A. Yeah, and they are deeper.

10 Q. Okay. But you did --

11 A. There are --

12 Q. -- obtain accurate measurements there;
13 do you feel?

14 A. Oh, yes. We wouldn't plot any
15 measurements that we didn't think were accurate.

16 Q. The next page appears to be -- is a
17 spreadsheet. In fact, it's a three-page
18 spreadsheet. What did -- what does that
19 indicate?

20 A. Well, this is the tabulated well
21 information that I referred to previously. And
22 it is our -- this is the synthesis of the
23 information -- of the well information and the
24 water level information that we find useful as a
25 reference. This is part of that memo. It's the

1 supporting data for the memo. So that it's -- we
2 just don't have a contour map. The data is here
3 to refer to as well. Which include the things,
4 such as the well depth, the well completion
5 interval, which are important to the various
6 measurements.

7 It also indicates whether we think it,
8 at that time, was within the -- completed within
9 the PGSA or not.

10 Q. Okay. Mr. Squires, I would like you to
11 refer to Exhibit 29, please, and also Exhibit 31,
12 which is just --

13 THE HEARING OFFICER: By the way, just
14 as a comment?

15 MR. FEREDAY: Yes.

16 THE HEARING OFFICER: I do appreciate
17 what Figure 1 of Exhibit 18 shows. I struggled
18 with contours and depiction in Figure 6 of 44 A 4
19 for a long time with all the angulations and the
20 cross directions of those. It just seemed to me
21 intuitively all of those contours to be somewhat
22 in conflict with each other.

23 So at least for me, Figure 18, Figure 1
24 shows, at least, contours that are much more
25 intuitively correct. So I do appreciate that.

1 Q. (BY MR. FEREDAY) And, Mr. Squires,
2 with regard to Exhibit 18, Figure 1, do
3 you -- what would be your opinion to the accuracy
4 of those contours even as compared to your much
5 earlier version on Figure 6 back in the
6 application?

7 A. The Figure 6 -- I better look at these
8 again. They are starting to run together for me.

9 Well, Figure 6 is the one that the
10 Hearing Officer just expressed confusion over.
11 That's the same confusion that we had, because
12 those contours don't necessarily make sense.

13 But what that tells us is, that we're
14 measuring wells that have different completion
15 intervals. And we did a similar -- we did
16 preliminary contour maps based on drillers data,
17 and those were even worse. And we found one
18 water level, for example, that the driller had
19 recorded as being a hundred feet off. So it put
20 a huge bull's eye in our contour map.

21 We subsequently measured that well, and
22 found out that the water level was not correct.
23 It was 100 feet too high. And whether it was a
24 typo or whatever, I don't know. But gradually we
25 distilled it down to more reasonably, more

1 reliable data. And I think that the picture has
2 smoothed it out, as the Hearing Officer
3 suggested.

4 Q. So Figure 1 of Exhibit 18, you see your
5 opinion as a more accurate, more up to date, more
6 precise water level contour map in the PGSA?

7 A. It's our best one so far, yes.

8 Q. Okay. With regard to what you just
9 said about some confusion in the contours. I
10 would like you to look at Exhibit 29 and Exhibit
11 31.

12 Now, these have been discussed before,
13 you may recall, with Mr. Vincent. I'll represent
14 to you that Exhibit 29 is something that I call
15 the Newton contour map. Exhibit 31 is something
16 I call the USGS, or Lindholm contour map.

17 And I would just like to get your
18 comment on this, and ask you if you've seen them
19 before, and know where they come from?

20 A. I have seen them before. And they come
21 from previous researchers.

22 Q. What are the dates on those?

23 A. Well, Exhibit 21 is --

24 Q. Excuse me. 31?

25 A. -- or 29. I'm sorry.

1 Q. I see 29.
 2 A. That's from the Newton 1991 study by
 3 the U.S. Geological Survey. And Exhibit 31, the
 4 date is 1980. I believe that's by Lindholm. In
 5 nineteen- -- yeah. It was 1980 data, and he
 6 presented it in 1982.
 7 Q. And I would also like you -- I'm going
 8 to ask you some questions about these. But I
 9 would like you, in connection with these, to
 10 refer also to Exhibit 45, Attachment A, which is
 11 near the back of that Exhibit 45. And ask if you
 12 can describe what that is?
 13 A. Would you say the figure number again,
 14 please?
 15 Q. It's Attachment A of Exhibit 45, which
 16 is a September 2nd, 1994 letter to David Tuthill
 17 of the Department, authored by Terry Scanlan of
 18 Scanlan Engineering. I would just like to ask
 19 you if you've seen that before?
 20 A. I have seen this before.
 21 Q. And it has a Figure 1 attached to it,
 22 which is a similar contour map of the same
 23 general area; is it not? It's a few pages back
 24 in this.
 25 A. Yes, I see it.

1 Q. And that Figure, I read it as source
 2 USGS Hydrologic Investigations Atlas 1988. Have
 3 you seen that before?
 4 A. Yes.
 5 Q. With regard to these three contours,
 6 the Newton, the USGS No. 1, the Lindholm, USGS
 7 No. 2, this Scanlan offering, what do you see
 8 there with regard to ground water gradients in
 9 this area of north Eagle and the Payette River?
 10 A. Well, first of all, I would have to
 11 agree with the testimony of Mr. Vincent. That,
 12 you know, these are large regional scale type
 13 things. So they don't have nearly the fine point
 14 that we have measuring at the local scale. But I
 15 think that they -- they depict a general, you
 16 know, northwest flow in many cases. If you look
 17 at Figure 1 of --
 18 Q. Of the Scanlan letter?
 19 A. -- of the Scanlan letter. In the Eagle
 20 area, which if you see the cross section there,
 21 it says, "A prime." I don't -- I would just say,
 22 that those contours in the Eagle area, and
 23 that -- and you can see where Eagle is on this
 24 map, because the river goes to the northwest, and
 25 then it kind of turns west. That's the Eagle

1 Island area. So that kind of places you on this
 2 map, even though the M3 study area is not on
 3 there.
 4 Well, those contours would indicate,
 5 you know, flow toward the Boise River from both
 6 sides. And if you drew the arrows normal
 7 perpendicular to that, in that area, that's kind
 8 of what it would show.
 9 But I think overall, it shows the same
 10 sort of thing that our water level contours show
 11 on a grosser scale. That there seems to be, for
 12 lack of a better discussion, a mound there, or a
 13 bulb that -- where some water would be flowing
 14 more northwesterly, some would be flowing more
 15 westerly, and some would be flowing easterly.
 16 It's the same mound that would be
 17 depicted on the other ones, and on our contour
 18 maps, and on the University of Idaho contour maps
 19 that Stacy Douglas also contoured our water data.
 20 And by the way, she was also one of the interns
 21 that measured the water levels, the graduate
 22 student that produced the U of I model.
 23 Q. Mr. Squires, I would like you to refer
 24 now to Exhibit 47, Figure 9 of that exhibit.
 25 A. (Witness complying.) Yes.

1 Q. Can you tell us what Figure 9 is, and
 2 who prepared it?
 3 A. It was prepared by Dr. Ralston, I'm
 4 pretty sure. Yes.
 5 Q. And --
 6 A. He submitted -- or at least it was
 7 dated, January two-thousand- -- just a second.
 8 In his report, expert report prepared for the
 9 North Ada County Ground Waters Users Association,
 10 January 2009. And it is a -- it is an alteration
 11 of our contour map, or some information
 12 superposed on our contour map.
 13 Q. And how did he alter your contour map?
 14 What's your understanding?
 15 A. Well, I think he chose some -- a few
 16 selected points, and added two contours of his
 17 own.
 18 Q. Could you describe which ones are his?
 19 A. They are the red -- the red dashed ones
 20 in the left half of the diagram, extending from
 21 the lower left more toward upper right.
 22 Q. Do you know what data points he
 23 selected?
 24 A. I did at one time. I would have to go
 25 back and read the memo. But I guess they are

1 these -- the red -- the red dots.
2 Q. Well, I'm not asking you to guess, and
3 perhaps we can return to that, if necessary.

4 Do the contours that Mr. -- or
5 Dr. Ralston has indicated, still indicate a flow
6 to the west, northwest to some degree. Would you
7 agree with that?

8 A. Yes.

9 Q. Mr. Squires, I would like to ask you
10 some things about the well construction issues
11 and the reliability of some wells over others for
12 monitoring or measurement. You've mentioned this
13 several times in your testimony without really
14 explaining what you mean by reliability of data
15 from certain types of wells. And I would like to
16 have you explain that to us.

17 Could you please refer to Exhibit 3,
18 which I believe is a map showing the wells of the
19 protestants in this case?

20 A. (Witness complying.) Yes.

21 Q. Could you tell us what this map shows,
22 Exhibit 3?

23 A. This is a location map showing the M3
24 property, and proposed wells locations for the M3
25 property. The boundary of the M3 property is in

1 dark black line centering on Big Gulch. It's a
2 USGS seven-and-a-half minute topographic series
3 map that locates by section and quarter section
4 the GPS located -- well, I'll say our best -- our
5 best approximation of where the protestants in
6 this case domestic wells are located.

7 And some of them are located quite
8 accurately, because the protestants responded to
9 a questionnaire that we circulated. Some
10 protestants didn't respond to that, and we
11 located the wells based on Google Earth, and
12 addresses.

13 Q. The questionnaire that you mentioned,
14 is that Exhibit 101? Are copies of that attached
15 as Exhibit 101?

16 A. Okay. Thank you, sir. Yes, that's
17 correct.

18 Q. And based on this questionnaire, were
19 you able to make any determinations about these
20 protestants domestic wells?

21 A. I'm sorry. Was I able to --

22 Q. Based on the questionnaire, were you
23 able to make any determinations about the depth
24 or location -- or which aquifer they might be
25 completed in?

1 A. For those that had that information,
2 yes.

3 Q. I noticed that on Exhibit 3, you have a
4 key that shows yellow for Pierce Gulch Sand
5 Aquifer, and other symbols for other aquifer
6 units. Could you describe how you determined
7 that?

8 A. Based on -- as you recall, we developed
9 the contour map of the base of the Pierce Gulch
10 Sand Aquifer. And then based on our knowledge
11 from the geophysical logs of the approximate
12 upper boundary of the Pierce Gulch Aquifer, we
13 also drew contour maps of that.

14 And then located these wells in their
15 depth with relationship to the two contour maps,
16 and determined to the best of our ability,
17 whether we thought they were within the Pierce
18 Gulch Sand Aquifer, both depth-wise and aerially.

19 Q. Did you also evaluate drillers reports
20 or drillers logs for these protestants wells?

21 A. We attempted to obtain drillers logs
22 for all of the protestants wells. And we were
23 mostly successful in coupling drillers reports
24 with each well.

25 Q. So do you feel fairly confident about

1 your depiction on Exhibit 3, as to those that are
2 in the Pierce Gulch Sand Aquifer?

3 A. Yes.

4 Q. With regard to your information from
5 the questionnaires, Exhibit 101, from the
6 drillers reports, were you able to make any
7 determinations as to how these protestants wells
8 are constructed?

9 A. Well, yes. In fact, we -- we drew
10 cross-sectional diagrams of many of the
11 protestants wells in the same way that we did for
12 our -- for our cross-sectional diagrams. And we
13 attempted actually to go out and take
14 measurements in the protestants wells. And had
15 even at one point offered to do some research in
16 the wells.

17 Q. Okay. Did that happen?

18 A. No.

19 Q. Why was that?

20 A. The protestants' attorney wanted us to
21 sign some liability waivers, which we were not
22 willing to do.

23 Q. Do you usually sign liability waivers
24 when you go on people's property to inspect or
25 measure wells?

1 A. No.
 2 Q. What about the 169 wells that you did
 3 measure, did you sign liability waivers?
 4 A. No.
 5 Q. Were there ever any problems with any
 6 of those well owners?
 7 A. No. Usually the problems start when
 8 you sign the liability waivers.
 9 Q. Okay. Could you explain well
 10 construction methods and issues with regard to
 11 reliability of wells, reliability of water level
 12 measurements in those wells, and so forth, based
 13 on construction methods?
 14 And I would like you to refer it
 15 particularly to the protestants wells based on
 16 what you know about them?
 17 A. Well, first, I would say that, the
 18 protestants wells are -- there is nothing
 19 distinct about those with respect to the other
 20 2,000 wells in the area. They are almost always
 21 predominately drilled by the same drilling
 22 technique, many by the same group of drillers,
 23 same materials. It's kind of a -- it's kind of a
 24 standard procedure, and --
 25 Q. And what are those techniques?

1 A. Domestic wells in the Treasure Valley
 2 are almost predominately -- they are probably 95
 3 percent drilled with drill-and-drive drilling
 4 techniques, that include cable tool, and air
 5 rotary drilling techniques.
 6 Q. What do you mean by drill and drive?
 7 A. That means in unconsolidated sediments,
 8 the casings must be advanced as the well is
 9 drilled. So the casing has a hardened drive shoe
 10 on the leading edge, so it doesn't bend the
 11 casing. And as the well is deepened, the casing
 12 is driven into the ground to keep the sediments
 13 from caving into the well.
 14 And the conspicuous problem, in my view
 15 of those types of drilling techniques, are that
 16 the drive shoe is in larger diameter than the
 17 casing. Because you, obviously, can't drive a
 18 casing that's bigger than the hole into the
 19 ground. So you have to -- you have to make a
 20 bigger hole to put the casing in, and that's the
 21 purpose of the drive shoe. But so you end up
 22 with an annular space outside the casing from --
 23 Q. "Annular" meaning a circumferential
 24 space --
 25 A. Yes.

1 Q. -- outside the casing?
 2 A. Yeah. And if the drilled hole is
 3 perhaps seven inches in diameter, and the casing
 4 is six inches in diameter, there is a half inch
 5 annular space.
 6 But oftentimes, in fact, most cases I
 7 would submit, the annular space is much larger
 8 than that. And there are often voids and
 9 cavities outside the casing as a result of the
 10 drilling method in both cases; cable tooling and
 11 air rotary.
 12 Q. And what are the -- what's the
 13 significance of this type of a well with space
 14 outside the casing? What does it -- what does it
 15 matter?
 16 A. Well, I think just as the data -- the
 17 uneven quality data from the lithologies that we
 18 spoke about, the water levels derived from such
 19 wells are not nearly as reliable as wells that
 20 are drilled with other techniques.
 21 Q. Why is that?
 22 A. Because it's very difficult to place
 23 seals, annular seals in air rotary drilled wells.
 24 And it's cost prohibitive in the current way
 25 things are done. The drilling industry is

1 extremely competitive. And if you -- if a
 2 domestic well -- prospective domestic well owner
 3 were to call ten drillers to get quotes, the
 4 quotes would be within a few dollars of each
 5 other. Because it's a very, very competitive
 6 business.
 7 And because the wells get drilled
 8 by -- because most people believe, that a well is
 9 a well is a well, they are going to take the
 10 lowest bid in most cases. And so those wells end
 11 up without annular seals in them, in almost all
 12 cases, in my opinion.
 13 Q. Do they sometimes have a surface seal?
 14 And could you describe what that is?
 15 A. Well, they almost always have some type
 16 of surface seal, the newer wells.
 17 Q. What is that?
 18 A. Under the current rules, it's a seal
 19 that extends to 18 feet below ground, although in
 20 some cases, they go deeper. And it's generally a
 21 casing, a larger size casing that's drilled down
 22 to 18 feet. A 20 stick foot of casing that's
 23 drilled to 18 feet. Sometimes it's in an over
 24 bore. So perhaps you would drill a 10 foot hole,
 25 and put the six inch casing in there. And if it

1 stayed open, you would put an annular seal
2 between the casing and the bore hole wall.

3 Q. So if a seal -- just so I'm clear on
4 this -- is impervious material, such as grout, or
5 cement, or something like that, that is placed
6 between the outside of the casing and the
7 formation; is that correct?

8 A. Correct.

9 Q. And that prevents water from flowing up
10 or down along the casing; is that right?

11 A. That's what it is aimed to do. If you
12 are referring to the standard surface seal?

13 Q. Correct.

14 A. In rotary drilled wells, and seals that
15 have wells that are properly sealed, in my
16 opinion, then the annular space is always sealed.
17 The entire depth of the casing is sealed.

18 Q. The entire depth of the casing, with
19 the exception of where the screens are located?

20 A. Yeah, from the -- from the top of the
21 open area, the screen, all the way to the land
22 surface.

23 Q. With regard to the wells that United
24 Water has, for example, are those that you've
25 worked on, are those sealed throughout their

1 depth?

2 A. We started placing full depth annular
3 seals in the United Water wells while I was at
4 United Water, and that was approximately 1993, I
5 think, is when we started. We switched from
6 drill-and-drive methods, which many of United
7 Water's wells were drilled by the cable tool
8 method. We switched over to fluid methods, where
9 we were able to place full depth seals. And now
10 all of their wells are full depth seals, as are
11 almost all of the municipal wells in the valley.

12 Q. Let's say that we have a domestic well
13 in the Eagle area that has an 18-foot surface
14 seal, but no other seal in it. What problems, if
15 any, do you see with that well in terms of its
16 productivity, its reliability, or its reliability
17 as a test well, or a well to determine actual
18 water levels in the aquifer?

19 A. Well, just as we discussed, we were
20 just discussing the perturbations from the water
21 levels. And we previously discussed that in the
22 Eagle area, generally the deeper you drill, the
23 higher the level. We've showed in piezometer
24 nests that are completed to different levels of
25 the aquifer, that each level of the aquifer has a

1 different pressure head.

2 Well, when you open that up by drilling
3 a well, and you pierce and perforate, the
4 stratigraphic layering, the natural stratigraphic
5 layering of the aquifer, you allow those heads to
6 commingle. And so that you get -- you then get
7 an average of head in the well. Not the well
8 that is the piezometer nests, the head at this
9 (indicating) level, the head at this (indicating)
10 level, but rather an additive commingled.

11 So if you had a -- if you commingled a
12 zone at 20 feet below ground, and the well was
13 400 feet deep, you would have the additive of the
14 pressure heads of all those as one water level.
15 And if there were levels of the aquifer that had
16 higher pressure, then that would be pushing water
17 up, and it would be pushing it into levels of
18 lesser pressure.

19 Q. Let me give you a hypothetical. Let's
20 say a well is completed at its bottom into the
21 top of the Pierce Gulch Sand Aquifer. And water
22 rises in that casing because of this to, let's
23 say, 60 feet of ground surface. Are you with me
24 so far?

25 A. Yes.

1 Q. And let's say that this well also is
2 not sealed outside of its casing, other than the
3 very top --

4 A. Yes.

5 Q. -- 18 feet. But that there is a more
6 shallow aquifer, let's say, at 80 to 100 feet,
7 well above the place where the Pierce Gulch Sand
8 Aquifer is encountered. What would happen?
9 Would water flow up the outside of that casing
10 from the Pierce Gulch, and escape into that other
11 aquifer?

12 A. In my opinion, yes.

13 Q. And would that tend to cause water to
14 flow from the Pierce Gulch Aquifer into that
15 upper zone?

16 A. Yes.

17 Q. And what are the implications of that,
18 in terms of that well owner having an accurate
19 view of well effects from pumping in the Pierce
20 Gulch Sand Aquifer?

21 A. The answers to that are many. But in
22 your simplistic hypothetical, saying, that there
23 is two aquifers; a shallow aquifer at 80 feet,
24 and another one at the base of the well in the
25 Pierce Gulch. Let's say -- and I think you said

1 that the water level in the Pierce Gulch was 60
 2 feet. If you could put a piezometer there, and
 3 measure that at 60 feet.
 4 Let's further your hypothetical, and
 5 say that the 80-foot aquifer has a water level
 6 that's at 70 feet. Well, within that well, with
 7 the heads commingled, you would have a water
 8 level of 75 feet; halfway between the two. And,
 9 yes, there would be a head that would provide
 10 water to go up and move out into the area of
 11 lower head.
 12 But also, in many cases what happens,
 13 because the Pierce Gulch is a confined aquifer,
 14 and because in many cases, there is a vadose, or
 15 unsaturated zone underlying the aquifer. In many
 16 cases in these unsealed wells, the water level
 17 rises in the well, as you've indicated.
 18 Let's say, there is no overlying
 19 aquifer at this location in your hypothetical,
 20 and the water level rises to 80 feet from being
 21 completed in the Pierce Gulch Sand Aquifer.
 22 Well, it also rises to 80 feet outside the
 23 casing. And outside the casing, if there are
 24 sand layers that were previously unsaturated,
 25 then that water is also moving into that

1 unsaturated zone. And you also have an
 2 attenuated or average water level.
 3 And it serves -- you could think of it
 4 as having a pump in that well all the time,
 5 because there is always an exchange as long as
 6 there is a differential in the head pressure.
 7 And I believe that that's happening a lot in the
 8 Eagle area.
 9 But of more concern to me, and I think
 10 we've said in our reports that -- at least I've
 11 never seen a denser domestic well field, in my
 12 opinion, anywhere in my career.
 13 Q. Than?
 14 A. Than the Eagle area. And that's mainly
 15 because it grew up as a ranchette sort of
 16 community. And public water systems -- the
 17 expense of distribution systems tend to be cost
 18 prohibitive when you have to run pipelines for
 19 long distances. So Eagle grew up as a community
 20 dependent upon domestic wells.
 21 But in our view, it is the density that
 22 you saw in the one map, that showed all the
 23 density of wells of these 2,000 wells, that can
 24 also serve as conduits for contamination into the
 25 surface to move downward into the aquifer, into

1 the Pierce Gulch Sand Aquifer. So I think that
 2 goes to your question about the depth of the
 3 wells, the 150 feet.
 4 A lot of the wells, fortunately, are
 5 still completed above the Pierce Gulch Sand
 6 Aquifer. Over time, as they are deepened, and if
 7 they are continued to be drilled with these type
 8 of well methods, they will allow contamination to
 9 move down through these contaminates through
 10 these conduits.
 11 THE HEARING OFFICER: Mr. Fereday,
 12 before we go on, do we want to take a short break
 13 before we press on to 5:00?
 14 MR. FEREDAY: Yes, I think that would
 15 be appropriate.
 16 THE HEARING OFFICER: Yes, let's take
 17 ten minutes.
 18 (A recess was had.)
 19 THE HEARING OFFICER: Okay. We are
 20 recording again.
 21 Mr. Fereday, further questions?
 22 Q. (BY MR. FEREDAY) Mr. Squires, you've
 23 been testifying about well construction, and the
 24 lack of seals around wells. Can a well's
 25 construction affect its ability to produce water?

