

BEFORE THE DEPARTMENT OF WATER RESOURCES
OF THE STATE OF IDAHO

IN THE MATTER OF APPLICATION)
FOR PERMIT NO. 63-32573 IN)
THE NAME OF M3 EAGLE LLC)
_____) VOLUME VI
(Pages 1206 through 1469)

BEFORE
HEARING OFFICER: GARY SPACKMAN

Date: May 4, 2009 - 8:52 a.m.
Location: Idaho Department of Water Resources
322 East Front Street
Boise, Idaho

REPORTED BY:
JEFF LaMAR, C.S.R. No. 640
Notary Public

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1 APPEARANCES: 2 3 For M3 Eagle LLC: 4 GIVENS PURSLEY LLP 5 BY MR. JEFFREY C. FEREDAY 6 MR. MICHAEL P. LAWRENCE 7 601 West Bannock Street 8 P.O. Box 2720 9 Boise, Idaho 83701-2720 10 For North Ada County Groundwater Users 11 Association: 12 BY MR. JOHN THORNTON 13 5264 North Sky High Lane 14 Eagle, Idaho 83616 15 For Eagle Pines Water Users Association and 16 Individually: 17 BY MR. ALAN SMITH 18 3135 Osprey Road 19 Eagle, Idaho 83616 20 Appearing Individually: 21 BY MR. NORMAN L. EDWARDS 22 884 West Beacon Light Road 23 Eagle, Idaho 83616 24 /// 25 ///	1 INDEX 2 3 WITNESSES 4 TESTIMONY OF ED SQUIRES PAGE 5 Cross-Examination by Mr. Thornton 1210 6 Cross-Examination by Mr. Alan Smith 1292 7 Redirect Examination by Mr. Fereday 1327 8 Recross Examination by Mr. Thornton 1340 9 Recross Examination by Mr. Alan Smith 1352 10 TESTIMONY OF RICHARD K. GLANZMAN 11 Direct Examination by Mr. Fereday 1358 12 Cross-Examination by Mr. Thornton 1422 13 Cross-Examination by Mr. Alan Smith 1458 14 15 EXHIBITS 16 NO. MARKED ADMITTED 17 71 1432 1434 18 19 20 21 22 23 24 25
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1 APPEARANCES (Continued): 2 3 Also Present: 4 Jerry Peterson 5 Jason Smith 6 Dennis Owsley 7 Cherie Padilla 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25	1 THE HEARING OFFICER: Let's go on the 2 record. We're recording again. Today is May 4th, 3 and it's approximately 8:45 in the morning. This 4 is a continuation of the hearing for application 5 to appropriate water No. 63-32573. And we're in 6 the middle of the testimony of Mr. Ed Squires. 7 And I think, Mr. Thornton, you were 8 cross-examining Mr. Squires. 9 MR. THORNTON: Right. Yes, I was. 10 THE HEARING OFFICER: All right. You may 11 continue. 12 13 ED SQUIRES, 14 having been called as a witness by M3 Eagle LLC 15 and previously sworn, testified as follows: 16 17 CROSS-EXAMINATION (Continued) 18 BY MR. THORNTON: 19 Q. Okay. Well, Mr. Squires, I bet you 20 enjoyed your week off like I did. 21 In the testimony the previous week, I 22 want to thank you for pointing out the Pierce 23 Gulch sand and how it could be viewed in a large 24 exposure in terms of the north -- the location of 25 the north Boise foothills. And I think you even

Page 1211 1 brought in a sample -- I don't know if that was 2 here today -- of the material for illustrative 3 purposes of that. 4 And this weekend we went up to look at 5 that area of Pierce Gulch sand. And I was 6 wondering if you ever observed all of the birds 7 that are building their little tunnels about 8 halfway up in that exposed face? 9 A. Yeah. 10 Q. Okay. And thinking of the sample of 11 the Pierce Gulch sand over here that you brought 12 up previously in your expert opinion and with your 13 intimate knowledge of the Pierce Gulch sand, could 14 you estimate what angle of repose that sand might 15 be right now where those birds are building into 16 that face? 17 A. It's pretty steep. It's a fairly 18 sheer face. 19 Q. Okay. And then in your expert opinion 20 as a registered professional geologist, why do the 21 facies of that exposure in Pierce Gulch appear to 22 be largely stable and near vertical? 23 A. I think that we've said throughout our 24 research and all of our reports that one of our 25 major findings is that the Pierce Gulch sand was	Page 1213 1 to the left, but it varies, there's quite a bit of 2 variation? What does that tell you about that 3 medium of the Pierce Gulch sand, then? 4 A. Well, it tells us that there are 5 interbeds between the sands. And it's not a 6 constant, thick, homogeneous unit. 7 Q. Okay. 8 A. It has fine sands, coarse sands, 9 gravels, et cetera, that all affect the 10 geophysical response. But we have -- you know, 11 we've mapped 270 feet of Pierce Gulch sand capping 12 the foothills, you know, in the Boise area. And 13 that seems to correlate pretty well what we see on 14 the geophysical logs. 15 Q. So are you saying that it is all some 16 medium of sand or is it interbedded, as Dr. Spence 17 Wood testified, where it's a layering of sand, 18 some coarse, some fine, some clays, some finer 19 materials in there? 20 A. There's certainly finer materials in 21 there. The lower part of the Pierce Gulch sand 22 has very little clay in it. We know that from the 23 geochemistry; we know that from our cuttings. And 24 just because you see oscillations in the 25 geophysical logs, you don't see those oscillations
Page 1212 1 quite cemented, actually. And that comes through 2 in all of our aquifer testing. We've had to 3 correct for the fact that it's cemented. 4 It's a combination of cementation in 5 the subsurface, but also there's some things that 6 happen in the outcrop that cause it to stand like 7 that as well. And it has to do with water 8 evaporating out of there and precipitating near 9 the surface. It gives it a harder surface in the 10 outer few feet. But it doesn't necessarily mean 11 if you dig back in there where the birds are going 12 back in that it isn't a lot less cemented in the 13 outcrop. 14 Q. Okay. 15 A. In the subsurface it appears to be 16 quite cemented. 17 Q. And then in your testimony or in your 18 display of the Pierce Gulch sand, are you stating 19 that the Pierce Gulch sand being 200, 300, 400 20 feet, whatever the thickness is, that it is all 21 like that? 22 A. No, I'm not stating that. 23 Q. Okay. And so what would you look at 24 based on your resistivity logs where we can see 25 it's not necessarily a straight line over I think	Page 1214 1 come back to the clay line. They're far from it. 2 So it's mostly sand. 3 Q. Okay. But a difference in the 4 transmissivity between those different -- 5 A. Well, it depends. If you look at it 6 on a micro scale, sure. But as Dr. Wood 7 explained, you've got these switching deltas and 8 these lows that build on top of each other. But 9 everything that we've seen, the hydraulic data 10 suggests that it's pretty connected. 11 Q. Okay. All right? 12 A. Certainly there's going to be changes 13 in transmissivity in any natural deposit based on 14 any number of causes. 15 Q. Okay. All right. So in your earlier 16 testimony the week before last you discussed at 17 some length the quality of residential wells in 18 general and your opinion of the quality of 19 residential wells in north Ada County; is that 20 correct? 21 A. I have testified to that, yes. 22 Q. Okay. And did you indicate in that 23 discussion that many of the well reports you 24 reviewed from the area -- from that area, in the 25 Eagle area north of Boise River, that most wells