1 A. Absolutely.
 2 Q. Could you describe some of the ways
 3 that that can occur?
 4 A. Well, the open area, the methods of
 5 open area that allow water to move into the well,
 6 the depths of the well, the diameter of the well,
 7 the materials used in the construction of the
 8 well.
 9 Q. Do any of these have anything to do
 10 with what Mr. Dittus testified to yesterday with
 11 regard to clogging of wells?
 12 A. Yes.
 13 Q. In your review of the some 2,000 or
 14 2,300 ground water wells in this area, did you
 15 make any determination as to whether any wells
 16 had -- did you see any of these wells that had
 17 gone dry? Or before I ask you that question.
 18 Let me ask you.
 19 Did you hear what Mr. Smith testified
 20 to yesterday with regard to or asked yesterday in
 21 his cross-examination of Mr. Vincent about wells
 22 going dry?
 23 A. Yes.
 24 Q. In your examination of the 2,000 some
 25 odd wells that you conducted as part of your work

1 for this matter, did you come across any wells
2 that had gone dry, in the sense that the water
3 table had been drawn down, so that the well could
4 no longer produce water?

5 A. Well, I think we need to point out that
6 those -- we did not visit 2,000 wells. The 2,000
7 wells are the records that the Department of
8 Water Resources that we examined that were the
9 report of the driller at the end of construction.

10 And those would not have any
11 indication -- of course, I mean, they are just an
12 indication of a brand new well. So there would
13 not be any way to determine from that kind of
14 analysis whether a water level went down or --

15 Q. Well, let me rephrase the question,
16 then. Do you know of any wells in the Eagle area
17 that have gone dry?

18 A. No.

19 Q. Why do you say that? What's -- in
20 light of Mr. Smith's questions, I assume he had a
21 good faith basis for asking that question?

22 A. Well, I've heard this expression a lot
23 over the years, and I think it's a misnomer. My
24 experience tells me that people report that their
25 well went dry when they turn on pump and air

1 comes out, not water. And I think that happens
2 with some frequency. Quite a bit of frequency,
3 unfortunately.

4 And it goes to what Mr. Dittus
5 testified to. That there is lots of water in the
6 aquifer, but the pump takes more water out than
7 can get into the aquifer, get into the well. So
8 the pump is more powerful than -- if it can pump
9 more water than the openings of a well will allow
10 in, so it pumps it don't to the pump. And then
11 the pump is pumping air, instead of water.

12 So to the unsuspecting domestic well
13 owner, it's a natural conclusion -- well, my well
14 went dry, because it's pumping air. But in
15 reality, a foot outside the casing in the
16 aquifer, the water level may not have gone down
17 even an inch.

18 So it's a -- to my degree, it's an over
19 used term. It's a misnomer. And in my career, I
20 can think of very few wells that actually -- the
21 water level in the well lowered beneath the reach
22 of the well. It's -- in my opinion, it's not
23 that common. Especially, in areas like Eagle,
24 where the water levels are extremely high, and
25 there is high artesian pressures.

1 Q. You heard Mr. Dittus' testimony
2 yesterday about his views about water level
3 declines, or lack thereof in his wells. Do
4 you -- can you comment on that subject?

5 A. I agree with him.

6 Q. Have you reviewed the data from -- with
7 regard to water level from the wells that
8 Mr. Dittus testified to yesterday?

9 A. I have, and I secured many of those
10 measurements myself, or my staff secured them.

11 Q. Do you know of any water level declines
12 in the Eagle City wells or the Eagle Water
13 Company wells? Would you have any reason to know
14 that?

15 A. You know, as a -- I know that we did
16 measure water levels in the Eagle Water Company
17 wells. And I honestly can't remember. But, no,
18 I don't -- I don't really know of any declines.
19 And I'm sure there are seasonal declines, and
20 annual declines that happen.

21 There is -- as I indicated, there is
22 fluctuations in the water table. But in terms of
23 unexpected water level declines, or unpredicted
24 water level declines, no. And I think there
25 are -- and I think it's important to point out,

1 that just developing a resource causes some
2 anticipated and fully expected drop in
3 water -- in water levels. And are typically, you
4 know, minor in this area.

5 Q. You mentioned some reasons for well
6 failures. Did you hear Mr. Dittus testify
7 yesterday about the life of wells?

8 A. Yes.

9 Q. And what's your view about that? Do
10 you agree with him, or disagree, or what's your
11 view?

12 A. Well, I've always found this to be an
13 interesting subject. Because a well is something
14 that people expect to last forever for some
15 reason. Nothing else that we buy or build anyone
16 expects to last forever. But everyone expects
17 that a well, you build it, and it just lasts
18 forever.

19 Wells almost receive no maintenance in
20 their life. And they should receive regular
21 maintenance. Wells -- the life of wells, I
22 think, is dropping. If you had to measure it,
23 because of the quality of the materials used to
24 build them is declining. The steel casing is
25 becoming less quality. They corrode more easily.

Page 950	Page 952
<p>1 But I know when I was at United Water 2 Idaho, the Public Utilities Commission would only 3 let the utility earn on a well for 20 years, 4 because they considered that to be the life of a 5 well. 6 On the other hand, the municipal wells 7 that we're building that are constructed of 8 plastic and stainless steel, I expect them to be 9 very long-lived wells, perhaps 100 years. 10 Q. With regard to the type of municipal 11 central system that M3 Eagle proposes to 12 construct here in terms of ground water 13 development, how would you compare that in terms 14 of efficiency, or conservation of the resource 15 with the alternative of putting in, well, let's 16 just say 7,000 domestic wells for 7,000 units at 17 M3? 18 A. I have every expectation that M3 will 19 pulled state-of-the-art wells. That's been the 20 intention. That's been my design so far for 21 their wells. I think that, as I said before, 22 that domestic wells are a real threat to the 23 resource according to the way they are currently 24 being drilled. And I think it would be very 25 damaging to the resource to drill 7,000 domestic</p>	<p>1 9:00. 2 (Hearing adjourned at 4:32 p.m.) 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25</p>
Page 951	
<p>1 wells, instead of three municipal wells -- three 2 or four municipal wells. 3 Just think about it. It doesn't make 4 any sense to perforate the stratographic layering 5 7,000 times when you can do it a few times. And 6 the wells that M3 has planned, are full depth 7 seals. They are un-corrodible material. They 8 are fully developed, maximum amount of open area 9 and filter pack. Very -- as efficient as they 10 can be. 11 Q. In your opinion, is that a conservative 12 way to approach development of this water 13 resource? 14 A. I do. 15 MR. FEREDAY: Mr. Hearing Officer, I 16 would like to end our work at this point, if that 17 meets your needs? 18 THE HEARING OFFICER: Anybody want to 19 vote? 20 MR. FEREDAY: And take this up again in 21 the morning. 22 THE WITNESS: I would appreciate it. 23 I'm getting -- my voice is getting weak. 24 THE HEARING OFFICER: All right. Very 25 good. Let's end. We'll start in the morning at</p>	

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

REPORTER'S CERTIFICATE

I, COLLEEN P. KLINE, CSR No. 345, Certified Shorthand Reporter, certify:

That the foregoing proceedings were taken before me at the time and place therein set forth, at which time the witness was put under oath by me;

That the testimony and all objections made were recorded stenographically by me and transcribed by me or under my direction;

That the foregoing is a true and correct record of all testimony given, to the best of my ability;

I further certify that I am not a relative or employee of any attorney or party, nor am I financially interested in the action.

IN WITNESS WHEREOF, I set my hand and seal this 5th day of May, 2009.

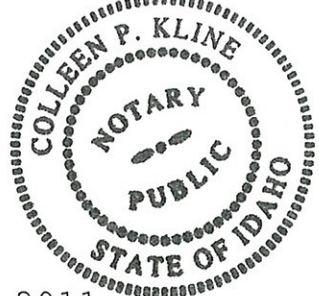
Colleen P. Kline

COLLEEN P. KLINE, CSR

Notary Public

P.O. Box 2636

Boise, Idaho 83701-2636



My commission expires September 17, 2011

A				
ability 803:21 865:3 932:16 944:25	873:25 929:16 addition 752:25 816:12	airport 871:15,16 872:4	884:3,3 920:23 921:3 948:20	899:20,21 appreciate 746:5 748:14 784:11 923:16,25 951:22
able 748:25 749:20 750:2 781:4 793:18 796:19 810:14 813:20 850:22 884:14 911:18 931:19,21 931:23 933:6 939:9	additional 823:8 870:3 872:1 891:13 additive 940:10,13 address 749:20 775:8	ALAN 742:16 allow 871:2 940:5 944:8 945:5 947:9	annular 785:16 935:22,23 936:5,7 936:23 937:11 938:1,16 939:2	approach 951:12 approached 846:20 878:5,8
abrupt 816:4 Absolutely 945:1 abutted 751:20 academic 783:24 837:14	addresses 931:12 adjacent 804:3 adjourned 952:2 adjust 797:3 admit 912:11 admitted 745:3 877:19 886:25	alluvial 748:3 869:9 alongside 797:12 alter 929:13 alteration 929:10 altered 847:17,21 alternative 950:15 amount 754:15 773:10 779:22 812:15 879:25 880:2 904:9 951:8	answer 751:25 752:14 753:14,15 772:6 775:22 784:1 823:6 845:8 881:21 answered 760:3 answers 872:17 941:21	appropriate 741:5 822:22 838:24 944:15 appropriation 761:9 appropriations 871:3
accompanying 829:24	advanced 903:11 935:8 advisor 915:8 advisory 871:8	amounts 863:6 879:3 ample 867:18 analogy 791:19 818:4	anticipated 949:2 Anybody 951:18 anyway 820:7 842:6 845:4 885:1	approved 761:18 approving 761:11 approximate 883:20 932:11 approximately 811:17 842:17 884:2 897:13 902:20 939:4
accumulate 799:20 accuracy 770:8 924:3	aerial 852:12,14 aerially 932:18 affect 944:25 afforded 749:17 afield 763:3 aforementioned 790:5	analyses 785:13 analysis 747:22,24 760:16 784:13 787:22 913:21 946:14 analysts 754:22 787:19	apart 843:3,7 apologize 819:21 apparently 750:24 754:22 877:2 898:20	approximation 931:5 April 741:14 746:2 885:22
accurate 765:5 776:4 789:1,3 790:23 791:7 796:13 801:8 807:8,10 813:8 818:14 831:5,9 851:17 898:22 918:7 922:12,15 925:5 941:18	age 759:17 760:14 767:9 769:24 770:8,13,18,24 772:21 773:8,9,13	analytical 753:22 768:22 analyze 785:12 analyzed 798:8 ancestral 756:5,22 757:1,12,18 758:15,20,21 759:3,24 760:9 767:11,12 768:16 768:17,24 769:1,3 769:9,20,21 770:13 772:15 774:4,4,9	appear 772:17 843:20 866:8 895:5 APPEARANCES 742:1 743:1 appeared 768:18 885:3 Appearing 742:19 appears 844:13 852:23 861:25 887:12 916:2 922:16	aquifer 747:14,20 747:25 748:2,3,5 748:11 751:5 754:1,9,10,16 757:23 759:24 761:5 762:16 763:20,23 764:1,6 764:10,10 768:23 770:18,24 771:25 772:22,23 773:6,9 773:11,15 776:17 776:22 780:1,2 781:9 784:19 785:24 786:3,4,5 786:21 800:6 803:16 804:8,11 804:11,15,18 806:12 807:17 808:7,9,16,25 809:2,10,10,20 810:6,10 811:2,5 811:7,18 815:2,8
accurately 776:1 796:16 807:3 876:14 898:21 931:8	ago 774:10 899:10 agree 756:24 774:16 784:4 889:25 927:11 930:7 948:5 949:10	analyze 785:12 analyzed 798:8 ancestral 756:5,22 757:1,12,18 758:15,20,21 759:3,24 760:9 767:11,12 768:16 768:17,24 769:1,3 769:9,20,21 770:13 772:15 774:4,4,9	applicant 758:15 application 755:9 755:11,12 770:11 812:23 814:8 851:13 862:18 866:25 867:5 878:1,4,25 879:8 879:9,18 899:12 899:16 900:3 909:7,12 924:6	
acquiesce 768:21 acres 911:2 activity 747:11 actual 773:5 797:1 853:18 939:17	agreed 749:5 881:25 agreement 781:5 agrees 794:7 ahead 752:14 772:10 aimed 938:11 air 811:13 935:4 936:11,23 946:25 947:11,14	ancient 774:11 Anderson 778:2 and/or 852:16,16 angle 820:11 angular 751:18 angulations 923:19 annual 883:19,22	Apparent 742:19 appears 844:13 852:23 861:25 887:12 916:2 922:16 applicant 758:15 application 755:9 755:11,12 770:11 812:23 814:8 851:13 862:18 866:25 867:5 878:1,4,25 879:8 879:9,18 899:12 899:16 900:3 909:7,12 924:6 applications 741:4 755:8 788:23 868:3 871:19	
Ada 742:9 748:22 762:16 777:6 812:6 814:21 832:19 858:23 919:14,14 920:4 929:9	add 833:23 898:5 added 835:25			

815:17 816:15	919:6 920:24	909:23 910:11	929:9	868:9 874:23
817:25 818:2	931:24 932:5,5,10	916:1 918:1,2	assume 844:21	878:9 904:1 905:1
821:14,19 822:9	932:12,18 933:2	919:7 920:7	946:20	913:20 914:19
822:12,19 823:16	939:18,25,25	921:23 926:23	assumed 754:20,20	avenues 878:15
823:19,25 824:20	940:5,15,21 941:6	927:9,20,22 928:1	770:18	average 940:7
824:21,24 825:20	941:8,11,14,20,23	928:2,7 934:20	assumes 752:12	943:2
825:21 826:2	942:5,13,15,19,21	938:21 939:13,22	755:25	avocation 783:4
827:14,24 832:15	943:25 944:1,6	942:10 943:8,14	assuming 758:13	awarded 776:13
834:7,11,16	947:6,7,16	945:4,5,14 946:16	758:18 843:7	aware 757:9
835:15 836:15,22	aquifers 763:18	949:4 951:8	assumption 753:24	axis 902:13
836:23 837:17	766:24 788:15	areas 815:14	919:9	A-A 875:1 891:24
840:16 844:21	834:14 835:9	846:10 947:23	assured 748:25	a.m 741:14 746:3
846:5 849:4,13,14	836:1 837:1	argumentative	astray 795:2	
849:16 850:25	838:16 862:13,14	886:19	astute 895:1	B
852:6,12,22	862:17 868:16,19	arithmetic 902:12	as-built 798:19	B 745:2
853:17,19 854:1,3	868:20 941:23	arranged 858:23	799:2	bachelor's 776:9
854:5,8,22,24	Aquifer's 887:18	arrow 841:19	Atlas 927:2	back 746:20 755:13
855:6,19,23 856:2	area 758:11 762:13	arrows 841:14	attached 926:21	789:24 799:14
856:6,17 857:18	762:17,19 766:17	856:20,25 858:11	931:14	801:24 813:22
857:25 858:2,4,7	772:1 776:22	858:13 928:6	Attachment 926:10	815:3 820:18
859:1,18,21,23	777:19,22 778:5	arsenic 825:2	926:15	830:14 845:10
860:1,14 861:6,8	778:11 779:12,20	867:13	attempt 830:10	851:12 853:12
861:15,21,22	780:15,19 782:8,9	artesian 806:18,25	835:8 859:8,15	859:7,7 861:18
862:6,16,20,20,23	782:22 783:9,11	826:5 858:1	attempted 932:21	865:22 895:1,13
862:23 863:1,13	784:7 790:6 793:6	947:25	933:13	924:5 926:11,23
863:15,18 864:3,4	793:8 795:14	asked 755:6,21	attendance 789:15	929:25
864:6,8,9,11,14	798:3 799:8 801:2	763:4 766:23	attended 787:16	backdrop 783:7
864:18,22,24	801:18 807:23	768:14,17 769:25	attention 896:5	background 776:8
865:1,2,7 866:9	812:18 813:4,7	814:6 819:20	attenuated 943:2	balance 754:15
867:1,6,7,8,12,19	816:20 819:5	832:19 845:15	attorney 933:20	Bannock 742:6
867:20,23,24,24	824:8 825:24	878:6 882:1	attributable 879:24	Barber 777:1
868:5,24 869:7,8	827:20 829:9,18	899:10 911:24	879:25	barrier 751:22
870:13 871:6,8,9	830:5 838:1	916:4 945:20	attribute 867:11	754:18,24 903:2,6
873:5,11 877:23	841:23 845:25	asking 757:14	attributed 879:22	basalt 788:12
884:1,4 885:8	846:9,13 849:7	760:1 856:11	885:11	839:25 840:15
887:13 888:1,22	857:10,17 860:20	881:19 920:3	attributes 825:5	841:3 842:17
891:5 892:4,7,13	861:10,16,25	930:2 946:21	augment 793:25	843:4,5,10,15,20
892:22 893:8,13	862:7,16 863:3,4	asks 752:12	authored 751:13	844:6,13,23
893:14,16 894:3,5	868:24 869:1,3,4	aspects 779:4	762:8 783:21	847:16,18
894:18,19 895:7	869:21 870:2,7,9	assemblage 783:13	926:17	basalted 843:24
895:15,19 896:10	870:11,20,23	841:3 847:25	authoring 885:23	base 784:18 803:16
897:1,7,19 898:3	871:4,10,14,25	asserts 758:15	authorities 777:22	804:7 815:2
898:6 900:10,18	872:2,3 873:3,7	assess 757:4	authorizing 885:24	817:17 821:19
900:19 901:2,7	873:11,17 877:23	assist 886:3	availability 832:13	823:23 834:24
903:12 904:15	892:16 898:13	associated 818:19	available 750:3,7	853:17,19,25
908:18,19,22	901:8 903:22	867:15	754:15 817:8	854:3,23 855:5
914:25 916:14,24	905:13 907:5	Association 742:10	828:18 830:11	857:18 866:17
916:25 917:5	908:6,11,17	742:14 748:23	831:8 867:18	887:24,24,25
				888:1,20 889:23