Page 1215 1 had been completed by some five or six well 2 drilling companies? 3 A. I didn't say that. 4 Q. Okay. And then could you tell me what 5 your -- so in -- 6 Yeah, I just wondered if we could just 7 relisten to the testimony, but that's what we had 8 down what he said, that he said that generally 9 five or six well drilling companies -- 10 A. I don't recall that, but I'd be glad 11 to -- 12 THE HEARING OFFICER: I don't recall that 13 either, Mr. Thornton. And I don't know how to 14 find it. I mean if it's not there, I don't know 15 how to find it. 16 MR. THORNTON: Okay. We'll continue on -- 17 THE HEARING OFFICER: Okay. 18 MR. THORNTON: -- in interest of time here. 19 THE WITNESS: I wouldn't dispute that 20 that's probably true. 21 Q. (BY MR. THORNTON): Okay. And then 22 did you also indicate that for the -- a lot of the 23 well drillers in that area, are you familiar with 24 those companies from your many years of experience 25 in the Treasure Valley?	Page 1217 1 know, the state of the art of practice that the 2 licensed well driller usually carries out? 3 A. Yes. 4 Q. So in your experienced opinion, was 5 the intent of the well drillers licensing law to 6 afford some level of protection to the lay public 7 when hiring well drillers? 8 A. Absolutely. 9 Q. Again, do you recall indicating in 10 your earlier testimony that wells in the north Ada 11 County area was the highest density of wells that 12 you've seen in many years of your experience? 13 A. I would say that, yes. 14 Q. Okay. Now, what was the approximate 15 number of wells you're referring to in your 16 testimony? 17 A. I believe, depending on the area, I 18 think we've got something around 2250, 2,250 wells 19 that we have in our north Ada County database. I 20 think we've reviewed up to perhaps 3,000. 21 Q. Okay. And so would all of those 22 2,000, 2,500 wells generally have water rights 23 senior to whatever water right that might be 24 issued to M3? 25 A. Well, I would say that any -- any
Page 1216 1 A. Generally, yes. 2 Q. Okay. And can you tell us which of 3 those companies that you are familiar with? 4 A. I'm familiar -- I could go on and on. 5 Of course, I'm familiar with them not only from 6 personal experience but also from reviewing these 7 logs over the years. There's not too many that 8 I'm not familiar with. 9 Q. Okay. I believe you testified that a 10 large number of those well drilling companies are 11 not drilling appropriately in terms of what you 12 had stated in terms of poorly constructed wells; 13 is that true? 14 A. I believe that domestic wells are 15 poorly constructed in this valley, yes. 16 Q. Okay. And what -- are those companies 17 licensed to drill wells? 18 A. Yes, they are. 19 Q. And what agency issues those licenses? 20 A. The Department of Water Resources. 21 Q. And is there some type of requirement 22 that a well driller must possess to obtain a 23 license? 24 A. Sure. 25 Q. So is there some level of quality, you	Page 1218 1 existing well is going to be -- have a water right 2 that's senior to a new well. 3 Q. Right. And in terms of the wells that 4 are poorly constructed, do you have the names of 5 those companies that poorly construct wells? 6 Could you provide us those? 7 A. I think what I am referring to is I 8 think that all air-rotary wells drilled under the 9 current rules in the Treasure Valley and around 10 the state are poorly constructed, in my opinion. 11 Q. Okay. And are those wells, the 12 majority of those, wells in your expert opinion 13 following the State regulations for well 14 construction? 15 A. Yes, they are. 16 Q. Okay. All right. 17 A. The current standards. 18 Q. The current standards. 19 A. They will change now in July after 20 three years of trying to improve them. 21 Q. Okay. And what was the substantive 22 change just recently? 23 A. Well, there were a number of changes. 24 Q. And do you have what those were? 25 A. Well, one is an increase in the

Page 1219 1 surface seal to 38 feet from 18 feet. A lot of 2 the rules were clarified. And those are the two 3 main substantive changes. 4 Q. Okay. Thank you. 5 And then what about the cable-tool 6 wells? I think you talked a little bit about 7 that. In your opinion, cable-tool wells, how are 8 they in terms of providing for better 9 construction? 10 A. I think I'm referring to all 11 drill-and-drive methods. 12 Q. Okay. 13 A. That includes cable tool and air 14 rotary. The problem with those types of wells is 15 they can't be sealed effectively, so they comeingle 16 everything that they drill through. 17 Q. Okay. 18 A. Doesn't mean that a homeowner can't 19 get his water. I think they're very effective 20 at -- obviously, you've got a lot of people 21 depending on water that are getting their water 22 from those wells. 23 Q. Okay. 24 A. But in terms of protection of the 25 resource, they're grossly inadequate.	Page 1221 1 testified earlier regarding this letter about an 2 earlier water right application in the general 3 area of M3 project; is that correct? 4 A. You know, I'm not -- I can't recall 5 that I did speak to this letter. Perhaps I did, 6 but I can't recall that I did. 7 Q. Okay. If I didn't write it down, I 8 don't know if I could remember either. 9 So please refer to page 2, and 10 specifically to the third paragraph on that page. 11 And could you read that -- and it's stated 12 "Groundwater flow direction." And if you could 13 read that paragraph underneath "Groundwater flow 14 direction." 15 A. The sentence starting with "However"? 16 Q. No. It starts, "The proposed points." 17 So we're maybe not close on this -- 18 A. "Groundwater flow direction" heading? 19 Q. Yeah. That starts, "The proposed 20 points of diversion." 21 MR. FEREDAY: Objection. Mr. Hearing 22 Officer, this should speak for itself. If there's 23 some specific purpose for having the witness 24 recite this, maybe it's justified. But we would 25 object that it speaks for itself. And it wasn't
Page 1220 1 Q. Okay. And, Mr. Squires, if you could 2 refer to Exhibit 45, please. 3 A. Got it. 4 Q. Do we all have that out? 5 And then I believe previously you 6 testified that you're the primary author of this 7 document with your professional geologist stamp on 8 it? 9 A. That's correct. 10 Q. Okay. And if you could go back to the 11 appendix containing the letter from Scanlan 12 Engineering. And that is probably two-thirds of 13 the way back. And the top of the page has 14 "Scanlan Engineering." 15 MR. FEREDAY: Attachment A. 16 MR. THORNTON: Attachment A. 17 THE WITNESS: Appendix A? 18 Q. (BY MR. THORNTON): Yeah, 19 Attachment A. 20 A. Okay. It says Appendix A right here. 21 Q. Oh, okay. 22 MR. FEREDAY: Let me show you. 23 THE WITNESS: Okay. Got it. 24 Q. (BY MR. THORNTON): And then on -- 25 okay. And then on page 2 -- and I believe you	Page 1222 1 Mr. Squires -- and I believe it is beyond the 2 scope of direct because we did not inquire about 3 this letter in this way. 4 MR. THORNTON: He did -- Mr. Hearing 5 Officer, he did testify on this particular 6 exhibit. And we have been -- what I want to try 7 to bring out is the discussion on the groundwater 8 flow tributary to the Payette River. 9 THE HEARING OFFICER: Okay. With respect 10 to the objection regarding the reference to the 11 letter, I'll overrule that objection. We've 12 referred extensively to Exhibit No. 45. This is 13 an attachment to it, and it apparently was 14 attached thereto for purposes of either 15 illustrating some point, perhaps this particular 16 point as well as others. 17 But with respect to the objection 18 about the text, is there a specific portion of 19 this, Mr. Thornton, that you want to -- 20 MR. THORNTON: Yeah, I could go with my 21 next question on that paragraph, if you'd like me 22 to. 23 THE HEARING OFFICER: What I want to do is 24 just avoid Mr. Squires reading the whole thing. 25 MR. THORNTON: Right.