892:18,21 893:12 895:15 912:24 932:9 941:24 based 746:20 749:3 752:12 753:24 754:23 756:19 770:23,25 772:17 790:23 803:3 805:16 806:6 823:1 828:5,12 829:16 837:5 838:14 848:13 858:18 870:18 887:17 899:25 907:18 913:4,7 916:7 919:2 924:16 931:11,18 931:22 932:8,10 934:12,15 basement 819:17 basic 834:5 basically 757:23 790:13 827:25 870:22 basin 751:8 778:21 779:6 784:18 809:12,16,18 827:16 840:8,11 840:17,18 848:7 850:2 860:23 865:22 869:10 basin-ward 851:8 basis 790:3 793:24 946:21 batholith 847:10 bathtub 850:2 Beacon 742:21 841:22 bear 840:6 bearing 773:10 823:24 beauty 792:5 becoming 949:25 bed 809:21,22 810:2 815:6,18,21 850:10,23 854:6 855:6 bedrock 752:19	765:11 857:10 862:15 began 832:21 850:5 905:12 beginning 787:25 803:12 904:12 behaves 900:1 believe 747:12,18 752:11,18 753:16 756:5,9 759:17 761:2,3,25 763:7 791:2,6,7 797:14 808:4 811:23 813:9 814:6 820:19 851:1 852:13 861:11 863:18,23 865:19 865:24 867:17,22 880:23 881:23 888:3 890:1,5 891:18,21 900:7 905:8 914:11 926:4 930:18 937:8 943:7 bend 935:10 beneath 816:18 832:13 848:22,22 848:23,24,24 858:17 870:7 889:11 897:1 947:21 beneficial 872:11 872:12,14,22 benefit 846:8 best 753:23 754:23 766:11 831:8 849:14 854:2 899:23 913:19 917:4 925:7 931:4 931:5 932:16 better 760:14 808:13 817:22 835:24 836:1 890:21 910:8 918:3 924:7 928:12 beyond 765:16 816:9,21 920:7,12	bid 937:10 big 801:5 821:23 838:13 862:17 910:12 931:1 bigger 935:18,20 Bill 812:12 bit 775:21 777:1 788:24 820:2 833:1 835:13 837:24 839:22 864:7 868:2 870:5 877:21 891:6 893:3 899:9 915:13 947:2 bits 844:7 black 801:12 931:1 blips 816:16 block 859:14 blue 806:16 824:17 824:18,20 842:14 842:15 844:15 845:7 852:9,21 856:20 860:8 892:4,8,14 894:17 896:11 897:5 898:1 Board 876:1 body 801:16 Bois 870:3 Boise 741:17 742:8 747:13 748:1 751:8 756:22 757:1 762:16 768:24 772:1,15 774:7 775:10,15 776:10,11,17 777:2,18,22 778:11,15 779:12 780:5 783:9,10,12 783:16 784:22 787:20 789:12,15 795:14 801:5 810:11 841:2 846:25 847:25 866:20,23 868:23 868:24,25 869:4 870:20 871:14,25 873:3,6,10,11	902:11 928:5 bond 921:15 bookshelf 765:1 bore 785:8 787:2 787:15,15,17,19 787:23 788:2,17 788:19,22 789:1 789:12,13 790:10 791:18 792:9,11 792:25 793:3,7,9 793:14,19,20 795:13,21 796:15 937:24 938:2 bottom 784:19 796:22 803:13 836:15 854:4 892:17 921:7 940:20 boundaries 761:23 861:13 boundary 753:25 754:8,19 755:13 755:15 771:10,15 771:16,22 856:6 861:7,11,15 893:5 893:12,15 902:1 902:16,18 903:6 903:12,18 930:25 932:12 bounded 852:24 853:1 863:17,20 901:7 bounding 860:23 Box 742:7 brand 946:12 break 813:14 814:6 838:24 855:7 881:19 889:24 944:12 breaks 890:22,24 brief 813:25 826:23 briefly 801:10 812:10 813:15 broad 788:18 Brook 921:15 brought 870:19 874:3 906:1 Brownlee 812:12	878:6,8,11,17 BSU 882:20 build 949:15,17,24 Builders 921:14 building 880:15 950:7 built 786:15 789:13 bulb 928:13 bull's 924:20 Burnham 777:16 777:20,21 778:12 783:6 Busack 843:15,19 843:23 business 775:8 789:10 790:2 794:15 872:19 937:6 buy 949:15
C				
C 742:4				
cable 791:18 935:4 936:10 939:7				
calculated 771:1				
caliber 788:6 792:24 795:9,18 796:2				
calibrate 791:3				
calibrated 789:4 791:2 798:13				
call 774:24 797:22 838:6 841:2 851:18 863:24 884:3 925:14,16 937:3				
called 755:15 847:24 895:19 896:5				
camera 793:17,23 793:25 794:3,6 831:13				
cameras 789:20 793:14				
Canyon 919:14 920:4				
capable 820:1				
capacity 787:5 884:24				

caption 835:24	cement 938:5	812:13 815:11	clear 765:20 774:9	comment 774:12
career 777:17	cemented 840:3	827:14,15,20	815:12 817:21	795:5 836:10
778:1 785:4 786:9	center 781:22	868:18 870:9	837:4 860:6 889:8	861:18 923:14
786:25 789:9	809:18 842:10	characterized	938:3	925:18 948:4
943:12 947:19	857:11 910:9,21	842:14 848:15	clearly 856:7 862:3	commented 755:10
carried 779:12	centering 931:1	861:23 863:6	clients 782:19	comments 755:7
780:10 785:21	central 950:11	869:9	clogging 945:11	765:3 767:8 771:3
790:2	certain 805:18	charge 761:19	close 778:7,8	784:12
carry 770:4 850:17	832:25 833:3	778:18	863:19,19 865:12	commingle 940:6
carrying 850:16	835:18 847:8	charts 798:6 799:3	916:14 920:20	commingled
case 754:19 785:9	930:15	checked 746:20	closely 920:16,18	940:10,11 942:7
805:21,22 844:14	certainly 762:25	chemistry 759:15	921:1,10,11	commingles 759:24
878:22 885:20	769:15 772:11	760:16 772:3	closer 819:14 860:3	Commission 950:2
899:19 904:13	873:2 899:4	785:19 798:18	Cloverdale 776:25	commissioned
913:7 930:19	certainty 845:22	823:21 825:1	clues 778:21	846:19
931:6	919:23	chip 883:8	cluster 857:6	Commissioners
cased 795:4,6,10,14	certified 872:14,16	chose 929:15	921:22	876:1
795:17	cessation 748:12	Chris 884:16 885:2	clustering 837:4	committed 832:20
cases 786:12	cetera 813:5 835:6	chute 904:23	coarse 848:8,16	committee 871:8
792:20 794:2,24	905:2	circuited 795:12	849:1 850:3	871:11
795:2 831:12	cfs 872:10,24,25	circulated 931:9	864:20 900:22	common 902:14
844:13 873:15	chair 746:9	circumferential	cold 782:15 823:23	947:23
878:20 927:16	chance 790:13	935:23	COLLEEN 741:23	commonsense
936:6,10 937:10	change 803:18,19	cities 799:18	college 787:14	774:16
937:12,20 942:12	816:2 836:2,12,16	city 781:20 801:1	Collin 842:19	communication
942:14,16	844:7,7 900:1	801:14 813:3	843:5,11,18	747:25 748:7
casing 793:20	changed 834:8	884:16,17,20	844:10,14,16,24	community 943:16
795:5,8,12,25	863:21	908:24 948:12	colloquy 887:2	943:19
796:6 935:9,11,11	changes 751:23	claimed 758:23	901:24	compacting 809:17
935:17,18,20,22	759:25 796:17	Claire 921:15	color 793:15	company 775:17
936:1,3,9,14	892:8,8	clarification 757:6	835:25 892:8,16	775:24 782:19
937:21,21,22,25	changing 828:8	clarifies 831:22	895:5,5 898:20,20	790:12 812:11
938:2,6,10,17,18	character 805:3	clarify 746:22	colored 857:4	868:18 948:13,16
940:22 941:2,9	822:3 836:13,16	747:17 748:13	Columbia 869:24	compare 797:1,12
942:23,23 947:15	characteristic	887:10	combination 774:8	798:25 800:2
949:24	792:2	clarifying 748:14	809:14,15 838:4	845:12 864:5,25
casings 935:8	characteristics	clash 838:8	come 775:1 824:12	865:1 909:19
cause 751:21 767:3	765:8 779:3	class 803:14	826:7 863:13	916:23 950:13
775:4 866:2	792:15	clay 788:13 794:24	895:1 903:20,20	compared 760:15
941:13	characterization	808:19,20 815:5	925:19,20 946:1	770:24 902:12
caused 873:1,23	765:25 812:6,16	815:10 816:2,14	comes 810:7	924:4
874:6 903:22	812:22 832:16	816:18 825:4,5	886:21 892:4	comparison 818:9
causes 949:1	870:11 871:14	clays 791:24	908:22 911:17	844:10
caved 793:6	872:6 880:9	803:23 804:4	947:1	competitive 937:1
caving 935:13	891:10 894:10	847:21 848:17	comfortable	937:5
cavities 936:9	characterize	892:17	761:16 835:20	complaints 869:20
ceases 855:19	752:19 765:5	clean 864:20	837:7	complete 746:25
856:18	778:17 799:8	cleans 851:9	coming 797:5	825:25

completed 760:25 763:22 807:20 824:22,23 825:8 825:16 836:20 923:8 931:25 939:24 940:20 942:21 944:5	823:20 833:5 893:15 conditions 767:2 896:16 conduct 765:14 803:25 conducted 779:25 785:24 789:9 945:25 conductive 811:13 conduits 943:24 944:10 cone 754:10,13,15 754:17 873:23 874:5 cone-shaped 754:11 confidence 791:5 792:18 confident 919:20 932:25 confined 942:13 confirmation 806:10 confirmed 823:9 918:7 conflict 923:22 conformational 838:18 confused 911:17 confusing 890:5 891:6 confusion 924:10 924:11 925:9 connect 805:3 806:9 830:24 connected 863:24 863:25 884:14 connecting 803:6 820:3 845:16,19 connection 751:3,6 871:19 905:16 926:9 Connolly 842:9,19 842:19 843:5,11 843:13,18 844:10 844:10,22,24 845:17	conservation 950:14 conservative 951:11 consider 748:10 784:9 814:14 823:23 827:4 830:16 831:25 853:25 consideration 907:23 considered 772:1 950:4 consistent 821:15 821:17 822:7,10 conspicuous 935:14 constant 748:10 constriction 795:22 construct 950:12 constructed 779:23 798:24 933:8 950:7 constructing 785:2 construction 797:25 798:20 799:3 831:11 869:18 930:10 934:10,13 944:23 944:25 945:7 946:9 constructive 784:11 consultants 879:2 consulting 775:14 778:3,4 contact 854:4,19,21 888:2,21,21 889:23 890:18,22 890:24 892:19,20 893:23 contacted 812:11 884:15 contain 839:11 containing 768:23 contaminates 944:9 contamination	943:24 944:8 context 753:18 769:3,10,13 774:7 774:7 783:23 887:9 907:4 continual 816:1 continuation 779:5 continue 802:7 842:5 852:18,20 892:21 continued 743:1 744:4 745:1 747:7 830:23 833:12 944:7 continues 876:5 continuous 751:10 821:20 844:22 883:3,4 888:21 896:25 contorted 855:11 855:12 contour 857:22 858:13 864:8 887:24 918:6,18 919:2 923:2 924:16,20 925:6 925:15,16 926:22 928:17,18 929:11 929:12,13 932:9 932:13,15 contoured 853:25 914:24,24 928:19 contouring 920:25 contours 855:2 857:24 864:5,10 864:12 888:18 889:6 915:20,21 915:23 918:8 923:18,21,24 924:4,12 925:9 927:5,22 928:4,10 929:16 930:4 contract 760:20,22 761:1 contradict 823:12 contrast 804:16 873:3 contribute 832:22	contributed 783:18 coordinate 805:2 copies 931:14 copy 764:22,23 898:9,11 core 920:7 corner 875:12,18 910:7,15 911:4 Corp 801:18 846:3 846:19 847:23 848:25 857:12 865:10 correct 762:12 766:6,7,12,14 772:23 773:6 795:19,25 796:1,3 798:17 801:11 802:5,13,14 810:25 814:4 818:6,7,10,11 819:1,2,18 822:22 825:8 828:16 835:17 839:25 854:11,13 855:14 855:16 858:9 859:12,13,24 866:10,16 876:7 879:13 880:9 886:12 887:14 888:9,11,16 899:12 903:7 909:16 912:10 918:4,22,23 919:9 919:10 921:12 923:25 924:22 931:17 938:7,8,13 Correctional 874:2 correctly 854:7,16 887:25 889:4 903:10 correlate 805:1 834:3,17 correlated 817:16 correlation 803:2 817:19 834:6,10 correlative 885:4 corresponded 874:21
---	--	---	--	---

corresponds 875:23	cross 800:10 802:10,10 805:7 806:11 809:3,8 818:25 819:7,19 819:21 820:24 821:1,12 826:12 826:16,22 827:3,9 828:3,4 829:23,24 830:4 833:17 839:11,13,16,20 841:12,16 842:1,7 842:10 845:13 849:6 853:4 855:24 859:8 865:6 874:10,11 874:22 875:1,6,13 875:24 876:10 891:12,13,15,18 891:24,24 904:10 905:7,8 913:20 923:20 927:20	802:24 803:4,12 805:2 810:24 847:5 cycle 883:23 C-O 875:20	746:15 769:24 925:5 926:4 dated 812:8 918:21 929:7 dates 925:22 dating 767:9 770:8 770:24 773:8 David 743:5 926:16 day 800:6 904:4 days 789:24 799:15 809:24 873:12 884:10 921:2 dead 816:14 910:9 dead-end 757:22 deal 791:5 792:17 795:16 December 883:15 decided 812:16,17 declared 871:10 declines 948:3,11 948:18,19,20,23 948:24 declining 850:11 869:20 949:24 deemed 846:4 deep 748:4 765:10 809:22 816:23 817:5 826:8 836:20 847:12 865:12 897:14 940:13 deepened 870:25 935:11 944:6 deeper 748:1 752:19 807:22 809:24 823:18 825:25,25 829:12 849:8 857:2 860:4 865:7 895:20 896:14 908:12 922:3,9 937:20 939:22 deepest 829:15 842:7 908:1,4,13 909:24 912:8 913:1 deeply 897:24 defined 834:19	890:21 Definitely 832:3 definition 893:23 894:10 definitions 893:24 definitive 767:7 degree 930:6 947:18 delineated 870:21 delta 815:16 816:6 848:15 849:23,25 851:7 deltaic 850:12 delve 897:23 demonstrate 892:1 895:8 Dennis 918:16 denote 837:10 denoted 828:22 919:6 denotes 919:17 dense 847:21 857:6 denser 943:11 density 909:21 910:1 911:23 943:21,23 department 741:1 741:15 757:5 763:15 764:25 766:16 780:14 870:17 914:20 917:25 918:16 926:17 946:7 departs 861:4 depend 789:11 dependent 943:20 depending 766:3 791:25 depends 769:3 depict 824:14 876:14 893:9 897:18 927:15 depicted 849:7 859:20 861:10 882:17 892:13,15 896:10 914:24 928:17 depicting 894:17
Corrington 843:20 corrode 949:25 Cosgrove 760:24 cost 936:24 943:17 costs 867:15 Counsel 753:13 755:6 763:2,4 counter 791:20 Counties 812:7 County 742:9 748:23 762:16 812:6 814:21 832:19 858:24 875:20 876:1 919:14,14 920:4 929:9 couple 773:25 797:14 834:2 910:19 coupling 932:23 course 750:21 787:14 795:8 829:11 842:3 855:8 860:14 866:17 873:8 884:12 914:15 916:21 946:11 courses 787:19 869:25 courtesy 746:23 cover 764:9 776:23 covered 764:6 created 799:2 Creek 782:9 801:3 846:5 849:1,4,5 849:14 852:5,22 859:1 861:21,22 862:16,22 863:12 864:2,6,11,14 865:1,7,16,17,18 865:20 866:4 867:1,6,10,12,20 894:5,19 895:19 896:10 897:7,9,18 898:6 900:9,18 919:6	cross-examination 744:6 749:14 750:17 945:21 cross-examine 748:20 cross-sectional 799:25 800:13 802:17 820:20 876:15 891:8 906:14 907:13 913:16 933:10,12 crystal 840:3,14 CSR 741:23 culled 913:19 916:11 917:1 culling 907:11 current 785:6 789:18 823:3,20 936:24 937:18 currently 950:23 currents 795:11 curve 919:17 cut 871:3 cuttings 782:5 785:10,14 797:2,2 797:4 798:7	D D 744:1 745:1 daily 793:24 Dam 777:1 damaging 950:25 dark 800:19 852:21 854:1 857:22 931:1 dash 805:17 dashed 801:12 806:14,19 807:6 824:16 852:8,25 860:21 861:1,3 894:21 896:7 897:8 919:19,21 929:19 data 753:23 754:23 755:19 786:15 790:14,17,20 794:1,9 797:12 798:13 799:23 800:11 805:11 806:8 823:8,10 827:4,5,6,10,18 828:4 830:12,17 831:17 838:11,12 839:19,23 842:7 844:4 874:23 882:16,17 883:3 883:10 884:12 885:1 891:17,19 905:4,5 911:10 912:24 913:20 914:16 918:5,19 923:1,2 924:16 925:1 926:5 928:19 929:22 930:14 936:16,17 948:6 database 827:23 831:18 906:21 910:25 912:25 date 741:14 746:2		

909:23	767:2,10 791:16	915:5,9 932:8	793:14 798:16	discussed 746:4,6
depiction 802:10	821:18 845:14	951:8	807:16,21 808:24	764:10 776:18
914:7 923:18	846:3 849:15	developing 789:17	808:24 822:18	780:21 809:9
933:1	describing 880:12	828:19 878:16	835:10 837:9,10	818:17 833:20
depicts 807:18	919:4	949:1	837:20 843:17	845:11 858:11
809:8 905:19	description 745:3	development	848:13 864:7	905:4 919:8
deposit 748:1 849:2	776:5 846:11	780:17 781:17	875:2 896:15	925:12 939:19,21
850:3 900:23	880:6 898:23	785:17 832:17	897:9 924:14	discusses 749:6,10
deposited 850:1	design 781:13,16	868:11,20 869:24	939:24 940:1	813:1
depositional 751:7	782:4 785:14	869:25 870:7	differential 943:6	discussing 814:2
751:12,15 762:21	950:20	879:7,21 892:11	differentiating	826:8 939:20
809:19 834:24	designate 836:8	892:23 897:12	835:9	discussion 749:24
848:14	designated 779:24	899:11 904:16	differentiation	768:2 928:12
deposits 751:19,20	781:1 798:21	950:13 951:12	786:2	discussions 880:16
849:23 850:12	887:17	device 791:14,15	difficult 752:3	dispersion 772:3,8
depression 754:11	designation 894:20	791:16 792:25	753:6,7 757:4	distance 754:25
754:11,13 873:23	designed 780:18	797:23	859:16 936:22	842:20 843:22
874:5	786:25 787:5,7	diagram 797:23	difficulty 869:19	distances 943:19
depth 753:1 796:14	824:3 880:15	800:24 807:20	digress 812:2	distilled 924:25
797:3 798:10,11	designing 785:2	810:3,15 815:1	837:24	distinct 768:23
798:12,16 825:24	despite 766:11	852:7 855:1 857:2	dilute 759:14	792:13 796:20
909:24 913:5	831:3	857:5,11,23	diluted 759:3	803:17 816:8
914:17 923:4	detailed 920:11	859:22 860:5,15	dimensions 859:10	934:19
931:23 932:15	details 797:25	860:18 891:9	dip 809:13,19	distinctive 815:12
938:17,18 939:1,2	814:2	929:20	810:7,13 818:6,8	815:15 816:5
939:9,10 944:2	determination	diagrams 799:25	820:8,9 908:19	821:18 835:2
951:6	756:19 770:12,13	799:25 824:13	dipped 808:10	836:15
depths 796:16	945:15	859:15 906:14	908:22	distributed 815:21
798:24 836:23	determinations	907:14 913:16	dipping 817:25	distribution 909:22
916:20,22 945:6	931:19,23 933:7	933:10,12	855:6 860:2	943:17
depth-wise 932:18	determine 806:1	dialog 752:4	dips 809:11 810:2,2	Dittus 799:16
DEQ 884:23	868:19 869:12	diameter 792:25	822:5	825:11 880:3,17
derived 849:23	878:9 884:15	795:13,22 935:16	direct 744:4,11	881:25 882:1,21
856:25 857:21	889:20 939:17	936:3,4 945:6	747:7 748:18	908:8 945:10
936:18	946:13	diameters 793:15	775:5 896:5	947:4 948:1,8
describe 776:1,7	determined 771:18	diamonds 857:5,14	direction 850:7	949:6
777:13 778:10	932:6,16	866:6,6 914:14	858:15 862:11	diversion 867:5,22
780:22 785:1,25	determining 751:4	Dick 837:24 838:1	876:19	879:22 899:10,16
787:21 793:12	786:18 820:2	838:11	directions 923:20	900:6,12
809:7 812:4,9	868:11,15	differ 833:22	directly 752:21	document 767:15
817:24 828:23	develop 830:13	difference 755:23	827:7	812:5 877:17
832:7 871:21	871:24 900:9	755:24 767:13	director 832:19	885:19
902:7 918:13,25	916:24	836:25 837:5	disagree 949:10	documents 886:21
919:16 920:14	developed 787:25	919:19 921:22	discharge 758:11	905:1
926:12 929:18	823:7 826:24,24	differences 837:16	disconnect 808:1	dollars 937:4
932:6 937:14	827:3,10,11,13,15	different 751:11,15	discontinuity 808:1	domain 762:25
945:2	829:21 832:24	751:20,21 762:21	discrepancy 760:6	domestic 787:4,8
described 751:12	839:12 872:9	769:7 772:22	discuss 868:2	813:4 908:5,6,7
		784:18 788:25		