Page 1223 1 THE HEARING OFFICER: However, we're taking 2 enough time that we just as well have. 3 MR. THORNTON: Right. 4 THE HEARING OFFICER: Is there a particular 5 portion of this, I guess? 6 MR. THORNTON: Yeah, there is. 7 THE HEARING OFFICER: Okay. 8 MR. THORNTON: And could I rephrase my 9 question to assist in that? 10 THE HEARING OFFICER: Sure. 11 Q. (BY MR. THORNTON): So in that second 12 paragraph, essentially the last sentence in that 13 paragraph. 14 So, Mr. Squires, was the logic 15 expressed by Mr. Scanlan in the last sentence of 16 that paragraph regarding the Boise River Basin 17 groundwater moratorium part of the logic that your 18 team of experts used in postulating that the PGSA 19 has a primary outlet to the Payette Valley? 20 MR. FEREDAY: Objection to the extent it 21 asks this witness to testify to another person's 22 logical thought processes. 23 THE HEARING OFFICER: I'll sustain the 24 objection. But it has more to do with the 25 phrasing, Mr. Thornton. I'm not sure that -- and	Page 1225 1 first sentence in that paragraph states that, 2 quote, "Said differently, even if the exact 3 direction of groundwater flow and/or the precise 4 locations of discharge far to the west of the M3 5 site have not been defined definitively, 6 et cetera." 7 Are you saying you really don't know 8 where it goes? 9 A. I'm not saying that at all. 10 Q. So do you know where the discharge 11 goes? 12 A. I have a pretty good idea, yeah. 13 Q. And what is the direction of the 14 discharge? 15 A. And the discharge of what, sir? 16 Q. Of the Pierce Gulch Sand Aquifer. 17 A. Well, we've shown that the Pierce 18 Gulch Sand Aquifer is a regionally extensive 19 aquifer. We have said in our reports and in our 20 testimony that it discharges to the Boise River, 21 it discharges to the Snake River, it discharges to 22 the Payette River Valley. 23 And I think it's pretty evident that 24 it's extensive over a huge, vast area that 25 includes several river valleys. I believe it
Page 1224 1 I think you called it a major outlet to the 2 Payette River Valley. I guess I don't recall that 3 reference. So let's rephrase the question. 4 MR. THORNTON: Okay. 5 Q. So was the logic expressed by 6 Mr. Scanlan in the last sentence of the paragraph 7 regarding the Boise River groundwater moratorium 8 part of the logic that your team of experts used 9 in postulating that the PGSA has some discharge of 10 ground water to the Payette Valley? 11 A. I would say no. 12 Q. Okay. 13 A. I would go on to say that I think that 14 Mr. Scanlan correctly inferred that this area, 15 which is not the Pierce Gulch Sand Aquifer, does 16 flow toward the Payette. We concur with that. We 17 looked at that. We see no reason or evidence why 18 it would not flow to the Payette. 19 And similarly, in the stratigraphic 20 section, as we understand it, we would see no 21 reason also why the Pierce Gulch Sand Aquifer 22 would not flow to the Payette. 23 Q. Okay. Thank you. 24 And then still in Exhibit 45, on 25 page 14 of the third paragraph. Page 14. And the	Page 1226 1 discharges as all -- as all groundwater basins do, 2 in the lower parts of those valleys in those 3 basins. 4 Q. Okay. Thanks. 5 And then in that same sentence you use 6 the -- a term "insufficient groundwater" where it 7 says this -- "Said differently, even if the exact 8 direction of groundwater flow and/or precise 9 locations of discharge far to the west of M3 site 10 have not been defined as definitively, this does 11 not mean there is insufficient groundwater in the 12 PGSA for the development of 6500 acre-feet of 13 groundwater annually at M3." 14 And how do you define "insufficient"? 15 A. That there is insufficient water for 16 the use. 17 Q. And do you -- and so insufficient for 18 a person that's concerned about their water table 19 declining? What is "insufficient"? 20 A. I think that what I meant when I wrote 21 that is that -- and I think what it says is that 22 we've shown that the Pierce Gulch Sand Aquifer, as 23 it underlies the M3 site, is well connected to the 24 Valley, the Boise Valley. We believe it's -- 25 we're almost certain that it is also connected to

Page 1227 1 the Payette River Basin and to the Snake Basin, 2 and even across and beyond the Snake Basin. 3 So not only have the protestants in 4 this case, your experts and the DWR staff seem to 5 have just focused on this idea of whether it 6 actually flows to the Payette River. What I'm 7 saying is it really doesn't matter to me as a 8 scientist whether it flows to the Payette River. 9 It clearly flows from the Boise Basin, under the 10 M3 site, and beyond. 11 And so to me, it doesn't matter where 12 the water goes after it leaves 5 miles beyond the 13 M3 site in terms of water sufficiency for this 14 project. 15 Q. Okay. So if you could refer to 16 Exhibit No. 12. And that's the -- I think we've 17 talked about it as the M3 model. And on -- 18 MR. LAWRENCE: Exhibit 12 is the 16 aquifer 19 test report? 20 MR. THORNTON: Well, it's the -- 21 MR. LAWRENCE: Exhibit 16 is the M3 -- 22 MR. THORNTON: It's the five models history 23 updates. Exhibit 16. I wrote it down wrong. 24 Exhibit 16. I'm sorry. 25 THE WITNESS: I'm there.	Page 1229 1 for this water right, the M3 application, I 2 believe it's moot whether it flows to the Payette 3 or not. 4 Q. Okay. 5 A. This paragraph and bullet that you are 6 referring to simply states that the previous 7 models did not allow for any flow to the Payette 8 whatsoever, because there's a no-flow boundary 9 between the two basins. 10 Q. And so are you saying that it does 11 matter? I'm confused. Does it matter if it 12 goes -- your model matter if it goes to the 13 Payette River, or does not if it -- 14 A. It depends in which context you mean, 15 if you mean for purposes of appropriating this 16 water right. I don't believe that it does matter, 17 no. 18 Q. What about in terms of potential 19 drawdown curves if you had a no-flow boundary to 20 the Payette River, would that make a difference on 21 your drawdown curves? 22 A. Well, I believe that -- I believe that 23 we do have no-flow boundaries on the M3 site. 24 It's obvious. We've reported on them, we've drawn 25 them, we've described it. There's two of them, at
Page 1228 1 Q. (BY MR. THORNTON): And then if you 2 would go to -- if you would go to I believe the 3 first page of the executive summary. And on the 4 second paragraph it states that "The new model, 5 the M3 model, supersedes the four earlier 6 groundwater flow models." It goes on to the 7 second sentence to say, "The previous four models 8 were unable to simulate and predict impacts to 9 wells near the M3 property because these models 10 were" -- and the third bullet in there is 11 stated -- "set up with boundary conditions that 12 did not allow groundwater flow in the Pierce Gulch 13 Sand Aquifer, or for that matter any modeled 14 aquifer, to move to the Payette Valley as measured 15 in the field." 16 And so I believe I just heard you 17 testify that it doesn't matter which way it flows, 18 if it goes there or not, but yet this is one of 19 the main points you identify for the benefits of 20 the model and previous insufficiencies of the 21 past. 22 So how do you explain that third 23 bullet sentence? 24 A. I believe what I said was for the 25 purposes of the sufficiency of water to be granted	Page 1230 1 least. 2 Q. But to the Payette River? What if you 3 had a no-flow boundary to the Payette River, would 4 it make a difference in your estimates of 5 drawdown? 6 A. Not especially, no. 7 Q. Some? 8 A. Hardly at all. We modeled that. Made 9 essentially zero difference. 10 Q. Zero difference? 11 A. Yeah, zero. 12 Q. Okay. 13 A. To my knowledge. You know, I'm not 14 the modeler on this project. But I know that we 15 modeled that, and there was not a significant 16 difference to cause us to change our conclusions 17 in any way. 18 Q. Okay. Okay. If you could in the 19 same -- well, Exhibit 45, going back to that. On 20 page 39 and 40, the bottom of 39 and 40. 21 A. Yes. 22 Q. On the staff memorandum it states that 23 "The staff asserts that the pumping in the PGSA at 24 M3 would cause a reduction in groundwater 25 discharge to the river of indeterminate magnitude

Page 1231 1 in unknown locations." And then in a partial 2 response to that in your report at the very bottom 3 of the page, the start of the last paragraph, it 4 goes on to state that "There has been no study of 5 the potential effect on the Boise River flows that 6 could occur by pumping that 6500 feet annually 7 from the PGSA for the M3 Eagle project. However, 8 because PGSA groundwater in the M3 vicinity is 9 tributary in part to the Payette River, we do not 10 anticipate measurable impacts to the Boise River 11 in reaches downgradient from the M3 site." 12 Do you agree with those statements? 13 A. Yes. 14 Q. Okay. So in this case here you're 15 stating, in large part, the PGSA in large part is 16 going to the Payette River. 17 How do you know that? 18 A. Well, I think we've shown, number one, 19 that the flow gradients show clearly that there is 20 a potential between the Boise River Valley and the 21 Payette Valley. We've also shown that there is a 22 physical drop between the two valleys, and we've 23 shown that there are permeable, traceable geologic 24 units between the two valleys. 25 So every line of evidence that we have	Page 1233 1 Q. Yeah. 2 A. I believe that to be true. 3 Q. So isn't it a matter of just 4 connecting dots from one place to another over 5 large distances where your data is gathered? 6 A. No, sir, it's not. 7 Q. So how do you really know that the 8 majority of the flow, as you state in your report, 9 in large part the water from the M3 Eagle vicinity 10 in the Pierce Gulch Sand Aquifer in large part is 11 going to the Payette River? 12 A. Well, I think what we're saying is 13 it's going to the Payette Basin, for starters. 14 Number two, I think it's based on several lines of 15 evidence. And I'll repeat those to you again. 16 Q. Okay. 17 A. As we measure wells in the area, 18 there's higher head in the Boise area and lower 19 head in the Payette area. This is true for 20 virtually all wells in the Payette Valley as 21 compared to the Boise Valley. 22 But we have shown both through 23 geophysical evidence and flow gradients that there 24 are permeable layers that exist between the two 25 valleys. And we've drawn them very graphically in
Page 1232 1 indicates that there would be flow to the Payette 2 Valley. And no line of evidence that we have 3 seen, discovered, or considered would suggest that 4 there's not. 5 Q. Enough line of reasoning for you to 6 say that in large part Pierce Gulch Sand Aquifer 7 is going to the Payette River? 8 A. I'm fine with that statement. 9 Q. Okay. Could you not find a well 10 somewhere out which is -- and I'll get to the 11 Treasure Valley Hydrologic Report, well pressure 12 heads and whether it's in the Marsing area or 13 Notus area that shows a flow gradient from Boise 14 River down there as well? Isn't it just 15 connecting dots? 16 A. From the Boise River to? 17 Q. From upper Boise River from the 18 piezometric heads and looking at data down in 19 Notus and Parma, could you draw a line that 20 direction? 21 A. You know, I can't answer that. I'd 22 have to look. 23 Q. Have you stated that water likely does 24 flow from the Boise River down to the Snake River? 25 A. You mean in the river itself?	Page 1234 1 cross-sectional diagrams. Dr. Wood has testified 2 to those. 3 So we have a conduit; we have a 4 gradient. There's no reason for us to believe 5 that it flows in another direction. 6 And as far as connecting the dots 7 goes, if you have a high head in the Boise Valley 8 in the vicinity of M3 and you have a low head in 9 the Payette Valley to the north and to the 10 northwest, groundwater -- there still exists a 11 gradient that goes in that direction. 12 Q. A gradient 100 percent for sure, or an 13 assumed gradient? 14 A. Well, there's a gradient 100 percent 15 for sure. There's no doubt about that. 16 Q. And is there also a gradient between 17 the M3 property and if you were to be down at 18 Notus? 19 A. Sure. We're in the upper valley and 20 that's in the lower valley, and groundwater flows 21 that direction. 22 Q. Downhill. Okay. 23 A. But I would clarify that we're not 24 saying that all the water that flows through the 25 Eagle/Star area flows to the Payette.