908:10 931:6,20 935:1 937:2,2 939:12 943:11,20 947:12 950:16,22 950:25 dominated 862:11 door 914:2,2,3 doors 911:20 dots 806:9 820:4 830:25 930:1 dotted 801:12 821:2 919:22 double 893:12 doubt 816:9 Douglas 915:7 928:19 downloaded 907:7 912:24 downward 880:19 882:2,15 943:25 dozen 787:8 Dr 751:14 779:7 817:9 860:24 886:6,6 915:7 929:3 930:5 draft 827:3 828:22 830:19,19 831:4,7 831:17 832:5,10 833:6,24 drafting 781:18 drafts 828:25 drag 850:22 drain 850:5 drained 815:18 850:9 dramatically 834:8 draw 796:23 805:18 867:20 drawdown 866:1 870:14 873:7,14 874:6 883:25 885:3 902:9,11,17 902:21 903:23,23 904:1 drawdowns 902:15 drawing 796:14 835:20 874:7 drawn 805:12,14	830:21 858:14 859:24 905:9 946:3 drew 828:3 874:22 891:19 928:6 932:13 933:9 drill 797:2 798:7 802:24 824:1 825:25 839:25 847:22 899:24 935:6 937:24 939:22 950:25 drilled 782:1,20 785:1,12 791:11 797:8 798:2,7 799:4 802:18 816:24 821:25 822:24,25 824:2 824:25 839:24 846:24 847:24 872:7 873:19 891:16 903:21 934:21 935:3,9 936:2,20,23 937:7 937:21,23 938:14 939:7 944:7 950:24 driller 782:17 831:9 839:19 842:13 914:17 924:18 946:9 drillers 794:9,10,13 794:17,19,25 799:23 827:5,10 827:18,23 828:5 828:13 829:5,8,10 829:17,18 831:20 839:23 842:6 844:4 847:22 874:23 891:17,19 905:5,9 906:18,19 906:20,23 907:8 907:19 913:5,6 924:16 932:19,20 932:21,23 933:6 934:22 937:3 drilling 779:23 781:15 785:8	800:12 824:2 827:8 840:5 844:5 844:8 934:21 935:3,5,15 936:10 936:25 940:2 drill-and-drive 795:14 935:3 939:6 drinking 837:11 drive 935:6,9,16,17 935:21 driven 935:12 driving 808:25 drop 949:2 dropped 850:20 dropping 949:22 drops 850:18 dry 782:9 810:12 811:18 893:8 945:17,22 946:2 946:17,25 947:14 due 771:22 883:23 903:18 duly 775:3 Duncan 884:16,18	896:6 908:25 915:11 921:23 927:9,19,22,23,25 939:13,22 943:8 943:14,19 946:16 947:23 948:12,12 948:16 950:11 Eagle's 884:20 earlier 803:8 822:7 833:20 849:8 857:11 891:1,7 914:14 916:5 924:5 early 777:16 813:14 839:20 846:21 883:13 earn 950:3 earnest 799:7 earth 800:14 931:11 easier 875:3 easily 949:25 east 751:11 762:17 762:18 776:25 777:2 783:9,10 824:7 830:8 840:10 860:4 869:3 908:23,25 easterly 928:15 East-East 875:13 easy 804:25 805:1 812:25 834:25 863:14 economic 867:19 Ed 774:24 edge 778:21 815:20 840:18 852:24 855:22 856:17 861:7,8,20 893:13 935:10 educate 813:2,2 educational 776:8 814:16 Edward 744:10 775:2,9 Edwards 742:20 762:1,2 877:15,16 effect 773:14	effectively 765:7 effectiveness 785:7 effects 771:9 873:4 873:7 902:16 903:18 941:19 efficiency 950:14 efficient 749:1 951:9 efficiently 746:7 effort 832:21 913:9 efforts 766:12 eight-and-a-half 802:5 891:8 either 750:6 839:15 908:1 elaborate 837:21 electrical 792:11 795:11 electricity 803:22 803:23,25 electronic 883:10 electronics 789:21 element 746:19 904:14 elevation 800:18,19 836:9 853:24 857:20 858:7 917:7 elevationally 817:15 elevations 803:1 853:18,18 866:21 916:6 917:11 eleven 802:5 891:8 embarrassed 842:21 Emmett 862:8 emphasis 829:11 869:24 employed 775:11 777:24 employee 775:13 775:16 777:25 encounter 754:18 860:13 encountered 843:16 902:18 903:3,6 941:8
E				
E 741:16 744:1 745:1,2 875:18,22 875:23 Eagle 741:6 742:2 742:13,14,18,22 744:2 779:12 780:15,19 781:22 782:1 790:5,6 796:11 798:2 799:13 805:20,21 806:2 808:2 810:16,23 811:1 812:5,14 813:7 819:10,11,14 821:24 822:1 824:8 832:12 842:2 849:11 857:6 860:22 861:10,12,14 863:22 878:6 883:3 884:16,17 885:7 894:22				

encounters 808:11	evaluated 763:19	792:22	891:7,19 894:1	758:13,18,23
ended 915:23	evaluating 765:10	exchange 943:5	895:11 898:10,21	759:21 765:22
ends 861:6 876:6	778:11 779:8	exclusive 757:17	901:11 905:8,16	815:13 929:8
920:10	evaluation 747:24	758:16,21	905:19,22 906:8	experts 784:3
engaged 747:11	756:20 765:9	exclusively 757:1	909:6,13,20 912:2	explain 747:16
846:22	772:2	765:10 772:15,18	912:5,15,16,16,20	754:7 772:10
Engineering	evaluations 780:17	774:13	913:2,16 914:11	782:12 783:2
846:22 847:3	event 884:6	excursion 804:5,9	918:10,14,15,25	807:17 814:11
926:18	eventually 773:6	804:16 810:21	920:13 923:11,11	820:17 822:15
ensure 918:4	everybody 813:18	811:9,12 815:3	923:17 924:2	825:21 852:3,19
entering 780:15	evidence 756:1	excursions 816:17	925:4,10,10,14,15	859:4 877:6
869:10	767:4 805:5	excuse 779:1	925:23 926:3,10	888:12 894:23
entertain 899:4	877:18,19 886:21	864:25 880:24	926:11,15 928:24	895:2 904:12
entire 785:11 809:3	886:24,25	887:8 888:15	928:24 930:17,22	906:7 930:16
910:25 938:17,18	evolved 785:4	898:8 905:18	931:14,15 932:3	934:9
entitled 762:15	exact 762:17	912:11 925:24	933:1,5	explained 760:5
800:5 812:5	exactly 747:21	excused 774:21	exhibits 817:9	761:20 796:17
entitlement 832:14	756:23 862:12	exercise 766:6	828:9 839:10,16	887:23 891:1
environment 751:8	887:4 917:3	786:13	exist 767:5 811:19	894:11 895:11
environments	exam 872:12,22	exhaustive 779:17	855:19 856:19	918:20
751:12,16,24	examination 744:4	exhibit 753:13,15	897:19	explaining 930:14
762:22 788:10,11	744:7,11 746:10	762:10,11,14	existence 780:7	explains 762:23
eons 855:15	747:7 748:18	767:16,17,18	826:22	856:16
equals 842:23	749:12 762:5	768:10 776:1,18	existing 823:2	explanation 854:15
eroded 855:13	775:5 945:24	776:23 797:13,15	827:22 905:1	893:21 897:22
889:16	examine 750:12	797:16,18 800:5,5	exists 852:13	906:11 918:17
erosion 850:14	examined 906:18	801:9,21 811:21	expand 799:24	exploration 816:23
erratic 835:12	946:8	811:23 814:3	expanding 788:21	exploratory 779:23
escape 941:10	examiner 872:15	818:17,19,22,24	870:1	780:25 781:25
especially 777:23	872:16	826:12,15 827:1	expands 754:13	782:20 846:24
788:21 845:6,20	examining 782:5	828:2,10,12,16,21	expect 759:10	explore 902:16
850:25 862:14	839:7 907:19	829:2,6,24 831:1	845:3 949:14	explored 901:4
902:15 909:3	example 751:17	831:2,25 832:4	950:8	explosive 847:16
947:23	759:6 766:8	833:16,16,17	expectation 950:18	exposed 850:11,14
essential 791:9	782:22 791:24	839:18,19 841:5	expected 949:2	850:23
838:4	806:22 834:23	844:11 845:11,14	expects 949:16,16	expound 800:21
essentially 776:19	839:17,18 841:6	851:12 853:10	expense 943:17	820:2
776:24 798:23	865:25 866:13	856:10,10,15	expensive 823:22	expressed 924:10
800:25 801:4	873:5 874:25	859:11 874:8,16	experience 748:15	expression 805:20
802:11 852:10	875:2 887:5	874:18,25 875:4	777:9 779:7 780:9	841:24 861:5
855:7 859:24	899:24 904:10	876:14,16,22	784:7,15 786:16	895:15 946:22
estimate 786:8	910:4 924:18	877:5,5,6,18,19	790:16 805:13	extend 805:3
908:5	938:24	880:23,23 881:20	817:23 829:10,16	852:15 855:1
estimating 760:14	examples 868:23	882:10 885:14,14	868:3,6,13,15	920:12
et 813:5 835:6	Excel 914:15	885:15,16,17,18	878:4 907:18	extending 894:3
905:2	exception 798:17	886:8,25 887:5,7	913:4,8 946:24	929:20
evaluate 765:7	938:19	887:7,8,12 888:2	experienced 829:18	extends 801:13
777:5 932:19	exceptions 792:21	888:5,6,15 890:1	expert 753:7	937:19

extension 821:9	far 747:1 763:3	843:6,12,12,22	771:14,19 797:15	files 746:20
extensive 755:7	777:7 786:25	854:9 865:11,14	800:5,7,22 801:8	filing 899:16
834:6 862:20	793:5 801:24	866:2 873:9 874:6	801:10,21 802:4,8	filled 804:11
extent 764:3	821:16 843:17	884:2 897:11,14	802:9,15 806:11	filter 785:15 951:9
831:16 833:1	845:4 859:23	908:11,16 909:1	807:16 811:20	final 831:25 833:24
847:8 852:12,14	880:9 925:7	916:7 924:19,23	813:10 814:7,11	898:5
extreme 910:6	940:24 950:20	937:19,22,23	817:12 818:17,18	finality 832:8
extremely 825:1	farther 777:1	940:12,13,23	818:22,23,24	find 759:16 790:24
848:16 937:1	843:14 851:8	941:5,6,23 942:2	820:15,16,18,21	794:16,16,24
947:24	fathers 769:4	942:3,6,8,20,22	820:23 821:12	796:5 827:21,22
eye 924:20	fault 753:25 754:21	944:3	826:25,25 829:25	902:23 922:24
E-E 875:6 876:10	783:10 784:17	fell 837:6 838:16	835:23 836:7	finding 758:7
E-East 875:13	805:14,16,20,21	felt 754:22 812:18	845:10 849:6	770:21 794:10
	806:2,6 819:4,7,8	833:2 835:17,20	851:14,17,21	fine 782:7 829:3
	819:12,22 820:5	837:7	852:4,20 853:10	888:13 892:12
	841:7 843:9	Fereday 742:4	853:12,13,15,15	906:10 927:13
	849:12 860:22,24	744:5,7,11 746:10	853:20,21,22	finer 834:2,10,18
	861:12,14 863:22	746:12 747:8	854:2 855:4 856:8	848:9,9
	894:22 896:6	748:18 749:25	856:9,12,15,17,20	finest 851:7,9
	897:8	750:9 752:11	857:3,19 859:2,7	finish 753:15
	faulting 752:25	755:23,25 756:8	859:11 860:25	finished 746:10
	765:7 805:5,7,10	756:11 762:4,6	861:18 866:6	748:18 761:3
	839:14,17	763:4,17 767:18	880:24,25 881:3,6	919:4
	faults 751:6 784:21	767:22 768:13,14	881:20 882:3,10	finite 901:8
	784:22 844:2	773:17 774:23,24	882:13 883:25	fire 879:15,17,20
	849:11	775:6,25 801:19	885:14,17 887:5,7	879:23,25 884:25
	Feast 846:23	802:4 813:13,16	887:8,12 888:2,5	firm 775:14 778:3
	Feather 781:21	814:1,4,5 838:20	888:6,14,15 890:1	778:4
	841:18	839:7,9 874:17	890:1,10,12 891:7	first 768:19 772:6
	feature 790:19	877:4,20 881:1,4	893:22 894:1	775:3 789:19
	861:25	881:5,9,11,12,18	895:2,11,11,25	798:1 806:13
	features 765:11	882:6,10,12 886:8	896:1,2 897:6	808:15 812:1,21
	767:5 798:16	886:11 887:1	898:12 901:10,22	812:24 818:24
	800:21 852:4	888:13 891:21	903:8,15 909:8,11	820:21 827:19
	February 885:21	893:17 894:14,15	909:19,20 911:22	828:17,18 829:4
	885:23	898:8 899:2,6,8,9	911:24 912:5	830:10 838:12
	feel 853:8 859:4	901:22 906:2,7	914:9,11 915:18	844:25 851:6
	863:3,5 919:20	923:15 924:1	918:11,13,24	852:1 857:15
	922:13 932:25	944:11,14,21,22	919:5 920:13	873:19 874:25
	feeling 839:22	951:15,20	923:17,18,23,23	878:5 882:16
	feelings 784:8	Fereday's 749:11	924:2,5,7,9 925:4	886:5 895:2
	feels 746:25	ferret 904:25	926:13,21 927:1	899:24 904:24
	feet 752:24 753:25	fewer 921:25	927:17 928:24	913:24 915:19
	754:25 785:11	field 760:23 780:5	929:1	917:2 927:10
	807:10,13,23	783:5 788:18,21	figures 831:5 832:9	934:17
	810:4 811:4 817:5	885:7 943:11	833:19 851:14	fit 753:23 823:8
	819:15,16 826:9	figure 752:10	887:10	five 771:18 785:11
	842:14,16,24	753:13,16 771:11	file 812:17 871:18	798:22,23 839:2,3
F				
facies 808:5 848:1				
848:3,4,20 849:20				
863:21				
fact 751:19 771:13				
809:16 825:3				
831:3 838:5				
846:20 849:20				
873:3 878:14				
889:8 891:13				
898:18 901:3				
922:17 933:9				
936:6				
factors 751:5				
facts 756:1				
failures 949:6				
faint 834:17				
fair 812:15 904:9				
920:6				
fairly 761:22 774:9				
835:4 843:20				
880:19 884:7				
889:5 932:25				
faith 946:21				
fall 777:15 883:17				
familiar 749:19				
766:1 782:9				
784:20 831:12				
847:7 878:17				
881:24				
familiarity 846:12				
847:4				
fan 868:24 869:8				
fancy 793:17				
fans 869:9				

883:20 884:2	follows 765:6 775:4	872:7 873:24	939:22	789:18 790:17,24
903:10,11 907:6	foot 807:12 842:8	907:6 951:2	gentle 889:17	791:2 792:6,15,16
908:1,13 909:24	842:20 864:10,12	frame 769:11	geochemical	794:1 796:8,11
912:8,25	873:14,20 883:20	frames 833:3	756:20 797:25	797:11,24 798:5
flat 809:11 818:1	909:2 916:5,19,19	framework 762:15	836:25,25 837:15	799:1,3 802:21
859:18 864:14	937:22,24 947:15	776:16 869:8	geochemist 757:3	803:18 810:21
865:21 916:1	foothills 777:2	Franklin 775:9	760:12	811:10,15 814:17
917:6	778:15 779:6	free 853:8 878:15	geochemistries	816:23 817:10
flexibility 899:22	801:6 810:11	frequency 947:2,2	837:4,9	820:1 823:11
flip 801:10	812:14 820:25	fresh 804:14	geochemistry	831:14 836:13,16
Floating 781:21	840:23 869:6	front 741:16	768:21 836:18	847:1,5 889:6
841:18	889:9	768:12 780:5	838:1,2,5,8,8,11	932:11
floor 821:21 866:16	forces 815:22,23	783:16 784:23	838:12,15,21	geophysically
866:18,20	855:15	801:22 830:2	863:7	782:15 795:16
flow 751:22 753:25	forever 949:14,16	846:25 863:11	geographical	geophysicist
754:8,18,19,24	949:18	882:4,8 901:17	800:17	804:21 835:19
755:13,14,22	form 857:18	full 749:9 911:2	geologic 751:18	geophysicists 827:7
758:1,8 766:24	861:15	939:2,9,10 951:6	766:5 767:2,5	geophysics 782:6
767:3 771:9	formal 787:9	fully 949:2 951:8	769:6 777:6	787:10,15,15,17
803:24 841:4	794:19 832:25	function 753:10	782:24 784:13	787:20,24 788:18
858:15,20 866:3	formally 783:17	825:3 841:10	794:4 795:1	788:19,23 789:8
884:25 927:16	formation 783:12	funded 761:8	807:21 841:10	789:22 790:11
928:5 930:5 941:9	793:6 794:20	915:11	847:7 875:6,13	791:3 793:2 794:7
941:14	796:3 803:22	further 757:8	919:24	795:3 800:1 803:3
flowing 806:24	808:6,12,14,15,17	773:17,23 821:9	geological 750:23	817:20 818:12
826:4 928:13,14	808:19 815:7	824:7 833:8	760:19,21 775:14	834:18 835:10
928:15 938:9	822:17 823:16	834:19 837:2,7	779:4 794:20	846:14,15 891:20
flows 758:9 841:4	824:1,4,6 848:2	852:15 877:6	797:12,24 916:8	geoscience 780:13
842:17 847:16,17	848:16,21 854:6	899:3 910:2 915:1	926:3	Geosciences 846:23
847:17 858:12	862:2 938:7	942:4 944:21	geologically 756:22	geothermal 782:14
879:15,17,20,23	formations 794:5	future 785:14	767:11 768:16,24	Gerry 812:12
879:25	formed 778:6	899:20	769:9,20 770:12	getting 794:22
fluctuation 883:20	815:17 861:11		774:4,8 778:17	828:19 848:9
883:21 884:3	forming 754:10	G	889:21,22	849:25 911:17
920:23 921:3,6,7	forth 846:6 934:12	GARY 741:13	geologist 784:16	951:23,23
fluctuations 948:22	fortunate 777:15	gauge 826:10	geology 776:10	give 775:7 778:21
fluid 939:8	817:7	gears 868:1	777:10,18,22	779:16,19 826:22
fluvial 815:23	fortunately 944:4	geez 830:14	778:11,14,19	839:2,16 841:6,15
834:14 835:3,4	forward 775:1	Geiger 791:20	779:13 780:3,4,6	844:8 846:7,10
850:21 869:9	823:7 870:19	Gem 812:7 875:19	783:9,13,15	856:23,24 858:14
focus 758:4 761:19	899:7	875:20 876:1	794:20 803:5	872:9 940:19
focused 770:10	found 758:22	general 858:15	813:1 858:23	given 746:21 766:6
898:6 908:12	790:18 794:6	926:23 927:15	877:22	845:1 894:10
focusing 883:9	836:17 850:5	generally 761:19	geomorphologica...	Givens 742:3
folks 898:10	870:10,22 890:21	785:25 792:4	889:22	gives 792:17
follow 875:3 876:3	924:17,22 949:12	840:19 846:2	geophysical 779:25	859:17 884:13
891:3 892:10	four 781:25 806:13	869:5 882:24	782:21 785:9	glad 894:25
following 748:4	827:3 828:3 872:7	883:16 908:15,17	787:22 789:1,14	Glanzman 756:24
		922:3 937:20		

757:9 758:21 760:17 767:19 768:18,20 770:14 772:13 837:25 886:6 Glanzman's 838:6 glasses 906:1,10 go 752:14 756:4 758:12 767:23,25 772:10 790:14 791:11 793:18 809:25 813:13 814:19 820:21 827:21 828:18 830:6,7,8,8,14 838:14,14 841:5 842:1,25 845:4,10 859:18 860:13 875:4 881:1,10,13 881:17 896:18 910:19 911:18 917:9 921:4 929:24 933:13,24 937:20 942:10 944:12 goals 871:23 Goddard 759:6 763:24 764:2 771:4,5,9,20 781:22,23 901:25 902:9 903:16,19 903:24 904:2 goes 751:11 779:6 784:9 793:17 801:5,15 809:22 810:21 815:3 822:4 852:7 906:12 927:24 944:2 947:4 going 749:4 752:10 755:13 760:5 763:1,3 766:10 767:20 827:20 833:23 835:8 837:24 895:13 906:3 919:17 926:7 937:9 945:22	golf 842:3 869:25 good 750:19,20 799:21,22 818:4 822:11,11 830:17 831:1 839:1 848:22,24 880:11 889:5 895:9,10 917:22 946:21 951:25 Google 931:11 governments 813:3 GPS 931:4 gradation 751:10 816:1 848:5 gradational 751:23 grade 750:25 861:25 862:13 917:11,19 grades 848:16 gradient 820:12,13 864:13 865:21,21 916:2 918:8 gradients 915:25 917:6 918:4 927:8 gradual 816:3 gradually 848:8 850:11 924:24 graduate 915:6 916:17 928:21 grain 785:13 849:2 grained 900:22 grandfathers 769:5 granite 840:14 granitic 792:3 840:15,24 847:9 857:9 860:18 862:15 863:18 granitics 845:25 852:5 859:1 graph 883:11 gratifying 838:18 gravel 788:13 850:18 gravels 792:1 grayish 860:20 gray-shaded 919:7 great 779:25 791:4 792:17 795:15	green 852:6 853:1 853:3 854:14,15 854:17 855:21 856:2,5,6,16 861:3 887:4,11,16 887:21 889:4 890:17 892:2,24 892:25 893:2,6 894:7,11 895:14 898:20 919:11 920:1 grew 943:15,19 grosser 928:11 ground 748:23 756:6,16,25 757:17 760:9,15 766:9,24 768:23 772:14 780:16 788:24 798:12,13 800:19 806:24 807:2 812:13 820:19 826:4,5,9 832:16 858:12,15 858:17,20 864:5 865:11,14 866:12 868:8,11,19,23,25 870:6,20 871:9,13 872:5 873:6 877:22 878:12 890:25 915:14,16 916:5 917:19 919:2 927:8 929:9 935:12,19 937:19 940:12,23 945:14 950:12 Groundwater 742:9 group 799:21 813:5 832:20 917:9 934:22 groupings 838:16 grout 938:4 grows 810:8 822:5 835:2 855:24 860:3 862:10 growth 869:23 guess 752:13 757:5 762:24 770:9	787:3 803:7 814:18,25 837:23 856:11 859:7 869:4 871:1 893:25 894:9 896:4 919:13 929:25 930:2 guiding 791:1 Gulch 763:20,22 764:1,9 781:8 782:21 783:14 801:5 803:16 808:7,9,16,21 809:2,10,20 810:10,10 811:2 811:18 815:2,8,17 816:15 819:23 821:19,24 822:9 822:19 823:24 824:21 825:8,17 825:21 827:14 834:7,11,15,25 835:1 836:10,13 837:17 841:23,25 845:13 849:12,15 849:22,22 850:24 851:3 852:6,11,13 853:17,19 854:1,3 854:5,8,22,23 855:18 858:3 859:20 860:1,14 861:6,24 862:6,21 862:25 864:8,9,17 864:24 865:2,8 866:9,14 867:7,9 867:18,24 875:21 877:23 887:13,18 888:1,22,23 892:3 893:16 894:3,18 895:6 896:14 898:2 900:19 908:18,21 909:1,4 916:14,16 917:5 931:1 932:4,9,12 932:18 933:2 940:21 941:7,10 941:14,20,25 942:1,13,21 944:1	944:5 <hr/> H <hr/> H 745:2 hairs 774:3 half 793:7 811:17 843:2,6 856:1 929:20 936:4 halfway 942:8 hand 807:15 829:14 863:19,20 875:12 882:19,22 950:6 handed 874:17 898:9 handle 918:3 hands 827:25 hands-on 789:16 happen 760:23 933:17 941:8 948:20 happened 816:4 850:10 happening 943:7 happens 942:12 947:1 hard 766:9 778:16 826:9 831:21 840:2,3,5 844:5 893:9 921:18 922:6,8 hardened 935:9 hashed 824:17 head 743:5 750:25 772:22 773:3,3 780:13 811:3 825:19,20 858:1 866:21 917:11 940:1,7,8,9 942:9 942:11 943:6 heads 808:24 866:8 916:22,24 940:5 940:14 942:7 hear 752:4 817:11 819:3 825:11 879:11,14 880:4,6 945:19 949:6 heard 834:1 946:22 948:1
--	--	--	--	---