Page 1235 1 Q. Okay. 2 A. And I don't think the groundwater 3 contour maps show that either. I think they show 4 that there's flow in more than one direction. 5 Q. Okay. Okay. If we could go again on 6 Exhibit 45, page 14. 7 A. Yes, sir. 8 Q. Let's see here. So is the quote on 9 page 45 of 15, which is -- excuse me, page 14 in 10 conflict with a quote from pages 39 and 40, 11 question 3? I'll go back to 39 and 40. 12 MR. FEREDAY: I have an objection here in 13 that he has not identified which statement on 14 page 14 he's referring to. 15 THE HEARING OFFICER: Yeah, at least right 16 now I need to know, Mr. Squires needs to know what 17 statement on page 14 you're referring to, 18 Mr. Thornton. 19 MR. THORNTON: Okay. All right. I'll get 20 that. 21 Q. So on page 14, the third paragraph, 22 where it says "Said differently, even if the exact 23 direction of groundwater flow and/or the precise 24 locations of discharge far to the west of M3 site 25 have not been defined definitively, this does not	Page 1237 1 Okay? 2 So therefore, if we through our 3 pumping or anyone else through their pumping 4 was -- were to lower the heads in the Pierce Gulch 5 Sand Aquifer by some X number of feet, then the 6 gradient between the Pierce Gulch Sand Aquifer and 7 the overlying aquifers and the gravel aquifer and 8 ultimately to the river would then be somewhat 9 reduced. 10 So therefore there would be less of a 11 gradient, so there would be less flow across the 12 geologic section in general, and not just to the 13 Boise River. Think of it as a sheet underneath 14 the Boise River where the groundwater is coming up 15 everywhere. And it's ultimately feeding the river 16 gravel aquifer, and those are flowing to the Boise 17 River and moving off down as surface water. 18 Well, the amount that would get 19 changed in that gradient, the amount of pressure 20 change that would happen in that gradient caused 21 by the pumping at M3 would be immeasurable, in my 22 opinion, to the Boise River. You would not be 23 able to measure that impact. It would be beyond 24 the ability of us to measure it. That's what I 25 said.
Page 1236 1 mean there is insufficient groundwater in the PGSA 2 for the development of the 6500 feet." And then 3 so that statement and looking -- turning to 4 page 39 and 40. 5 A. Yes. 6 Q. And then on that page it says, "There 7 has been no study of the potential effect on the 8 Boise River flows that could occur by pumping some 9 6500 feet annually from the PGSA." And then, 10 "However, because the PGSA groundwater in the M3 11 Eagle vicinity is tributary in large part to the 12 Payette River, we do not anticipate measurable 13 impacts to the Boise River." 14 So the question is how do you know 15 there's not going to be an impact to the Boise 16 River? 17 A. Well, to the extent that we are 18 saying -- and perhaps the staff is saying, because 19 we have made the same statement ourselves -- that 20 there would be -- could be an impact to the Boise 21 River is because in the area of Eagle and Star, 22 there's an upward flow gradient. That means that 23 water is moving from the ground upward and into 24 the Boise River. That is documented by the fact 25 that the river is a gaining stream in that reach.	Page 1238 1 And furthermore, I think that the 2 impact would be very, very small. And I believe 3 that is why in the Department's, quote, or 4 so-called "200-foot rule" that wells that are 5 completed below 200 feet are exempt from 6 conjunctive management in the Boise River Valley. 7 And added to that, I think where this 8 goes, is that the cone of depression, the 9 collective cone of depression that will occur 10 around the future well field of the M3 project 11 will not only be lowering the gradient under the 12 Boise River to some small extent, but it will also 13 be lowering the gradient to the northwest and 14 under water that is already beyond the reach of 15 the Boise River and is flowing to another basin. 16 So it will be somewhat attenuated in that regard 17 as well. 18 Q. Okay. Thank you. 19 Mr. Squires, referring to your 20 testimony in this hearing on Friday afternoon of 21 April 24th, did you say "I don't believe it is 22 M3's responsibility to try and determine where the 23 recharge and discharge of this regional aquifer 24 is"? 25 A. I believe that's true.

Page 1239 1 Q. Okay. And then, Mr. Squires, would a 2 model that does not reflect the location of the 3 discharge and the recharge not have an 4 unreasonable level of uncertainty? 5 A. No, it does not. 6 Q. And would the -- 7 A. And I'd be glad to speak to that if 8 you'd like. 9 Q. Sorry. Yes. Go ahead. 10 A. The -- because there's a lot of 11 misconceptions here with respect to the M3 model 12 and areas of recharge and the areas of discharge. 13 As I said before, we've identified the 14 areas of discharge as being the Payette Basin, 15 downstream of Leatha for the most part, perhaps, 16 and the Snake River and the Boise River. That's 17 where the water that runs under M3 ultimately 18 discharges to. 19 Q. To those three areas? 20 A. Yes. 21 And as to the recharge area, our model 22 does not encompass the entire recharge area. The 23 recharge area has been well-known for many, many 24 years to be, in large part, above Capitol Bridge 25 in Boise. That is where we have decreasing	Page 1241 1 Aquifer extends quite a ways upgradient from there 2 in terms of miles. 3 So the statement that our model 4 does -- you know, has some kind of inconsistency 5 between areas of supposed recharge and areas of 6 supposed discharge just isn't true, but we have 7 modeled that point. And my colleague, Mark 8 Utting, will speak to this more succinctly today 9 because he's the project manager on that project. 10 But I know that we modeled the fact 11 that none of the effects of M3 pumping make it 12 back to the edge of our model boundary. So I 13 think I have a fairly good handle on where 14 recharge is happening. I just said I don't think 15 it's M3's responsibility to obtain what I consider 16 to be, you know, a modest water right application 17 to work out all the recharge mechanisms that are 18 in the Boise Valley 15 to 20 miles from their 19 site. It's never been done before. 20 And so the water entered through the 21 Terteling Springs formation. It has to go through 22 its own path through the Terteling Springs 23 formation before it even enters the Pierce Gulch 24 Sand Aquifer. So it's not a direct recharge -- 25 it's not a direct path all the way to the recharge
Page 1240 1 potential with depth where water from the Boise 2 River and all surface waters indeed is downward. 3 That means water flows from the surface downward. 4 This is well documented in wells, in 5 experiments, in modeling, and in piezometer nests. 6 There's no question that that happens. 7 During the summer months the 8 decreasing potential with depth area increases 9 further due to pumping where gradients are 10 reversed in the Boise Valley. 11 But the area where the -- where the 12 Boise is a losing reach above Capitol Bridge, the 13 Pierce Gulch Sand Aquifer doesn't exist up there. 14 It's entering into the Terteling sand facies of 15 the Terteling Springs formation at that location. 16 Our model, the headgates, if you will, 17 where the water enters our model, that is in the 18 Pierce Gulch Sand Aquifer. And if you extended 19 Cole Road north, which it doesn't go north, but if 20 you extended the line of Cole Road to the north 21 and all the way out to the north through the M3 22 property, where that line would cross the Boise 23 River, that is where the -- where the edge of our 24 model is. 25 But we know that the Pierce Gulch Sand	Page 1242 1 area. But from the area of our model, it is a 2 direct path. 3 So I hope that answers your question. 4 I think we have a pretty good idea on where the 5 recharge occurs. We've mentioned five or -- four 6 or five things in our reports of where we think it 7 occurs. 8 Q. And do you know how much water is 9 actually going through that reach? Dr. Spence 10 gave testimony last week that identified no one 11 really seems to know for sure where that water is 12 going in. So you seem -- this week you seem to 13 know where it goes for sure. 14 Can you tell me the amount of water 15 that's going in there? What information do you 16 have that shows the amount of water going in 17 there? 18 THE HEARING OFFICER: One question at a 19 time. 20 MR. THORNTON: I'm sorry. 21 THE WITNESS: If you're referring to how 22 much water is moving underneath the M3 site, which 23 we have evaluated on at least two occasions, and 24 in our very first report we speculated that there 25 was 30 -- I think 30 -- 20 to 30 mgd flowing

Page 1243 1 beneath a 5-mile swath of the Pierce Gulch Sand 2 Aquifer that underlies the M3 site. 3 Since that time, we have refined our 4 understanding of the boundary conditions, and we 5 believe that the swath of the aquifer that runs 6 under M3 to be smaller than 5 miles, somewhat just 7 less than 4 miles. 8 In our recalculations using the 9 gradients, which have also been refined through 10 our well measurements and our modeling efforts, we 11 now find that -- we now calculate that there's 12 somewhere on the order of 34 cfs flowing through 13 that smaller -- or 34 mgd flowing through that 14 swath that underlies M3. 15 Q. And -- 16 A. If you're asking how much water is 17 being recharged totally by the Boise River at all 18 locations, I don't know that. I haven't studied 19 that. 20 Q. And do you know -- in your expert 21 opinion, what are the mechanisms for recharge for 22 the Pierce Gulch Sand Aquifer? You gave testimony 23 to that last week, but just bring it back up 24 again. 25 A. Well, I think that there's no question	Page 1245 1 Q. It is. And beginning with towards 2 about two-thirds of the way down, the far 3 right-hand side. 4 THE HEARING OFFICER: Mr. Thornton, I'm 5 referring apparently to the wrong page. 6 MR. THORNTON: Okay. Page 2. 7 THE HEARING OFFICER: Of what? 8 MR. THORNTON: Of document 16A. It's the 9 M3 model. 10 MR. FEREDAY: Excuse me. It's not 16A. 11 It's Exhibit 16. 12 MR. THORNTON: Exhibit 16. Excuse me. 13 MR. LAWRENCE: And you're not referring to 14 the executive summary, are you? You're referring 15 to the main report? 16 MR. THORNTON: Yes, the No. 2. 17 THE HEARING OFFICER: Okay. I am on the 18 correct page then. I think you were referring to 19 paragraph 2? 20 MR. THORNTON: Yes. The second full 21 paragraph. 22 THE HEARING OFFICER: Okay. All right. 23 Q. (BY MR. THORNTON): And then 24 two-thirds of the way down to the far right, it 25 states that "The construction of the Treasure
Page 1244 1 that the recharge to the aquifers -- to the 2 aquifer, the alluvial aquifer, if you want to call 3 it that in the Boise Valley and to the Pierce 4 Gulch Sand Aquifer and to the Terteling Springs 5 Aquifer, the water comes from the Boise River 6 drainage. There's no other magic water that's 7 coming into this basin. It all originates with 8 the Boise River and its tributaries. 9 Q. Okay. 10 A. In the upper part of the basin that is 11 dominantly sand and there's a downward gradient, 12 the water flows into the aquifer in those 13 locations. 14 Q. And then if we could have you refer to 15 Exhibit 16, I believe it is, which is part of the 16 Treasure -- excuse me, which is -- yeah, 16 that 17 we were just on. Let me grab this here again. 18 And page 2 -- 19 A. Exhibit 16? 20 Q. Page 2, Exhibit 16. It may have been 21 called 16A. It's your model -- 22 A. Oh, okay. 23 Q. -- the M3 model. Yeah, page 2, 24 paragraph 2. 25 A. That's a big paragraph.	Page 1246 1 Valley Hydrologic Project model prohibited the 2 simulation of groundwater flow toward the Payette 3 River Valley through designation of the region 4 between the Boise Valley and the Payette River 5 Valley as a no-flow boundary. Because of its 6 regional focus, boundary conditions that force 7 groundwater to flow towards the southwest and the 8 nonincorporation of the Pierce Gulch Sand Aquifer, 9 it was not, and cannot now, be used to assess 10 groundwater development from beneath the north Ada 11 County foothills area." 12 So can you -- okay. So that seems to 13 imply that a model that does not allow flow to the 14 Payette River Valley is not correct for the M3 15 project; is that correct? 16 A. I would say that's correct. 17 Q. Okay. Can you explain how the 18 paragraph relates to your recent testimony that 19 seems to imply that location of recharge and 20 discharge are not important to the model? 21 A. What I am saying is that -- let me see 22 if I can explain this to you. 23 Q. Okay. 24 A. Consider -- assume for a moment that 25 we have a calibrated model of the entire Boise