hearing 741:13 746:1,12 747:6,10 747:16 748:17 749:3,15,21 750:1 750:5,10,11,16 752:1,6,15 756:2 756:3 762:1,3 763:9,12,16 764:11 767:17,22 767:25 768:3,6 773:18,22 774:18 774:22,25 776:19 777:7 779:19 801:21,23 802:2 813:12,17,24 826:21 832:9 836:21 838:25 839:1,5 846:8 852:3 856:24 858:22 859:4 868:14 877:4,7,13 877:15,17 879:14 881:10,13,16 882:7,9 885:20,22 886:9,13,16,20 887:3,21 888:7,10 888:20 889:3 890:3,7,10,14,19 893:17,20 894:16 895:24 896:2,8,12 896:21,24 897:16 897:21 898:16,25 899:2,5 901:13,16 901:20 904:13 905:22,25 906:2,6 906:11 923:13,16 924:10 925:2 944:11,16,19 951:15,18,24 952:2	899:6 helps 797:3,7 799:22 806:9 837:21,23 892:1 Hewlett-Packard 781:23 high 742:12 759:2 771:6 804:17 825:2 843:21 846:25 851:2 864:15,19 865:15 867:14 872:8 924:23 947:24,25 higher 791:25 815:3 825:20 826:1,1 840:22,23 847:11,23 939:23 940:16 highest 847:11 849:24 883:13,16 highlands 840:22 847:10 highly 863:17 901:7 hills 782:2,3 840:23 842:2 860:10 908:24,25 hired 846:25 847:2 870:8 917:8 history 834:24 869:13 hold 748:24 801:20 holding 773:20 hole 785:8 787:15 787:15,17,19,23 788:18,19,22 789:1,12,14,20 790:10,14 792:9 792:11,25 793:3,7 793:9,11,13,14,20 795:23 796:15,22 842:16 935:18,20 936:2 937:24 938:2 holes 788:2 791:18 794:3 795:7 816:23 Holt 879:5,11	home 922:2 Homer 910:20 honestly 867:2 948:17 hope 876:17 hopefully 750:2 760:23 horizontal 842:23 horizontally 818:2 hour 746:3 839:3 883:6 house 810:9 hug 924:20 hundred 786:23 842:16 854:9 924:19 hundredth 807:11 916:5 hydraulic 747:24 748:7 750:23 751:3,6 785:23,24 806:7 808:1 903:2 903:5 Hydro 755:3 756:19 759:19 763:24 767:10 769:19 775:13 812:8 827:12 905:11 hydrodynamic 772:2,8 hydrogeologic 762:15 776:16 778:4 822:3 869:7 891:10 896:15 904:8 hydrogeological 797:24 hydrogeologically 844:20 hydrogeologist 804:24 884:18 hydrogeologists 827:7 hydrogeology 777:23,23 838:3,7 838:7 hydrograph 771:10	880:17 882:3,13 882:17 902:6 903:5 hydrologic 770:21 771:15 781:2,7 812:6 852:1 927:2 hydrological 779:3 hydrologically 845:18 hydrology 918:16 hypothetical 757:14 758:13 940:19 941:22 942:4,19	854:8 immediately 904:22 905:10 impacted 863:22 impacts 770:21 impedances 766:24 767:3 impermeable 847:20 impervious 938:4 impetus 757:21 implications 941:17 implies 769:10 importance 796:12 important 784:5 793:1 860:17 914:16 923:5 948:25 imposed 884:22 impress 767:13 imprint 873:1 improved 831:16 improvement 836:1,4 891:23 inaccurate 790:18 inaccurately 794:25 inadvertent 876:25 incentive 867:19 inch 842:23 843:1 936:4 937:25 947:17 inches 936:3,4 include 847:15,18 855:4 923:3 935:4 included 814:8 833:17 851:18 876:22 880:18 881:7 includes 800:15,15 827:23 851:14 918:17 including 780:20 851:14 852:5 894:20 incompatible 770:22
I				
		Idaho 741:2,15,17 742:8,13,18,22 748:6 762:16 771:6 775:10 780:13,15 781:24 789:25 790:1,7,9 799:14 812:7 824:4 847:10 850:6 860:9 868:22 869:19 870:8,19 871:17 871:24 874:2 880:14 905:12 915:6 917:8 928:18 950:2 idea 779:17 837:19 889:5 891:4 892:2 900:1 identified 763:24 764:13 771:14,18 783:10 860:24,25 identify 874:19 885:16 identifying 835:25 839:14 IDWR 784:9 827:23 IDWR's 906:20 912:25 illustrate 897:3 images 855:20 imagine 757:19,20 762:19 809:21		

inconclusive 753:4 755:20	841:7	intention 950:20	isotope 769:23 770:3	927:25 928:1,7 934:23,23 946:13
inconsistency 758:5,25 760:3 770:16,17,19	inference 866:10	interaction 835:5	isotopic 760:8,13 770:8	kinds 778:10 780:10 785:20 786:1,15 796:11 799:15 845:2 859:13
inconsistent 790:18	inferred 806:20 819:4,12 889:4 897:7	interest 749:1 783:19 813:5 870:1	issues 749:19 867:13 930:10 934:10	KLING 754:2,3,5
Incorporated 775:14	influence 793:4 819:22 834:15 883:23	interested 784:6 908:4	IV 741:6	knew 827:16 878:12
increased 902:21	informally 847:24 849:3	interesting 838:10 949:13	i.e 753:25	knocked 911:19 914:3
increasing 825:24	information 749:8 770:10 795:16 797:11 799:9,23 817:8 827:5,21 828:19 829:14 830:13,17 831:1,6 831:8,19 832:22 835:23 905:17 907:1 914:18 920:11 922:21,23 922:23,24 929:11 932:1 933:4	interference 873:4	J	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
indicate 765:22 768:22 819:21 878:11 922:19 928:4 930:5	information 749:8 770:10 795:16 797:11 799:9,23 817:8 827:5,21 828:19 829:14 830:13,17 831:1,6 831:8,19 832:22 835:23 905:17 907:1 914:18 920:11 922:21,23 922:23,24 929:11 932:1 933:4	intermingle 862:13	Jackass 875:20	knocked 911:19 914:3
indicated 759:19 819:25 861:19 904:23 906:15 908:3 919:18 930:5 942:17 948:21	information 749:8 770:10 795:16 797:11 799:9,23 817:8 827:5,21 828:19 829:14 830:13,17 831:1,6 831:8,19 832:22 835:23 905:17 907:1 914:18 920:11 922:21,23 922:23,24 929:11 932:1 933:4	intern 905:11	January 883:2,15 929:7,10	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
indicates 771:13 864:12,15 910:17 920:1 923:7	inherent 791:22	interns 882:20 928:20	Jason 743:4	knocked 911:19 914:3
indicating 802:1,1 830:6,22 841:21 842:22 845:7 857:23 859:21 894:21 899:25 901:19 905:21 940:9,9	inhibited 833:1	interpret 831:21	JDH 921:14	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
indication 755:18 779:20 804:10 815:25 841:15 858:14 859:17 946:11,12	initial 836:14 857:16	interpretable 753:8 766:13	JEFFREY 742:4	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
indications 812:19	initially 869:17	interpretation 793:1 805:12 820:3 830:21 839:24 858:16	Jeker's 782:14	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
indistinct 815:12	inland 860:16	interrupted 753:14	Jerry 743:3	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
individual 799:8,10 800:11,12 805:11	input 771:1 886:5	Interstate 869:5	Jim 915:7	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
Individually 742:15,19	inquire 746:24 763:7	interval 864:9 883:6 914:18 923:5	John 915:7	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
induce 758:8 766:4	inside 793:20 795:24	intervals 785:11 824:14 924:15	job 880:11	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
induced 758:1 759:12	insight 884:13	intimidate 814:18	John 742:11 843:15	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
indurated 840:1,2	inspect 933:24	introducing 921:8	Johnson 921:14,14	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
industry 787:25 788:22 936:25	instance 824:10	intuitively 845:1 923:21,25	judging 882:25	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
infer 752:21 830:18	instrument 917:12	intervals 785:11 824:14 924:15	judgmental 913:7	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
	intend 900:24	intervals 785:11 824:14 924:15	July 814:7 851:20 898:9	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
	intended 752:19 814:15 828:24 873:12 895:4	intimidate 814:18	June 905:13 911:21 913:24	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,23 899:14 899:23 900:3 903:16 904:8 907:5,15 910:8,14 916:20 917:23,25
	intending 760:19 766:16	intimidate 814:18	keep 761:21 908:20 935:12	know 752:7,16 753:3 755:1,4 756:17,18,23 757:5,18 759:4,11 759:17 760:4,12 760:18 762:13,17 763:18,21,23 764:12 765:13,18 765:23 766:15,20 767:16 768:11 769:14,23 770:2,7 771:20 782:7 783:25 784:8 787:1 788:20 791:6 794:23 797:5 799:21 808:3 811:4 813:13 821:14 824:9 825:1 831:10 832:12 834:8 836:20 838:2 841:4 842:13 843:1,2,16 843:22 848:25 849:11 850:8 853:6 857:8 862:4 865:11 867:2 870:2 872:17,21 873:8,9,14 876:24 877:1,2,20 890:25 897:11,

919:24 921:25	large 753:9,10	left 806:23	849:8 858:10	854:17 855:9,10
922:2 924:24	787:2 804:8 813:3	left-hand 875:5	865:6 866:2,12	855:12,21 856:2,5
925:19 927:12,16	837:16 844:12	910:7,15	869:21 870:25	856:6,16 860:21
928:5 929:22	870:12 873:2,4	legend 893:24	873:17 883:13,15	861:1,1,3,4 876:3
934:16 946:16	910:21 927:12	legislators 813:5	884:4 905:2	876:5 887:5,11,16
948:11,13,15,15	larger 802:3	length 845:11	911:19,20 914:25	887:21 889:4,24
948:18 949:4	901:17 935:16	919:12	915:3,16 916:3,12	890:17,24 891:2
950:1	936:7 937:21	Les 870:3	916:25 919:3	892:2,24,25 893:2
knowledge 752:13	largest 755:9,11	lesser 940:18	922:3 928:21	893:6 894:8,11,21
763:8 764:4 823:3	lasts 949:17	Letha 862:7 866:13	936:18 939:18,21	895:14 896:7
825:16 867:8	late 777:21 883:14	letter 926:16	939:24 940:15,17	897:19 898:2
903:21 913:4	883:17	927:18,19	947:24 948:16	919:11,15,17
932:10	laterally 751:9	let's 756:4 758:12	949:3	920:1,4 931:1
knowledgeable	latitude 749:9	767:25 768:3	lexicon 799:21	lines 798:6 801:12
750:22	launch 813:19	797:16 812:1	Lexington 782:2,3	803:6 805:10,18
known 805:20	lava 842:17 847:17	831:24 839:2	860:10 908:24,25	806:19 814:17
872:7	lavas 841:4 843:20	843:2 845:10	liability 933:21,23	824:16,17 830:1
knows 752:14	law 838:6	865:25 881:12,13	934:3,8	830:21 834:17
838:1	Lawrence 742:5	910:6 939:12	life 949:7,20,21	835:21 854:2
K-K 841:10	752:1,5	940:19,22 941:1,6	950:4	857:22 860:8
	lay 845:2 851:19	941:25 942:4,18	lift 865:15	874:14,24 876:15
L	layer 803:15	944:16 950:15	lifts 867:14	893:10 919:19,20
L 742:20	841:14 842:16	951:25	light 742:21 841:22	919:21,22
label 895:18	892:15 910:15	level 747:19 748:10	852:9 892:16	list 779:14
labeled 852:11	layering 940:4,5	748:12 754:10	946:20	listed 903:14
853:22 860:8,20	951:4	798:12,13 806:18	likes 899:22	lists 900:4
861:19 875:19	layers 816:17 820:4	806:18,20,23	limit 869:12	lithologic 803:10
lack 928:12 944:24	942:24	807:1,17 809:1	limited 763:2	819:25 823:11
948:3	laying 877:21	811:16 817:18	870:13,14,15	824:16 842:25
lag 797:6	layman's 791:19	826:1,9 834:18	901:8	lithologies 802:24
laid 808:15,16,19	812:25 814:15	836:9 850:11,20	limiting 751:3,5	936:17
809:20 810:1	891:10	857:16,21,24	limits 770:8 868:15	lithology 799:1
814:12 848:6,11	layperson 851:19	858:9 864:13	Linder 781:11	800:2
849:21 874:11	lays 846:11 848:25	865:9,13 866:17	821:4,21,23	little 752:3 760:12
lake 809:21,22,23	lead 795:2	871:2 883:7 902:9	824:11 826:3	775:21 777:1,12
809:25 810:2	leading 777:22	902:15 903:22,23	860:10 880:7,18	788:24 806:16
815:6,18,18,19,20	935:10	914:5,7,17,22	881:24 882:14	811:8 833:1 834:2
815:21 817:3	leads 895:9	918:18,19 922:24	885:5	834:9 835:12,13
835:3 848:10	League 870:3	924:18,22 925:6	Lindholm 925:16	837:24 839:22
849:24 850:4,5,10	learning 822:25	928:10 934:11	926:4 927:6	842:20 857:1
850:14,20,23	leaving 746:14	939:23,25 940:9	line 800:14,19,25	866:6 868:1
854:6 855:6	left 790:1 798:4,15	940:10,14 942:1,5	801:4,7,9,15	873:14 875:3
lakes 835:3 850:15	803:10 804:6	942:8,16,20 943:2	802:19 806:14,15	883:8 891:6 905:6
land 806:15 810:7	806:14 810:16	946:14 947:16,21	807:6 815:1,4,5	915:13
855:7,9 866:21	824:13,16 841:17	948:2,7,11,23,24	820:20 821:2	LLC 742:2
889:24 890:22	852:11 875:10,17	levels 748:3 779:22	832:23 841:16,18	LLP 742:3
892:22 893:7	892:5,23 895:18	806:12 807:3,7,22	852:6,8,25 853:2	local 784:2 813:4
917:7 938:21	910:6 929:20,21	807:22 808:25	853:3 854:14,15	829:18 927:14
Lane 742:12				

855:18 859:23	measures 792:9,11 792:25 803:21	mile 777:4 810:4 843:2,6 871:15 872:8,20 910:2,24	791:15	904:7 906:25
860:2 863:14	measuring 857:16	miles 873:8 878:22	mountain 863:11	907:6 910:9,11
864:3 866:1	905:12 924:14	907:6 911:1	move 773:6 830:23	915:11 921:16
873:20 893:12	927:14	mind 770:9	862:4,5 899:7	928:2 930:23,24
900:20 920:10,19	mechanics 844:6	minor 903:23	942:10 943:25	930:25 950:11,17
921:11,18 930:14	medium 837:16	949:4	944:9 945:5	950:18 951:6
935:6 946:11	meet 871:10	minute 764:3	moves 801:15	
meaning 774:6	meets 871:11	767:20 801:20	808:10	N
840:2 935:23	892:22 951:17	840:6 881:2 931:2	moving 746:7	N 744:1 745:1
meaningful 766:13	member 787:18	minutes 768:4	858:17 942:25	NACFA 813:4
means 753:7	801:14	813:22 839:3	mud 803:13,15	name 741:6 775:7
769:20 774:5	memo 749:7	902:19 944:17	808:5 822:13	842:9,19
793:3 805:17	784:10 917:24,25	mischaracterizing	848:10 854:5,22	named 849:3
834:13 844:6	918:21 922:25	756:13	863:21 887:14,19	names 909:24
851:4 910:22	923:1 929:25	misinterpret	889:1 892:20	naming 763:6
935:7	memorandum	793:10	muds 808:11	834:13
meant 854:25	755:18 759:20	misnomer 946:23	848:17	narrates 749:6
900:21 922:7	761:21 763:25	947:19	multiple 786:8	narrative 775:25
measure 786:20	881:8 885:25	missing 874:13	municipal 899:20	narrow 761:22
788:2 792:6,7	918:15	misstated 889:2	939:11 950:6,10	natural 791:22
796:17 807:11	memory 865:12	mix 772:24	951:1,2	940:4 947:13
826:10 905:13	883:5,8 884:8	mixing 772:11,19	Music 743:6	nature 747:21
907:17 911:15,19	908:9	model 758:6,7	M-3 741:6	758:15,20,21
913:22 917:21	mentioned 746:18	762:25 770:20	M3 742:2 744:2	759:25 760:9
918:2 920:20	747:9 751:2 761:6	771:2 813:6 823:8	755:16,24 758:9	766:3 793:19
921:5,6,18 922:5	771:17 774:19	823:9,12 838:19	762:17,19,25	804:19 821:13
922:7 933:25	792:8 793:11	893:3 915:5,9,12	765:13 767:5	886:22
934:3 942:3	821:5 839:12	928:22	771:2 780:10	near 747:12 758:16
948:16 949:22	874:9,10 886:4	molecules 773:5	782:1 785:21	758:20 806:14
measured 779:21	901:6 917:13	moment 767:24	786:6 790:5	843:21 846:4
807:4 811:16	930:12 931:13	812:2	796:10 798:2	848:7,15 849:2
857:15,20 858:18	Meridian 817:4	monies 761:9	799:4 801:3,6,16	851:3 852:23
905:12 916:4,18	918:3	monitoring 747:19	808:2 810:16,23	866:13 926:11
916:19 917:2,10	message 834:5	748:2,11 779:24	811:1 812:5,11,23	nearest 873:20
917:18 920:16	method 844:8	781:1,6 798:22	819:5,10,11,14	916:6
921:13,23 924:21	936:10 939:8	870:10 871:5	821:6,9,24 822:1	nearly 861:23
928:21	methods 934:10,13	873:17 884:12	830:6 832:12,20	927:13 936:19
measurement	939:6,8 944:8	885:2,6 930:12	840:20,21 846:1,9	necessarily 845:3
914:7 915:2,15	945:4	month 764:18	848:21,23,24	920:10 921:8
916:4 930:12	MICHAEL 742:5	882:24	850:25 851:3,13	924:12
measurements	Micron 869:4,25	months 883:13,14	852:24 856:19	necessary 769:24
796:20 882:19,23	middle 806:8	morning 746:3	860:8 861:5,8,15	878:16 930:3
882:23 904:19	821:23 852:7	747:10 750:19,20	862:5 863:4 865:8	need 750:2 767:20
914:22,23 920:16	910:10	799:17 951:21,25	865:9,23 866:14	779:17 866:1
920:19,25 921:20	Middleton 857:8	mound 928:12,16	866:24 878:6	897:23 906:10
922:12,15 923:6	862:6 915:23	Mount 789:17	881:7 883:2 885:9	921:9 946:5
933:14 934:12			889:10 894:4,6	needed 768:9 879:4
948:10			899:11 900:8	879:20
				needs 899:20

951:17	808:10 850:9	877:12,14,16	858:22 859:5	833:19,22 836:5
negative 771:14	863:4 866:3	886:17	868:14 877:4,7,13	838:9 839:19
825:5	906:25 910:16	objective 788:7	877:15,17 881:10	840:7 842:5 852:9
neighborhood	911:8 915:22	obscured 910:23	881:13,16 882:7,9	852:18 858:19
902:19	916:3 918:9	observable 889:23	885:20 886:9,13	875:4 876:3
neither 748:9	921:16 927:16,24	observation 786:8	886:16,20 887:3	877:13 880:3
nest 798:21	930:6	895:1,9	887:21 888:7,10	881:16 885:12
nests 916:22	northwesterly	observed 753:23	888:20 889:3	886:9,20 893:20
939:24 940:8	928:14	754:23 915:18	890:3,7,10,14,19	897:21 898:25
never 759:24	northwestern	916:2	893:17,20 894:16	899:8 900:17
766:21 943:11	861:21	obtain 785:8,10	895:24 896:2,8,12	901:5,9,15,21
new 757:25 781:25	Notary 741:25	795:17 872:1	896:21,24 897:16	903:16 904:5
871:3 874:4	notation 753:21	922:12 932:21	897:21 898:16,25	907:10 909:5
884:20 946:12	755:2,5	obtained 827:6	899:2,5 901:13,16	912:12,14,18
newer 937:16	notations 841:14	885:1 907:7	901:20 904:13	913:2 914:21
Newton 925:15	note 811:10 844:11	obvious 889:19	905:22,25 906:2,6	915:1 919:5 920:8
926:2 927:6	898:13 903:5,14	obviously 865:13	906:11 923:13,16	921:21 922:10
night 770:6	919:5	877:10 907:21	924:10 925:2	923:10 925:8
nine 800:6	noted 836:21,24	908:3,11 935:17	944:11,16,19	931:16 933:17
nineteen 926:5	865:5 897:5	occur 751:23 753:2	951:15,18,24	934:9 944:19
nonconductor	notice 828:22 840:4	945:3	Officer's 838:25	old 756:20,23
804:13	906:22 919:11	occurred 875:23	879:14 885:23	757:24 759:18
nonexistent 889:9	921:13	occurring 755:19	official 898:22	769:15 809:21
non-pumping	noticed 836:7,7	occurs 754:8 843:9	offset 820:5,7	older 808:14
865:13	932:3	October 883:18	843:12 897:7	823:17 847:12
non-semiconduct...	November 876:23	odd 945:25	offsets 844:2	849:21
804:12	883:18	offer 877:5 886:8	oftentimes 839:23	oldest 840:24 847:9
normal 802:22	number 778:5	offered 752:23	936:6	omission 876:25
814:23 858:12	779:24 780:1	933:15	oh 814:19 831:6	once 796:20,23
928:6	795:9 810:23	offering 927:7	842:21 888:4	830:17 851:5
normally 842:25	836:19,19 839:11	offhand 918:1	896:2 922:14	871:11 874:9
NORMAN 742:20	851:14 856:21	office 906:20	oil 787:25	882:24 888:14
north 742:9,12	871:20 874:6	Officer 741:13	okay 746:1 747:6	ones 763:21,23
748:22 777:2,6	906:16,23 907:13	746:1,13 747:6,17	748:14 749:3,12	824:19,20 928:17
812:6,14 813:7	915:4 926:13	748:17 749:3,15	749:15 750:4,11	929:18,19
814:21 821:3	numbering 811:22	749:21 750:1,5,10	750:16 755:1,6	one-hour 883:6
832:19 852:25	numbers 756:12	750:11,16 752:1,6	758:18 759:1,21	online 874:3
857:8 858:23	909:10	752:15 756:2,3	763:9,16 765:3	open 794:3 938:1
862:5,5 906:24	numerical 758:6,7	762:1,3 763:9,12	766:23 767:21	938:21 940:2
927:9 929:9	762:25 770:20	763:16 767:17,22	769:1 771:24	945:4,5 951:8
northeast 801:2,13	771:2 915:9	767:25 768:3,6	773:18,22 774:18	openings 947:9
802:12 821:1	numerous 780:5	773:18,22 774:18	779:18 787:4,21	operate 790:3
840:20 842:3		774:22,25 779:19	802:3,4,7 813:12	operated 748:5
846:1,10 863:20	O	801:21,23 802:2	813:24 814:1	790:7
869:5 894:5,6,7	oath 750:21	813:12,17,24	816:18 817:23	operations 800:12
894:19,20 898:1	object 886:18	826:21 836:21	818:5 821:12	827:8
908:22 911:5,6	objection 752:11	839:1,5 846:8	827:2 828:17	opinion 752:12
northwest 755:22	755:25 756:8	852:4 856:24	831:2 832:4	755:14 756:16
	763:10,13 877:10			

761:10 778:13	overall 751:10	761:8 764:5	908:6,10 935:3	810:9,10 811:2,18
789:2 816:10	837:18 901:1	789:16 795:1	percentage 785:13	815:2,8,17 816:15
831:3 833:1	928:9	809:23 811:7	perforate 940:3	819:22 821:19
845:18 902:7	overcomes 818:8	835:1 836:14	951:4	822:8,19 823:24
903:4 924:3 925:5	overlie 834:15	840:16,17 848:23	performed 760:16	824:21 825:8,17
937:12 938:16	overlying 808:20	848:24,25 849:20	period 759:8,11	825:21 827:14
941:12 943:12	808:21 815:7	851:1,25 854:21	786:7 816:4 884:7	829:12 834:6,11
947:22 951:11	834:10 835:1,9,16	857:15 858:23	884:8,9 885:4	834:15,24 835:1
opinions 756:1	841:1 847:14,25	879:18,21 880:13	920:22	836:10,13 837:17
902:5	942:18	880:15 885:9	periods 869:23	845:12 849:12,15
opportunity 746:21	Overruled 752:15	889:9 891:9 895:6	permeability	849:22,22 850:24
748:16 749:17	763:16	897:20 898:2	788:14,15 803:14	851:3 852:6,11,13
770:6	oversee 785:7	902:10 915:9	808:5,11	853:17,19 854:1,3
opposed 767:12	overview 826:23	922:25 945:25	permeable 851:10	854:4,8,22,23
768:16	846:7	partially 822:6	863:16	855:18 856:18
options 771:18	owned 771:6	particular 768:10	permission 914:4	858:3 859:20
order 759:18 810:4	owner 937:2	786:14 805:22	perpendicular	860:1,14 861:6,23
865:17 873:9	941:18 947:13	810:3 882:14	858:13 928:7	862:6,20,25 864:7
orders 769:16	owners 813:4 934:6	902:17 921:19	person 815:13	864:9,17,24 865:2
Oregon 817:3	Owsley 749:17,22	particularly 878:19	personal 780:9,23	865:8 866:9,14
organized 814:12	760:7 918:16	893:21 903:1	personally 779:11	867:7,9,18,24
original 778:4	oxygen 822:21	905:5 934:15	perturbation 766:4	877:23 887:13,17
846:15 851:18		parties 746:6	perturbations	888:1,21,22 892:3
891:18 898:11	P	parts 764:17	915:20 939:20	893:15 894:3,18
originally 832:11	P 741:23 742:5	783:16 804:2	Peter 886:7	895:6 896:14
856:13 899:15	pack 785:15 951:9	878:18	Peterson 743:3	898:2 900:19
originated 756:25	page 744:3,10	passed 875:17	petro 788:21	908:18,21 909:1,4
772:14	753:13,16 768:20	Payette 755:22	petroleum 788:22	916:14,16 917:5
originating 768:24	772:5,12 841:5,7	817:4 830:8 857:9	PGSA 756:25	932:4,9,12,17
oscillation 883:12	841:11,15 844:11	862:1,7 864:1	757:16,16 758:16	933:2 940:3,21
884:2	853:12 859:6	865:22 866:7,17	759:7 760:15	941:7,10,14,19,25
Osiensky 751:14	875:1,4,6,14,25	866:19,22 927:9	767:11 768:22	942:1,13,21 944:1
762:9 771:12	891:7 897:6	Pearson 835:19	772:14 823:13	944:5
886:6 915:7	922:16	peer 783:21,24	846:9 859:1 923:9	piezometer 798:21
Osprey 742:17	pages 741:7 828:23	784:2,5,10	925:6	825:9 916:21
ought 813:14	859:7 926:23	peers 784:6	photocopy 898:21	939:23 940:8
outcroppings	panhandle 755:15	pending 768:9	physical 788:3	942:2
889:10,12,13,13	798:3 801:16	penetrate 763:18	792:7,13,17 796:4	piezometers 824:15
outcrops 777:18	819:5	781:8	838:2,7	836:20
862:8 889:7	papers 783:25	Penitentiary 777:3	physics 788:21	Pines 742:14
outings 783:7	paragraph 768:20	874:2	picked 829:14	pink 860:20
outlet 850:4	772:16 886:5	people 783:25	picking 907:12	pipe 892:3,14
outside 762:19	parameter 837:12	784:7 813:2	picture 837:19	pipelines 943:18
796:5 918:2	parameters 771:1	814:18 831:21	862:17 925:1	place 760:21 761:1
935:22 936:1,9,14	788:3 792:8,13	922:2 937:8	pierce 763:20,22	822:11 827:17
938:6 941:2,9	796:24	946:24 949:14	764:1,9 781:8	837:7 838:17
942:22,23 947:15	Pardon 763:11	people's 933:24	803:16 808:7,9,16	844:25 859:24
outward 754:18	parentheses 754:21	percent 852:10	808:21 809:2,9,20	893:1 914:13
	part 748:2 753:10			

921:3 936:22	822:11,12,23	powerful 947:8	prevalent 883:21	produce 824:5
939:9 941:7	826:20,21 834:3	PowerPoint 906:3	prevents 938:9	872:24 944:25
placed 814:24	838:23 859:5	practically 889:8	previous 827:24	946:4
883:3 938:5	861:16 892:25	preceded 828:2	829:25 855:23	produced 851:20
placement 785:16	893:7,19 895:14	precipitation 863:8	857:18 865:5	852:1 928:22
places 797:14	895:17 899:4	863:10	874:15 883:25	producers 872:9
928:1	900:6,12 910:9	precise 797:4 925:6	911:23 925:21	produces 904:3
placing 939:2	927:13 933:15	precursor 906:14	previously 780:2	producing 764:1
plain 762:23 820:5	946:5 948:25	predict 770:20	814:14 859:3	824:5 872:21
854:9	951:16	predominately	919:8 922:21	production 771:6
plains 843:24	pointed 855:23	934:21 935:2	939:21 942:24	787:2 825:10,15
planned 899:11	894:16 903:9	preeminent 778:14	prime 841:11 875:7	867:1 871:2
951:6	pointing 841:19	prefer 830:25	875:13,14,19,22	productive 862:23
plastic 950:8	861:14	preliminary 746:4	875:23 876:11	862:24,25 864:17
please 762:9 764:8	points 747:3	877:22 878:3	891:24 927:21	870:12 873:16
775:1,7 776:8	799:24 800:3,11	924:16	principal 775:17	900:18
800:8 802:16	805:11 867:5,21	prepare 797:18	778:2	productivity
809:7 814:11	895:10 899:10,15	871:18 876:18	principles 791:1	771:21 864:23
820:17 822:15	919:3 929:16,22	878:24 886:1	print 892:12	868:4 901:1
826:16 836:11	politics 761:15	prepared 870:16	906:10	903:17,25 939:16
851:24 853:8	portion 757:22	876:19,20 906:8	printed 907:7	professional 778:8
874:19 881:21	814:2 816:13	909:25 929:2,3,8	prior 747:10 749:4	787:18 917:8
885:16 918:11	894:2	preparing 899:12	764:19 780:9	program 761:6,8
923:11 926:14	portions 750:6	904:7	849:22 881:18	857:16
930:17	portray 794:25	preponderance	902:22	Progress 812:7
pleasure 838:25	813:6	862:10	prison 871:16	prohibitive 936:24
plenty 904:1	portrayal 831:9	present 743:2	probably 762:18	943:18
plot 754:2 796:25	position 775:19	750:12 753:11	787:7 838:22	project 781:3,7
814:22 817:14	positioned 900:2	762:22 778:20	935:2	798:3 832:12
834:20 835:10	positive 884:23	782:16 810:11	probe 792:10 793:5	855:5 878:10
842:6 902:8,17,23	possibility 772:12	816:20 867:25	probes 788:1	904:20,25 907:20
922:14	844:1 901:25	presentation 746:8	791:20 796:15,18	915:10
plotted 802:23	possible 748:7	presented 770:10	796:21	projected 889:23
837:3 838:12,13	759:22 865:19	926:6	problem 935:14	projection 889:5
853:20,24 857:19	920:21,22 921:1	president 775:20	problems 869:14	projector 752:2
902:15 908:12	possibly 827:22	775:23	869:16,18,18	projects 868:21,22
912:25 914:23	postpone 749:13	press 944:13	871:7,12 934:5,7	878:18
915:18	potable 823:20	pressure 806:20,25	939:14	prolonged 786:7
plume 772:3	potential 780:17	825:23 826:2,10	procedure 746:5	propagates 754:17
plus 855:5	825:24 832:17	858:2 940:1,14,16	832:25 934:24	proper 765:24
pneumonia 825:2	863:2 868:12,15	940:18 943:6	proceed 794:11	properly 789:4
point 746:22	868:20 870:15	pressures 826:4	proceeding 780:21	938:15
748:13 758:3	899:15 900:6	947:25	824:12	properties 909:3
762:24 766:22	903:10,11 904:15	pretty 782:22	process 785:8	property 762:18
788:11,13,17	potentiometric	794:17,24 817:19	835:3,3,4 878:4	767:6 799:5
800:2,3 801:7	754:12 858:6	817:21 823:9	907:11,17	801:17,18 812:14
806:8 809:5,6	866:8 916:22	863:6,8,23 865:15	processes 845:2	821:7,10 822:1
810:7 816:7 822:6	power 850:16	929:4	850:21	823:2 830:6 846:1

846:2,3,4 852:24 856:19 865:8,10 878:13 889:10 894:4,6 906:25 909:3 910:10,11 930:24,25,25 933:24 proposal 760:22 770:6 proposed 801:6 804:3 878:10 930:24 proposes 950:11 prospective 937:2 protestants 748:20 930:19 931:5,8,10 931:20 932:20,22 933:7,11,14,20 934:15,18 prototype 789:19 prove 868:8 proved 790:17 provide 772:22 788:7 789:5 942:9 provided 749:8 753:23 757:21 876:23 provides 773:3 providing 867:21 pro-gradational 836:14 pro-grading 815:16 public 741:25 943:16 950:2 published 783:18 783:19 pull 820:16 pulled 754:16 888:4 950:19 pump 748:4 785:18 943:4 946:25 947:6,8,8,10,11 pumped 754:9 pumping 748:12 754:1,3,6,25 757:25 758:2,8,10 759:8,9,10 786:7	786:14 790:19 865:15,19 867:14 872:23 941:19 947:11,14 pumps 947:10 purpose 765:16 935:21 purposes 832:1,8 855:17 879:4 915:4 920:25 Pursley 742:3 pursue 878:15 pursuit 877:25 push 870:6 pushing 940:16,17 put 766:9 797:7,11 799:12 800:13 817:16 834:2 870:23 899:22 924:19 935:20 937:25 938:1 942:2 putting 765:1 950:15 p.m 952:2 P.O 742:7 <hr/> Q <hr/> qualities 757:18 837:10 quality 794:17 825:5 827:4 867:13 913:6 936:17 949:23,25 quarter 900:4,5,5,5 907:25,25 908:2,2 909:25,25 910:2,2 910:16 911:1,3,3 911:6,7 912:9,9 912:10 913:1 931:3 quartz 804:12 question 747:5 749:9 751:25 752:12 753:18 756:12,14 757:14 758:13,17 760:2 761:17 763:5 764:3,7 768:8,11	772:2,7,25 773:2 790:22 805:6 823:6 828:20 834:19 845:9 851:23,25 856:22 858:19 869:2 872:18 878:23 893:25 894:9 944:2 945:17 946:15,21 questionable 867:12 questioned 891:4 questioning 746:16 748:24 750:8 questionnaire 931:9,13,18,22 questionnaires 933:5 questions 747:8 750:15,18 762:2,6 763:2 771:25 773:17,21,23 774:2 775:6 818:20,22 826:20 877:24 878:3 879:15 881:19,21 887:4 893:18 899:3 926:8 944:21 946:20 quickly 848:17 quite 769:10 855:3 857:5 864:7 870:5 870:6 877:21 880:24 881:24 931:7 947:2 quote 772:14 quotes 937:3,4 <hr/> R <hr/> radioactive 795:7 radioactivity 788:3 791:22,25 792:2,4 792:10 raised 887:4,9 Ralston 929:3 930:5 ran 782:5 818:11 846:15	ranch 782:14 783:14 801:2,17 846:16 857:12 895:22 896:19 ranchette 943:15 range 916:20 rate 748:11 879:22 902:21,22 reach 947:21 read 764:15,17,19 764:24 765:2 770:6 788:9 795:7 796:2 813:1 814:19 892:12 927:1 929:25 readily 757:21 771:1 reading 768:10 792:18 793:7 804:4 854:7 883:7 906:1,10 readings 883:4,5 reads 793:5 ready 752:3 881:17 real 792:5,5 823:22 921:22 950:22 reality 859:23 947:15 really 755:22 764:3 769:10 778:16 790:9 799:7,14 805:8,9 811:9 823:21 825:2 827:5 837:13 838:10 840:2,4 845:5,7 848:11,15 850:3 851:2 855:9 889:14 891:1 893:9,11,23 895:10 896:18 897:1 898:4 906:9 915:21 916:6 930:13 948:18 reanalysis 885:8 reanalyzed 885:7 reason 897:2 948:13 949:15 reasonable 844:19	871:2 reasonableness 845:16,18 reasonably 924:25 reasons 809:1 864:16 949:5 recall 746:11 747:14,21 748:25 750:25 753:17,19 755:10 759:9 761:4 764:14 765:1,17 766:25 774:20 818:18 839:20 853:16 855:25 867:2 880:16,20 881:4 886:10 888:18 896:13 901:23 920:23 925:13 932:8 receive 810:14 949:19,20 received 877:18 886:5,24 recess 768:5 813:23 813:25 839:4 881:15 944:18 recharge 754:14 757:14,15,22 758:10 759:1,12 759:13,22 760:10 771:25 773:2,3 810:14 863:2,6,24 863:25 865:18 870:14 recharged 757:21 808:23 863:8 recognition 794:21 recognizable 804:8 816:9 844:3,5 recognize 747:2 765:6 766:2 771:5 814:9 recognized 809:10 816:19 recognizes 809:23 recollection 753:2 reconstitution
--	--	---	--	---

919:1	reference 799:11	regionally 786:5	report 751:13	904:14
reconstruction	840:20 853:2	regret 770:5	752:23 755:3	reproduced 797:14
793:22	854:14 882:14	regular 785:10	762:8,14 763:7,8	reproduction 895:4
record 749:5	885:13 887:10	790:3 949:20	763:19 764:5,13	request 761:21
767:23 768:1,2	893:22 910:8	rehabilitation	764:16,23,24	require 758:8
791:9 881:2,11,14	922:25	793:23	765:17 767:19	791:10
883:4 887:2	referencing 909:9	reiterate 755:17	768:18,20 771:12	requirement
898:22	referred 762:8	758:25	772:13 811:25	791:13
recorded 924:19	766:19 781:2	relate 869:1	812:7,21,22,25	requirements
recording 746:2	859:3,14 874:15	related 862:1	813:8,11 814:7,15	884:22
768:6 791:5	874:21 901:12	relating 775:3	831:20 837:25	research 870:16,18
796:23 813:25	914:14 922:21	relation 849:15	838:21 852:1	871:25 905:1
839:5 944:20	referring 768:10	relationship 778:7	870:16 891:11	933:15
records 791:21	786:21 787:2,23	778:8 846:9	898:10 901:11	researcher 778:14
799:15 847:6	825:14,15 834:12	887:18 932:15	906:20 913:6	904:24
946:7	839:18 841:22	relative 786:18	929:8,8 946:9,24	researchers 827:24
recount 779:14	884:5 888:5	relatively 803:15	reported 741:21	925:21
recovery 748:8	890:11 898:19	822:12 834:25	842:13	residual 879:25
Recross-Examin...	912:15 915:19	837:18 843:22	reporting 781:17	resistance 788:4
744:8 774:1	938:12	916:1	812:24	resistive 804:15
red 824:18,18	refers 751:19	reliability 828:25	reports 783:18,19	811:14
852:8,25 857:4,14	893:24	832:8 930:11,14	783:21 794:10,17	resistivity 788:4
860:21 861:1,1,4	refined 833:25	934:11,11 939:16	794:25 827:24	792:12 795:10
866:6 894:21	919:3	939:16	828:5,13 829:5,8	802:23 803:20,21
896:6 897:8,19	regard 756:11	reliable 789:5,10	905:9 906:18,19	803:24 804:1,2,5
898:1 929:19,19	757:6 762:7 765:3	790:25 829:9,10	906:23 907:8,19	804:10,17 814:23
930:1,1	767:8 771:3,24	829:16 831:5	932:19,23 933:6	815:4,4 816:14
Redirect 744:7	773:8 779:12	839:22 925:1	943:10	resource 949:1
762:3,5	780:8 782:24	936:19	represent 854:20	950:14,23,25
reduced 822:19,20	784:25 815:9	relic 895:3	857:14 882:19,22	951:13
825:1	819:4 831:2 844:9	relied 791:8	925:13	Resources 741:1,15
reduces 795:21	866:5 874:8 879:3	relief 800:24	representation	946:8
reemphasizing	880:3 885:15	rely 794:9 797:10	788:8 797:23	respect 796:14
908:21	899:15 900:25	797:10 832:2	802:18 805:19	800:17 810:5
refer 753:12,20	901:22 902:5	remain 809:3	806:17 853:16	817:10 915:15
767:10 797:13	903:4 904:9	828:24	860:22 919:23	934:19
800:4,7 811:20	918:24 920:13	remained 873:18	representations	respective 802:25
813:10 820:15,18	924:2 925:8 927:5	remains 880:1	749:4 859:14	respectively 776:14
826:11,14 830:14	927:8 933:4	remember 765:2	representative	respond 761:20
833:16 851:11	934:10 938:23	780:24 813:21	800:16 855:22	885:24 931:10
853:4,9 856:9	945:11,20 948:7	861:7 948:17	916:15 919:22	responded 763:6
875:16 880:22	950:10	remind 762:10	represented 826:6	931:8
881:20 891:6	regime 776:22	removed 830:17	844:21 860:7,25	responds 754:10
898:12 901:10	region 790:11	repairing 782:17	890:17 917:5	response 748:12
905:15 918:10	regional 748:1,5	repeating 887:20	representing 815:5	749:7 759:19
923:3,11 926:10	768:23 812:5	rephrase 756:14	represents 803:11	763:25 767:9
928:23 930:17	862:19 884:1	946:15	856:6 883:19	770:16 771:4
934:14	906:20 927:12	replotted 918:5	887:22 888:19,23	832:12 881:7

887:2	810:18,19,22	Robbins 812:12	822:19 823:24	943:22
responses 750:7	811:12 812:17,23	rock 788:12 793:4	824:21 825:21	saying 814:25
753:8	814:8 819:11	793:8 844:6	827:14 834:7,11	941:22
responsible 781:14	821:8 824:7 828:9	860:19 888:24	834:15 837:17	says 754:20 772:13
851:2	830:2 832:14,23	889:10	842:16 844:12,14	815:2 841:23
rest 847:13	838:16 842:5,18	rocks 788:4,5,8,14	844:20,22,23	861:5 875:6,12
restate 758:17	843:15 848:18	791:23 819:17	845:1,3,13,16,19	895:19 927:21
768:13	851:13 857:11	840:1,3,14,15,16	848:1,3,8,16,20	scale 762:21 769:7
rests 887:13	861:4 866:15	840:24,24 841:4	849:2,13,15,20,22	798:10 834:20,21
result 829:7 903:12	867:4,10 868:3	847:9,15 863:19	849:23 850:3,17	835:11,12 842:23
936:9	871:18 872:10,16	863:19	850:22,24 852:6	902:12 927:12,14
resulted 907:12	875:12,25,25	Roger 799:16	852:12,13 853:17	928:11
results 766:13	876:6 878:24	880:13 882:21	853:19 854:1,3,5	scales 893:10
768:22	879:8,9,18 881:9	role 899:11	854:8,22,23	Scanlan 846:22
retain 757:17	883:10 891:25	rotary 935:5	855:18,24 856:18	847:3 926:17,18
retired 778:6	892:5 895:17	936:11,23 938:14	858:3,7 859:21	927:7,18,19
return 746:15	896:19 897:8,16	rotate 793:16	860:1,14 861:6	scattered 817:1
802:15 818:16	898:7,14,19	roughly 842:2	862:6,10,10,21,25	857:7
858:19 874:9	901:17 904:16	919:7	864:8,9,18,20,24	scattering 857:3,4
881:3 922:2 930:3	909:7,11 910:10	routinely 878:20	865:2 866:9 867:7	scenario 757:19,20
Returning 832:4	912:22 917:3	rule 763:15	867:9,18,24	scheduled 761:2
reversing 865:20	919:13 920:4	rules 937:18	877:23 887:13,18	school 750:25
review 758:5	929:21 938:10	run 792:8,10,24	888:1,22,23	Schwartzman
783:21,24 784:2,5	951:24	793:9 794:2 795:6	889:12,13 892:3	886:7
784:5,10 913:12	righter 805:15	795:10,18 796:19	892:15,19 893:4,8	science 776:9,11
945:13	rights 761:11	830:1 831:13	893:16 894:3,18	scientifically
reviewed 784:1	879:19	846:14 848:7	895:6 897:1 898:2	907:17
877:8,11 907:8	right-hand 875:8	850:15,16 887:6	900:19,23 908:18	scope 761:22
913:3 948:6	911:4	924:8 943:18	908:21 916:14,16	Scott 879:6
reviews 767:24	ring 850:2	running 795:3	917:5 932:4,10,18	screen 938:21
revised 918:18	rise 858:10	863:10	933:2 940:21	screens 785:15,16
re-analyzed 780:2	rises 940:22 942:17	runoff 863:15	941:7,20 942:21	793:21 824:19
re-invent 828:1	942:20,22	runs 821:2	942:24 944:1,5	825:7 938:19
re-worked 851:4,6	rising 892:5		sands 804:18 808:7	scrutiny 913:4
rhyolite 841:3	river 756:22	S	808:21,22 810:9	se 783:18
847:15	768:25 769:5,10	S 745:2	819:23 851:4	seal 937:13,16,18
Richard 886:6	772:1,15 774:7	sampling 781:17	862:1,15 863:13	938:1,3,12 939:14
Ridge 777:4 871:15	781:21 817:3,4	785:19	sandwiched 825:4	939:14
872:8,20 873:21	862:1,7 865:22	sand 763:20,22	892:16	sealed 938:15,16,17
873:22 921:15	866:7,18 927:9,24	764:1,10 781:9	satisfaction 760:5	938:25 941:2
right 748:17	928:5	788:13 792:2	satisfactory 897:22	seals 785:16,17
749:25 753:12	rivers 815:24 835:5	794:23 803:15,16	saturated 804:18	936:23,23 937:11
755:21 756:10	835:5 848:7	808:7,9,16 809:2	809:3 811:3 822:6	938:14 939:3,9,10
758:12 760:18,24	850:15,21	809:10,20 810:1	844:20 856:2	944:24 951:7
761:10,18,24	Road 742:17,21	810:10,11,22	897:10,13	SEAN 744:3
784:9 798:7,15,18	776:25 801:3	811:2,18 815:2,7	saturation 810:6	season 760:23
801:25 804:9,16	841:19,22 849:1	815:8,10,17,19	893:14	seasonal 948:19
807:15,19 808:12	910:20	816:2,15,17 820:4	saw 873:7,13	second 803:9 821:1
		821:19 822:9,16		

857:21 905:3 929:7	839:24 847:18,19 935:7,12	selecting 829:9	shade 894:18 897:3	811:15,16 814:12
section 766:5	see 779:5 786:15	selection 907:15	shaded 860:20	816:3 829:25
785:12 794:11	791:11 792:14	self-serving 886:19	894:23 910:11	839:17 842:20
795:1 797:8,9	794:4 798:11	semi 902:8	shades 895:20	852:15,21 860:2,3
800:10,14,25	800:18 803:17	seminars 787:16	896:3,17,21	874:14,24 883:11
801:5,8 802:11,19	804:7,19,21 805:5	send 783:24	shading 894:17	894:2 897:6 902:6
803:11 805:7	805:8 806:15,22	sense 783:24 838:5	895:3 897:5 898:1	902:7,11 908:1
806:11 809:4,8	807:16 810:20	858:22 897:15	898:13,18	909:22 911:25
817:25 818:25	816:12,22 817:18	924:12 946:2	shadow 816:9	912:8 923:17,24
819:8,19,21	821:18 826:3	951:4	shale 842:14,15	928:9 930:21
820:24 821:1,13	830:20 831:24	sentence 768:19	844:15 845:8	932:4
823:24 829:13,24	834:9,16 841:13	separate 792:7	shallow 747:25	shut 748:4 806:25
836:9 837:3	841:17,19,24	798:23 861:13	748:3 752:24	side 807:20 821:7
841:16,18 842:1,7	842:7,9,12 844:15	869:7,7 884:6	820:11,12,13	841:17 853:1
842:8,11 845:7,8	857:2,4 858:17	897:3	941:6,23	857:11 861:21
845:13 847:8	860:2,4,7,15,21	separated 817:20	shallower 897:10	868:7,10 869:3
849:6 852:9 875:1	861:3,19 862:9	844:15 896:22	908:10,16	875:5,8,25 883:10
875:6,13,24	864:6 865:25	separates 808:6	share 917:22	886:22 894:4,5,6
876:10 891:12,25	867:5 875:5,9,18	separating 808:20	shoe 935:9,16,21	894:7,19,20
892:14 895:18	875:20 876:1,2,5	808:20	shop 747:12	897:19 898:1
900:5 907:25,25	883:11 884:11,12	September 926:16	shore 809:22	908:25
908:2,13 909:25	892:6,10,13	series 788:1 792:16	848:15 849:2	sides 746:16 749:8
910:3,12,13,16,18	895:17 896:9	796:21 799:12	850:13,18	928:6
910:21,22,23	906:10 907:21	800:3 814:21	short 795:11	sideways 793:16
911:2 912:10	910:11,20 912:16	826:12,15 827:2,9	843:22 884:7	sieve 785:12
913:1,1 918:17	913:18 915:22	828:4 829:22	920:21 944:12	sign 933:21,23
927:20 931:3,3	925:4 926:1,25	841:2,3 846:19,24	show 800:20	934:3,8
sectional 874:10	927:7,20,23	847:15,17 860:6	802:20 803:19	signal 793:10
sections 806:6	939:15 945:16	931:2	805:7,9 806:12	signature 789:6
818:9 819:25	seeking 866:25	serrated 861:20	818:5,8 821:20	792:2 815:16
826:12,16,22	seemingly 770:22	serve 943:24	860:18 862:10	816:6,7,22 818:3
827:3,9 828:3,4	seen 766:21 823:10	serves 865:12	884:24 885:10	821:18 837:1
829:23 830:1,4	889:11 902:24	883:5 884:9 908:9	898:15 910:1	signatures 817:19
833:17 835:15,16	925:18,20 926:19	943:3	928:8,10	835:13,18
839:11,13,16,20	926:20 927:3	service 760:19	showed 837:4	significance 861:2
841:13 842:25	943:11	790:8	871:6 872:1,23	936:13
853:5 855:24	seeps 772:23	set 797:10 872:7	939:23 943:22	significant 769:18
859:9 865:6	Seimans 782:21	874:21 882:17	showing 771:9	779:22 810:5
874:11,14,22,24	seismic 752:8,17,22	917:9	800:24 818:25	836:6 837:11,21
891:13,15,18,24	753:3,6,8 765:4	sets 882:17	859:8 874:11	844:2 860:23
904:10 905:7,8	765:21,22 766:4,6	setting 777:6 818:1	902:3 920:15	significantly
910:19 913:21	766:11,15,17	settling 809:17	930:18,23	866:22
secured 948:9,10	select 907:13	seven 789:13 792:7	shown 811:8	signify 855:1 856:3
sedimentary	916:13	796:20 814:21	820:19 853:21	similar 765:8
840:17	selected 802:20	873:8,9 936:3	860:12 863:7	788:10,10 792:14
sediments 751:9	911:13,17 913:15	seven-and-a-half	907:24 916:21	799:2 848:6
765:8 788:12	929:16,23	931:2	shows 798:20 801:9	871:13 891:12
		severely 759:3	802:16 804:17	921:3 924:15

926:22	763:11,14 766:23	sourced 756:21	778:13	800:4,22 801:7,19
similarity 804:22	767:9 770:17	sources 759:13	spent 777:17	807:4,16 813:8
837:5	771:4 773:22,24	863:25 867:21	778:22	814:5 826:11
simplistic 941:22	774:2,17 775:22	south 762:18 777:3	spiderweb 830:5	838:20 839:8,9
Simplot 870:4	877:13,14 886:11	817:3 821:3	874:12	844:9 851:11
simply 766:10	886:16,18,21	852:16 868:24	spike 880:19 882:2	866:5,24 868:2
single 746:22	945:19	871:14,15,15	882:15 884:5,15	874:8 877:20
747:23 786:11	Smith's 771:24	872:3 873:10,21	885:3	880:24 881:18
907:9 917:22	946:20	873:22 911:9	splitting 774:3	885:15 887:1
sir 775:24 823:14	smooth 915:21	southeast 747:12	spoke 770:16 798:5	893:19 894:15
931:16	smoothed 925:2	852:16,24 861:9	802:22 820:23	898:9 899:9
site 785:6 801:6	smoother 918:6	866:3,10 868:23	822:4 827:16	901:11,14 904:6
812:20 827:6	Snake 762:23	868:25 870:20	849:7 853:13	906:22 908:14
832:13 858:17	817:2 866:18	871:25 873:3,6,10	907:12 936:18	912:11 923:10
867:25 878:22	Soccer 870:3	southwest 801:1,13	Sports 870:4	924:1 928:23
904:16 907:6	society 787:18	801:14 820:25	spot 882:23	930:9 944:22
sited 781:14	soil 889:18	854:10,12 863:21	spreadsheet 879:8	stabilized 871:6
sites 914:7	soils 889:11	878:19 911:8	879:10,21 914:16	874:5
sitting 818:2	solid 805:18 919:20	southwestern	922:17,18	stable 873:16
situation 843:19	solution 753:22	853:1	Spring 786:6 801:2	Stacy 915:6 928:19
situations 903:11	754:23	so-called 798:2	801:17 846:16	staff 749:6 750:6
six 780:14 792:7	somewhat 814:15	801:16	857:12 892:11,23	755:18 759:20
796:24 802:18,25	834:1 837:13	space 907:23	895:22 896:19	761:21 763:25
818:25 936:4	863:4 896:7	935:22,24 936:5,7	897:12	784:10 797:20
937:25	923:21	936:13 938:16	Springs 783:12	835:20 880:13
six-inch 908:7	soon 760:20	spaced 920:16,18	808:6,8,14,17,18	881:7 882:20
size 766:3 785:13	Sopris 789:17	921:1,10,11	808:22,23 815:6	885:25 886:3
785:15 904:17	791:15	SPACKMAN	822:13,17 823:16	917:9 948:10
937:21	sorry 810:19 896:3	741:13	824:1,3,6,20,23	staffs 879:6
Sky 742:12	925:25 931:21	span 769:17	825:20 848:1,14	stainless 950:8
slice 800:14	sort 748:8 751:22	speak 749:18	848:21 849:20	Stake 781:22
slightly 872:24	762:20,23 783:6	775:21 805:6	854:6,21 862:2	stand 746:15 807:2
918:8	786:21 791:19	840:18	863:13 887:14,19	849:24
slot 785:15	800:10,13 841:13	speaking 835:18	889:1	standard 748:10
small 775:14	847:16 850:2	840:19 869:5	square 910:1,24	919:24 934:24
795:13 803:14	860:19 892:3	882:24 908:16,17	911:1	938:12
816:16 822:12	928:10 943:15	specific 753:1	squiggly 798:5	Star 781:20 801:1
837:16,18 842:15	sorted 907:25	764:7 846:18	814:17	801:14 802:11
879:23 880:1	sorts 788:16	913:5	Squires 744:10	806:23 820:25
882:18 908:7	sound 907:17	specifically 755:4	751:14 756:25	857:7 860:8 876:6
smaller 787:5	917:16	756:21 763:5,22	757:10 758:22	915:22
834:4 835:11	sounds 917:15	764:12 765:18	760:17 762:9	start 747:10 759:14
861:24 867:23	source 753:9,9	769:14 783:8	767:19 768:18	799:7,8 814:25
Smith 742:16 743:4	757:25 758:10	821:3 877:25	770:14 771:12	829:1,2 841:9
744:6,8 750:11,14	766:3,8,15,18	specify 785:14	772:13 774:24,25	844:1 850:24
750:18 752:7,16	772:22 808:24	speculating 780:6	775:2,9,12 776:7	853:15 888:12
756:4,10,14,15	815:22 867:23	Spence 782:4 783:5	777:10 780:8	904:12,18 910:9
761:24 763:1,4,10	927:1	Spencer 777:16	783:22 797:19	934:7 951:25

started 746:17 753:12 799:14 832:11 834:3,17 836:18 912:20 939:2,5	854:5,22 887:14 887:19 889:1 892:20	779:11 780:10 863:7 872:19 878:1 904:8	903:17	863:14,16 866:22 878:16,19 889:11 889:21,25 890:23 890:25 892:22 893:5,7 895:14 896:18 915:14 917:7,19 937:13 937:16 938:12,22 939:13 940:23 943:25
starting 911:3 924:8	storage 879:23	study 757:8 760:8 760:13,19,24 761:5 762:13,19 769:23 770:3 772:8 778:23 832:16,17 846:20 846:21,23 851:19 871:14 872:6 907:5 920:7 926:2 928:2	sufficient 754:14 suggested 872:2 925:3 suggestion 805:8 suggests 810:22 suite 792:6 793:13 796:18 798:4 summary 768:21 summer 913:24 917:2 sums 782:22 Sun 801:18 846:3 846:19 847:23 848:25 857:12 865:10 superposed 929:12 supervised 824:2 supplement 812:23 supplies 865:3 878:9,16 supply 799:18,19 support 770:11 792:19,20 810:24 832:21 837:19 supporting 923:1 supportive 838:17 sure 747:6 764:22 766:22 772:25 773:4 787:1 790:21 793:10 801:20 836:12 840:4 843:8 858:21 862:12 880:25 882:7 884:25 906:6 916:9 929:4 948:19 surface 754:12 757:1 772:15 780:3 782:21 800:19 803:4 805:16,24 806:7 806:15 810:7 843:21 847:13 855:8,9,10,13 858:3,6 860:3 861:5 862:8	surfaces 856:18 surmised 887:21 887:25 889:25 surprising 885:5 885:10 surrounding 907:6 survey 752:8,18,22 760:21 765:7,14 765:18 794:7 805:23,25 819:13 831:14 917:8,11 917:19 919:3 926:3 surveying 915:15 surveyor 917:8 surveys 765:4 779:25 782:21 794:3 suspect 843:9 sustainability 751:4 sustainable 786:18 865:3 Sustained 756:3 SVR 800:6 802:12 808:2 Swift 781:23,24,24 824:22 825:7,10 825:15,18 switch 868:1 906:3 switchbacks 915:24 switched 939:5,8 switching 835:5 sworn 775:3 symbols 882:18 892:7 932:5 synthesis 831:19
starts 800:23 847:9	stores 883:7	studying 777:11		
state 741:2 775:7 776:10,11 777:3 780:24 781:11 787:20 789:13,15 791:11 821:4,21 821:22 824:11 826:3,19 860:9 874:2 880:7,18 881:24 882:13 885:5	straddles 849:10	stuff 784:11 823:18 833:2 847:13		
stated 756:5 765:16 890:17	straight 858:5 891:2	subdivided 837:2		
statement 747:1 756:9 772:5,12	straightforward 834:25	subdividing 837:8		
states 768:21 791:10	stranded 815:20 850:13,19 862:15	subject 749:11,23 774:20 777:7 897:24 948:4 949:13		
state-of-the-art 950:19	stratographic 797:8,9 803:11 824:13 848:12 940:4,4 951:4	subjective 788:9 794:19		
static 747:19 748:9 835:4	stratographically 849:17	submit 936:7		
stating 900:24	streams 815:24 835:6	submitted 817:9 833:4,13,15 870:17 885:20 914:19 918:15 929:6		
station 798:22 917:10	Street 741:16 742:6 775:10 780:25 821:23	subsequently 924:21		
status 785:6	strength 760:10	subset 913:15		
stayed 938:1	stress 883:23	substantial 758:14 758:19 836:2 865:18		
steel 795:4,14 949:24 950:8	stretch 813:18	substantially 865:7		
steepened 918:9	strictly 832:15	subsurface 752:24 753:11 778:20,23 779:2,3,9 780:7 783:20 788:10 789:6 798:25 802:10 830:11 889:7		
stems 802:11	string 791:21 796:21	successful 932:23		
step 800:11	strip 798:6	succession 800:16 822:25		
Steve 879:5	strong 757:13,15 759:1 804:16 811:9,12 817:19 904:2	suffered 771:21		
Stewart 783:14	strongly 791:2 863:23			
stick 937:22	structural 784:13 784:16 809:15,16			
stippled 821:2 892:16	structure 784:17 892:14			
stipulated 886:10 886:13	struggled 923:17			
stock 827:17	student 928:22			
stone 803:14,15 808:5 822:13	students 905:11 913:23 915:6 916:18			
	studies 761:7,12 766:17 770:8 776:1 777:14			

918:19 922:22 synthesize 905:4 system 748:2,4,5 752:20 762:16 764:6 769:10 776:17 784:19 789:21 796:19 884:22 902:10 903:13 904:3 950:11 systems 769:6,6 789:14 811:22 943:16,17 S.H 805:24	838:21 839:10 845:24 852:22 892:19 898:11 908:20 talks 751:15 tangent 864:4 tank 880:1 tanks 879:24 target 752:23 867:7 867:8 taught 787:19 technical 749:7 832:20 885:24 technician 789:12 technique 919:24 934:22 techniques 934:25 935:4,5,15 936:20 technology 766:1 787:24 tell 760:8 764:4 775:3 784:14 785:5 796:16 800:8 802:16 804:23 817:12 821:13 839:15 845:23 846:1 882:12 884:7 905:17 921:16 929:1 930:21 tells 795:21 859:3 924:13 946:24 temperature 788:5 788:14 795:8 ten 756:7 759:9 768:3 777:4 813:22 871:15 872:8,20 937:3 944:17 tend 814:17 837:19 862:9 941:13 943:17 tends 770:3 809:17 term 751:19 768:15 769:1,20 865:4 947:19 terminates 852:23 terminology	772:18 terms 762:21 767:13 774:6,8,13 779:8 784:17 785:2 794:14 864:23 865:2 903:17,25 904:7 904:14 921:1 939:15 941:18 948:22 950:12,13 terrace 748:1 terrain 792:3 847:11 Terry 926:17 Terteling 782:19 783:12,14 808:6,8 808:14,17,18,22 808:23 815:6 822:13,17 823:15 824:1,3,6,19,23 825:19 848:1,14 848:20,21 849:20 854:6,21 862:2 863:13 887:14,19 889:1 test 747:14,20 748:9,11 752:8 753:4 754:1,6 780:20,25,25 781:11,24,25 782:1,20 786:3,3 786:4,5,11,13,17 786:21 790:4 799:17 800:6 803:8,9 808:2 810:16,23 811:1,6 819:10,11,14 821:4,6,8,21,24 822:1,2,3,23 823:1,1 824:11 825:9 845:20,21 846:19,24 855:25 856:1 865:10 873:6,9,11 880:7 881:24 882:14 885:4,6,7 891:16 902:20,21 939:17 tested 780:19	884:20,21 testified 747:18 753:5 765:21 772:20 775:4 821:15 854:16,18 879:11 881:23 888:19 900:17 908:8 945:10,19 947:5 948:8 testify 949:6 testifying 885:13 944:23 testimony 744:3,10 746:8,19 749:6 756:13 765:5,20 770:15 771:8,17 817:9 819:3 822:8 825:11 832:1 839:13 858:21 879:12 880:4 927:11 930:13 948:1 testing 781:17 785:2,18,23 tests 752:17 780:1 780:2 785:24,24 786:1,10,22 806:7 827:24 885:8 text 835:25 903:15 Thank 748:15,16 752:6 761:24 774:18 885:12 894:14 899:1,5 901:5,9,21 904:5 909:5,15 912:7 931:16 thereof 948:3 thesis 776:15,20,23 777:5 915:10 thick 816:14 825:4 834:6 843:4 845:1 845:5,7 850:3 854:9,9 864:20,22 thickness 864:21 thin 793:9 803:15 822:12 823:19 thing 757:4 771:13 827:19 840:25	841:12 844:5 856:4 861:17 863:12 904:24 905:3 928:10 things 765:23 785:20 788:5,11 788:16 805:17 813:19 829:20 831:22 839:21 843:25 854:17,18 860:17 868:18 887:11 904:21,22 915:17 916:10 920:2 923:3 927:13 930:10 936:25 think 746:6 749:23 750:25 752:9 755:19 758:4 760:2 768:8 769:8 769:25 772:20 774:9 778:15 784:8 786:4,17 789:3 791:8,12,20 797:15 804:19,25 805:1 808:13 809:9,23 813:17 814:2 817:21 819:24 821:15,17 821:17 822:10,22 829:19,22 833:25 834:16 835:22 836:12 845:8 850:1 851:15 856:5,21 859:17 859:17 861:2 865:25 868:10 869:17 870:17 874:22 876:17 878:17 880:19 881:6 883:9 884:23,24 885:11 887:20 888:4 890:7,20 891:4 892:1 893:11,22 894:25 895:9 897:22 900:15 901:3,6,6,13,18
T				
T 745:2 921:14 Tab 811:23 851:15 table 811:11 818:1 818:1 853:16 858:2 873:2 892:9 893:6 896:10,23 897:2 946:3 948:22 tables 798:18,19 tabulated 914:15 922:20 take 765:23 768:3 770:2,5,7 778:19 796:25 800:1 813:14 814:20 830:3 833:23 838:24 856:22 870:24 872:10 922:1,4 933:13 937:9 944:12,16 951:20 taken 787:14 882:19 takes 854:14 883:6 922:2 947:6 talk 764:2 796:10 915:12 talked 799:16,17 834:23 857:10,13 883:24 890:5,9 893:23 905:7 919:12 920:2,23 talking 769:5 776:3				

903:9,19 905:14	770:17 771:21	toto 885:18	897:18 916:23	Uh-huh 820:14
906:9 907:18	774:10 777:17	town 840:23 871:4	tube 798:23 824:15	ultimately 846:22
908:7 909:9	778:16,23 780:16	training 787:9,13	tubes 798:22	865:20 872:6
911:16 916:12	791:4 797:6	794:20	836:22	unbroken 844:23
917:4 918:7	803:18 816:4	transition 815:10	tuffs 847:18	uncertainty 917:7
922:15 923:7	822:24 833:3,5	transmissive	turn 752:2 753:14	unchanged 873:18
925:1 927:15	839:2 848:6,12	900:23	826:16 859:6	unconformity
928:9 929:15	851:12 871:5	transmissivities	904:6 946:25	751:18,21
936:16 939:5	872:24 884:21	851:2	turned 789:9	unconsolidated
941:25 943:3,9	885:4 902:13,22	transmissivity	turns 747:23	935:7
944:1,14 946:5,23	904:4 917:21	758:14,19 759:2	884:19 927:25	undefined 769:18
947:1,20 948:24	921:11 922:1,4	759:23 773:14	Tuthill 926:16	underground
948:25 949:22	923:8,19 929:24	864:15,19,21	TV 789:20	859:19
950:21,24 951:3	943:4 944:6	transmit 803:22,23	two 767:13 781:20	underlying 815:6
thinking 757:7	times 770:23,25	transported 878:21	789:13 792:12	834:7 842:15
760:13	809:9 821:5	trash 838:9	801:12 805:15	847:13 854:5
thinner 822:16	824:12 834:2	travel 770:17,23,25	807:19 819:13	867:24 888:22,25
third 768:19	922:1 930:13	Treasure 764:5	820:5 828:20	892:20 942:15
772:16 810:16	951:5,5	777:10 781:2,6	833:18 837:1,9	underneath 778:22
856:4	tip 809:17	816:21,21 817:2	838:3,4 839:10	812:19 816:15
Thirdly 905:10	tipping 854:10,12	902:24 935:1	843:10 844:11	841:1 849:5,17,19
Thornton 742:11	tips 809:12	treatment 823:22	845:17 859:7	867:25
746:13 748:19,21	today 746:17 790:3	867:15	860:17 861:13,13	understand 746:13
748:22 749:13	832:1 872:21	trend 845:12	879:24 882:16	790:21 866:24
773:19,20 877:7,9	told 765:15	triangle 892:7	884:9,9 887:10	868:14 879:17
886:15	tool 793:1,18 813:6	896:11	888:24 895:10,20	897:25 899:1
thought 802:3	814:16 829:22	triangles 806:16	896:3,17,21	understanding
829:15 838:15	830:12,20 905:6	811:8 853:22,23	904:21 915:17	750:9 765:12
876:24 880:11	913:21 935:4	857:17 882:18	916:9 929:16	803:4 830:24
898:5 899:14	939:7	895:21	932:15 941:23	854:2 856:25
917:4 932:17	tooling 936:10	tried 784:20,21	942:8	879:19 900:8,14
thousand 752:24	tools 792:23 793:9	814:20 817:14,16	two-thousand	900:15 904:15
842:8	top 800:18,23	824:14 860:12	885:21 929:7	929:14
thousands 756:7,7	808:17 810:2	916:13 920:20	type 747:13 769:23	understood 862:3
769:16	811:4 815:21	trips 780:5 783:5	770:3 788:12	undertake 913:10
threat 950:22	823:19 841:15	truck-mounted	847:19 869:16	undertaken 761:8
three 802:21	844:12 847:14	766:18	902:23 903:2,12	underwater 811:3
824:25 859:9	853:16 857:25	True 773:7	927:12 936:13	undif 834:13
884:10 904:22	858:7 875:14	truth 775:3	937:15 944:7	undifferentiate
927:5 951:1,1	892:9,17 921:5	try 778:19 780:24	950:10	834:14
three-page 922:17	938:20 940:21	786:10,19 797:16	types 840:14	uneven 794:17
throw 838:8	941:3	807:11 813:2	930:15 935:15	936:17
thump 766:9	topographic	834:2 859:15	typically 913:9	unexpected 948:23
tie 763:1	841:24 916:7,8	884:12 904:25	949:3	unfortunately
time 749:18 750:13	931:2	905:4	typo 924:24	947:3
751:20 754:12,14	topographical	trying 752:10		unit 789:18,23,25
759:8,11 764:15	800:24 855:10	753:19 758:3,22	<hr/> U <hr/>	790:2,11 807:21
769:7,11,17	topography 889:17	778:23 868:7	U 913:23 915:12	808:5 821:20
			928:22	

822:17 844:12,14 845:5 848:6,12,18 858:7 United 748:6 771:6 780:12,14 781:3 781:22,23,24 789:24,25 790:1,7 790:9 799:14 821:4 824:4,11 825:14 860:9 868:22 869:19 870:1,8,19 871:16 871:24 880:14 902:10 904:3 938:23 939:3,4,6 950:1 units 779:5 783:11 805:3 834:4,10 845:2,16,19 888:24 932:6 950:16 University 776:10 776:11 787:20 905:12 915:6 928:18 unpredicted 948:23 unreliable 794:18 unsaturated 809:4 809:6 810:12 811:7 855:22 942:15,24 943:1 unsealed 942:16 unsuspecting 947:12 unusual 902:23 un-corrodible 951:7 upland 909:3 uplands 860:19 upper 811:6 835:15 836:9 837:2,6 875:5,8,12,17 892:5 910:15 911:4,5 929:21 932:12 941:15 upside 806:16 811:8 892:6	896:11 upward 801:15 upwards 855:6 usable 823:21 905:6 use 752:3 766:8,16 768:15 769:8 790:4 791:4 793:12,23 794:14 814:16 830:12 839:13 872:11,12 872:14,22 913:21 useful 905:6 922:24 usefulness 901:1 User 742:9 users 742:14 748:23 813:3 929:9 USGS 770:3 778:1 925:16 927:2,6,6 931:2 usually 785:11 933:23 934:7 Utilities 950:2 utility 790:13 950:3 U.S 760:18 916:7 926:3	various 778:1 783:11 784:18 793:14 796:16,18 796:24 798:24 813:2 836:22 879:4 923:5 verify 776:4 version 924:5 vertical 819:16 860:8 896:7,7 vibroseis 766:19,21 vicinity 821:22 842:2 850:25 857:6 908:23 915:22 Vicky 743:6 video 793:11,13,17 view 793:19 794:13 822:8 893:15 935:14 941:19 943:21 949:9,11 views 948:2 Village 869:25 Vincent 744:3 746:9,11,14,18 747:9 748:21 749:5,9,22 750:12 750:19 756:9 762:7 763:6,17 764:16 768:9,12 768:15 773:24 774:19 784:4 854:16 901:12,23 903:9 925:13 927:11 945:21 Vincent's 763:8 819:3 Vine 781:21 virtually 791:3 900:4 907:20 visit 946:6 visiting 777:17 visits 922:3 visually 831:24 voice 951:23 void 793:6 796:5 voids 793:2 936:8 volcanic 783:13	840:15 841:2 847:15,18,25 857:10 860:19 862:15 863:19 volcanics 840:1 842:17 843:4,5,7 843:11 volcanic-clastic 847:19 VOLUME 741:6 vote 951:19	770:12,18,24 771:6 772:3,4,14 772:16,21 773:5,9 773:9,10,13 779:21 780:12,15 780:16 781:3,22 781:23,24 782:15 785:19 788:23,24 789:24 790:1,1,7 790:9 791:9 794:22 799:14 804:10,14 806:12 806:17,18,23 807:1,3,7,22,22 810:8,14 811:11 811:13,16 812:13 812:17,19,23 813:3 814:8 815:18 821:4 822:5 823:24 824:4 825:14 826:1 832:13,14 832:15,16,23 837:10,11 849:8 850:1,5,11,17 851:13 855:25 857:16,20,24 858:2,10,12,15,17 858:20 860:9 863:25 864:5,13 865:6,9,13 866:2 866:2,7,12,25 867:4,13,18 868:3 868:8,11,19,22,24 869:1,19,20 870:1 870:3,5,7,8,19,20 870:24,25 871:9 871:13,17,18,22 871:24,24 872:1,5 872:10,16 873:2,6 873:17 878:9,12 878:16,19,24 879:3,7,9,18,19 880:14 883:7,12 883:15,24 884:4 884:22 892:9 893:6 896:10,23 897:2 900:9 902:9
	V		W	
	vadose 942:14 valley 764:5 777:10 781:2,6 786:6 790:8 801:2,17 816:21,22 817:2,4 817:7 821:21 830:7,8 846:16 857:9,12 864:1 866:7,16,18,19,20 866:20,22,23 869:23 883:22 892:11,23 895:22 896:19 897:12 902:25 935:1 939:11 valuable 831:18 variability 921:9 variation 760:2 variety 788:2 799:23 809:1	W 742:6,21 wading 809:24 wait 747:4 waivers 933:21,23 934:3,8 wall 793:20 938:2 Wallace 842:9 843:13 844:9,16 844:22 want 750:12 753:14 761:14 768:12 779:14 799:7 801:20 813:20 826:11,19 856:22 881:2,10 882:6 921:4 944:12 951:18 wanted 748:13 812:17 858:21 870:2,5 933:20 wanting 832:12 wasn't 748:9 770:11 833:3 876:21 895:4 water 741:1,5,15 742:14 747:19 748:3,6,9,12,23 754:9,16 755:8,9 756:5,6,16,20,25 757:2,12,17,24,25 758:9,20 759:3,15 759:17,22,25 760:9,15 761:11 761:18 764:1 766:24 767:9,11 768:23 769:24		

902:10,15 903:22	781:25 782:1,8,10	917:20 918:2	we'll 748:19 749:13	898:6 900:9,18
903:23 904:3,16	782:14,15,15,18	919:3 920:15	773:20 776:3	919:6 921:15
905:1 909:7,11	782:20,20 784:25	921:5,7,15,17,23	800:1 817:10	winch 789:21
911:19,20 914:5,7	785:3,6 786:8,20	921:24,25 924:14	838:20 852:10	793:18
914:10,17,22,25	786:24 787:2,4,6	930:11,15,18,24	915:12 951:25	winnow 850:22
915:3,16 916:2,3	787:8 790:4,5,9	931:6,11,20	we're 746:1 748:24	winnowed 851:7,9
916:6,12,24	790:12,13 791:10	932:14,20,22	752:3 760:1 768:6	winter 883:1
918:18,19 919:2,3	795:10,13,15,17	933:7,11,14,16,25	769:5 794:5	witness 746:9
922:3,24 924:18	798:1,23 799:4,9	934:2,11,12,15,18	796:19 804:17	749:16 750:4
924:22 925:6	799:10,13,16,17	934:20 935:1	817:6 831:12	753:17 774:21,22
927:8 928:10,13	799:18,19 800:15	936:19,19,23	834:12 839:5	775:23 797:17
928:19,21 934:11	802:18,25 805:4	937:7,10,16	852:22 856:23	800:9 801:11,25
936:18 938:9,24	805:15 806:13,18	938:14,15,23	862:12,18,19	811:24 826:13,17
939:3,4,18,20	806:19,21 807:7,8	939:3,7,10,11	874:4 898:5 906:3	851:16,23 881:4,6
940:14,16,21	807:19 814:21	942:16 943:20,23	908:3,11 915:19	888:9,11 890:4,9
941:9,13 942:1,5	817:5,17,21	943:23 944:3,4,24	924:13 950:7	890:13,16,20
942:7,10,16,20,25	818:12 819:1,14	945:11,14,15,16	we've 779:21,22,23	894:12 896:1,4,9
943:2,16 944:25	820:5 822:23	945:21,25 946:1,6	789:23 794:2	896:13,23,25
945:5,14 946:2,4	823:2 824:1,3,5	946:7,16 947:20	799:17 802:20	897:17 898:4,17
946:8,14 947:1,5	824:11,15,25	948:3,7,12,13,17	803:2 816:19	901:15,19,21
947:6,9,11,16,21	829:12 831:13	949:7,19,21,21	824:13 826:8	905:24 909:15
947:24 948:2,7,11	836:19 843:10	950:6,9,16,19,21	839:9 845:11,24	918:12 928:25
948:12,16,16,22	844:11 845:17,20	950:22 951:1,1,2	846:14 855:3	930:20 951:22
948:23,24 949:3,3	846:14,15,16,17	951:6	859:9,20 860:24	witnesses 744:2
950:1,12 951:12	846:20,24 847:6	well's 944:24	868:10,20 873:25	846:5
Waters 929:9	847:23 855:4	went 746:19 823:4	874:3 877:21	women 750:24
Water's 939:7	857:12,15,19	823:5,7 851:7	882:19 891:15	wonder 813:14
way 747:3 760:14	858:18 860:7,11	905:10 914:2	892:19 904:8	wondering 767:4
791:12 798:9	862:9 865:9,10,23	916:11,18 946:14	905:3 907:20	772:7
815:9 837:11	869:14 870:13,23	946:25 947:14	908:12 909:25	Wonders 879:6,15
858:17 863:16	870:24 872:2,7,8	weren't 790:8	916:21 919:8,12	Wood 751:14 762:9
879:7 893:12	872:20 873:5,19	833:6 915:21	920:2 939:23	771:12 777:16
894:24 896:18	873:23,24,25	west 751:11 775:9	943:10	778:12,13 779:7
902:14 923:13	874:1,1,3 876:15	776:24 830:9	wheel 828:1	782:5 805:24
928:20 933:11	883:22,25 884:20	852:16 860:4	wide 816:20	817:9 860:24
936:24 938:21	885:6 891:14,16	878:18 902:11	widely 817:20	886:6
946:13 950:23	899:22 900:2	906:24 921:16,25	willing 933:22	Woods 841:23,24
951:12	902:10,24 903:21	927:25 930:6	Willow 801:3 846:5	word 769:9 830:4
ways 920:6 945:2	906:17,23 907:1,4	westerly 928:15	849:1,4,4,5,14	words 788:9 916:17
weak 951:23	907:16,16,22,24	western 762:22	852:5,22 858:25	921:4
wedge 852:23	908:1,4,5,6,7,7,10	821:6,9,25 906:19	861:21,22 862:16	work 748:19
weeks 914:3 921:2	908:12,13,16	west-Boise 805:20	862:22 863:12	764:24 778:10
Weiser 817:3	909:23,24 910:1	805:21 806:1	864:2,6,11,14	780:9 781:4,18
welcome 893:18	910:24,25 911:5	849:11 860:22	865:1,6,9,16,17	784:10 785:21
wells 763:18,19	911:11,18 912:9	861:10,12,14	865:18,20 866:4	787:14 796:9
779:22,24 780:1,1	912:23 913:14,22	863:22 894:21	867:1,6,9,11,20	812:15 833:8
780:18,19,20,22	916:12,13,18,19	896:6	894:5,19 895:19	834:21 836:18
781:15,16,18,20	916:19 917:1,4,10	wet 909:1	896:10 897:7,9,18	877:22 879:2

945:25 951:16 worked 778:5,16 779:8 782:3,4,13 782:18 790:6,11 831:15 846:13 870:9 871:13 874:1 879:5 880:12 882:21 938:25 working 832:11,20 874:4 works 766:20 worse 924:17 worth 908:21 909:9 worthwhile 757:8 765:10 wouldn't 758:15,19 772:17 845:3 921:4 922:14 wrestling 750:24 write 829:19 written 750:6 wrote 831:10 837:25 885:7	777:12 778:5 780:14 787:16 789:13 818:12 829:11,17 873:18 882:20,22 903:19 907:19 946:23 950:3,9 yellow 892:8 895:20 896:3,17 896:22 897:3 910:10 932:4 yesterday 746:19 747:1 753:5,18 755:6 761:20 770:1 771:17 772:20 825:12 854:16 880:4,17 882:1 901:12,23 945:10,20,20 948:2,8 949:7 yield 786:18 younger 772:21 808:22 823:18	923:17,23 924:2 925:4 926:21 927:6,17 1,500 753:25 754:25 1:10 839:3 10 797:15 864:12 895:22 896:20 916:7 937:24 10th 885:21,23 100 798:11 810:4 924:23 941:6 950:9 1002 775:9 101 931:14,15 933:5 11 818:25 820:16 888:17 905:16 909:8,11,19 911:22 12 753:13,15 841:5 841:7,11 844:11 872:9,10,24,25 880:23 911:7 12:00 839:2 13 901:10,23 910:12 911:4 14,000 817:5 140 807:23 15 786:9 787:17 911:8 150 897:11 908:11 908:16 909:2 944:3 16 885:8,8 160 807:23 167 858:18 916:12 169 907:16 911:13 911:17,20 914:22 916:11 917:2 934:2 17 818:25 820:16 827:9 829:22 874:22 888:17 905:8,16 170 911:20 18 787:17 881:20 882:3,10,13 911:8	918:11,14,15 920:13 923:17,23 924:2 925:4 937:19,22,23 941:5 18-foot 939:13 180 902:19,20 1930 788:1 1980 926:4,5 1982 926:6 1988 927:2 1990 776:14 870:18 1991 926:2 1992 751:13 762:7 763:19 764:5 771:11 776:14 901:11 1993 939:4 1994 926:16	2006 905:14 913:24 2007 811:24 812:8 814:7 851:20 882:25 883:1 920:17 2008 882:2 918:22 2009 741:14 746:2 885:22,23 929:10 21 925:23 225 753:13,16 23 741:14 865:25 866:1 23rd 746:2 250 787:3 26 826:12,25 827:1 828:17,21 831:1 832:4 839:10 887:7 891:19 27 826:15,25 828:2 828:10,12 829:2,6 831:2,25 839:10 839:18,19 841:5 844:11 845:14 874:8,25 875:5 876:16,22 877:6 891:22,23 905:8 913:16 2720 742:7 29 923:11 925:10 925:14,25 926:1
X	Z		2	
X 744:1 745:1,2 874:6 902:13	zero 798:11 zone 793:4 826:8 895:21 940:12 941:15 942:15 943:1		2 759:6 763:24 808:2 810:17 811:6,21 813:10 814:7,12 817:13 822:4 824:11 853:13,15,15,20 855:5 856:1 861:5 888:6 902:9 920:13 927:7	
Y	0		2nd 926:16 2,000 769:12 819:15,16 829:8 836:8 934:20 943:23 945:13,24 946:6,6 2,200 836:8 906:16 2,300 907:16 945:14 2,386 906:17 907:22 912:23 20 777:12,12 786:9 865:25 916:7 937:22 940:12 950:3 200 787:3 798:11 811:4 2004 898:9 2005 764:25	
yeah 753:21 772:25 827:2 837:17 841:8 849:4 856:14 863:12 875:10 889:17 894:12 901:20 902:20 911:16 917:15 922:9 926:5 936:2 938:20 year 761:3,4 787:17 812:7,22 871:11 880:20 883:14,14,17 891:9 911:21 916:10 years 756:7,12 759:2,10,18 769:13,16 777:12	01 807:13 08 876:23		2nd 926:16 2,000 769:12 819:15,16 829:8 836:8 934:20 943:23 945:13,24 946:6,6 2,200 836:8 906:16 2,300 907:16 945:14 2,386 906:17 907:22 912:23 20 777:12,12 786:9 865:25 916:7 937:22 940:12 950:3 200 787:3 798:11 811:4 2004 898:9 2005 764:25	3
	1		2nd 926:16 2,000 769:12 819:15,16 829:8 836:8 934:20 943:23 945:13,24 946:6,6 2,200 836:8 906:16 2,300 907:16 945:14 2,386 906:17 907:22 912:23 20 777:12,12 786:9 865:25 916:7 937:22 940:12 950:3 200 787:3 798:11 811:4 2004 898:9 2005 764:25	3 800:5,7,22 802:8 802:9,15 806:11 818:17,24 821:6,8 822:1,2 824:23 825:10 833:19 845:10 849:6 853:10,12,21,22 854:2 856:1 860:8 876:6 887:7,8,12 888:2,6,15 890:2 930:17,22 932:3 933:1 3,000 759:18 769:12 842:24 3-D 859:16 30 873:12,18 916:20