Page 1247 1 Basin that goes from Barber Dam to the Snake 2 River, and assume that it is a calibrated model 3 that works and everybody trusts. And let's assume 4 that in the upper valley there is groundwater 5 moving through the Terteling Springs sands, as 6 I've suggested, large deltaic sand in the upper 7 part of the valley. Think of it in terms of the 8 Table Rock area where those sands are present very 9 close to the river. 10 And it flows into the aquifer system 11 there, and along some flow path, and ultimately 12 discharges to the Snake River and the Payette 13 River, for the sake of this assumption. And 14 everything works out and the heads are predictable 15 and they're represented by this model. 16 And then if you move downstream by 17 6 miles, say, or 7 miles, and you now chop off the 18 upper part of the model but you keep the flux 19 across the model the same at that location, well, 20 that's not going to change the model, because you 21 have the same flux across this area of the model. 22 So we draw -- let's say we draw a line 23 where I previously indicated where our model is at 24 the extension of North Cole Road, well, as long as 25 you keep the flux the same from the recharge area	Page 1249 1 We've gone out and measured water 2 levels ourselves. We've created monitoring wells 3 to measure water levels over time. We've surveyed 4 in the well sites to do the best job we can of 5 determining the groundwater flow gradient 6 underneath this area. 7 And now we've taken a width of the 8 aquifer, which is the last remaining part we need 9 to calculate what the flux is. And those are the 10 numbers that we come up with. 11 And I submit that the flux that we've 12 calculated, even under nonpumping conditions, is 13 so much greater than the water that M3 is seeking 14 to appropriate that the error bars there are -- 15 there's so much water available that I think it 16 goes without saying that there's sufficient water 17 for this project. 18 Q. So you just mentioned error bars. 19 Can you point to me in your M3 model, 20 Exhibit 16, where you have identified some 21 sensitivity analysis or some error bands on your 22 estimates? 23 A. Yeah, I will defer to my colleague, 24 Mark Utting, who will be testifying this 25 afternoon, who is far more familiar with this
Page 1248 1 to the discharge area, you can eliminate that part 2 of the model, and it's not going to change 3 anything downstream in the model. 4 And what I'm saying is that our model, 5 the M3 model, has its headgate, if you will -- 6 that's probably not the best term you could use, 7 but it has its input or recharge in the Pierce 8 Gulch Sand Aquifer at that location. It doesn't 9 mean that things aren't happening differently 10 above there. 11 The same is true on the lower. If you 12 have the model that discharges wherever it 13 discharges, to the Boise, to the Snake, to the 14 Payette River, but you draw your model boundary 5 15 miles upstream and you keep the flux the same, it 16 doesn't matter where it goes. 17 Q. Okay. And so how do you know what the 18 flux is? Where is your data for the flux? 19 A. Well, I know what the flux is 20 underneath the M3 site because we've measured it. 21 We've measured. We've exhaustively measured all 22 the transmissivities from all available tests that 23 are available. We've conducted tests of ourselves 24 to understand the transmissivity of the aquifer 25 itself.	Page 1250 1 model than I am. 2 Q. Okay. 3 A. And I can say that I know we have done 4 extensive sensitivity analysis. 5 Q. Okay. 6 A. And he will explain those to you. 7 Q. Okay. That's great. Thanks. 8 Back to Exhibit 45 on figure 2, about 9 maybe halfway through the document. It's titled 10 "Subsurface Seismic Reflection Profiles" from 11 Wood. 12 A. Yes. 13 Q. And could you refresh -- just because 14 it's been more than a week, can you refresh our 15 memories regarding the information presented here? 16 A. Well, I'll try to. It's not -- I 17 think Dr. Wood probably explained it better than I 18 could. 19 Q. Okay. 20 A. His interpretation of the deep-seated 21 faults located by the seismic reflection profiles 22 are that the -- that noticeable faults at depth do 23 not apparently extend upwards and break the 24 shallower sedimentary section. 25 And I think when I was listening to

Page 1251 1 that testimony, one thing that I would also add, 2 just to help you understand this conceptual model 3 or the way that this happened, is that there seems 4 to be a misunderstanding that we had a geologic 5 section, and all of a sudden it got faulted down X 6 number of feet all at once. 7 Well, that did not happen. That can't 8 happen. Our world would fall apart if that 9 happened. Okay? 10 What happened was small offsets over a 11 very, very long time period, like the -- for 12 instance, the Borah earthquake, 10 feet here, 13 10 feet there, earthquakes over time, gradually 14 this plain we call the Snake River Plain subsided. 15 Well, as that happened over a very, 16 very long period, obviously the most displacement 17 has to be in the deepest section, because the 18 other section didn't even exist at the time that 19 it was being faulted and displaced. 20 Now, there's no question in my mind 21 that -- because we know, and I've observed them 22 myself, that you can find small offsets on the 23 order of a foot or less, even in the modern and 24 ancestral floodplain terraces of the Boise River 25 Valley that might be 100,000 years old, 200,000	Page 1253 1 Q. Do you suppose the oil company that 2 made the profile was much interested in the 3 unconsolidated sediments above the main rock? 4 A. Well, as I recall, this is data that 5 was acquired from the oil companies. They were 6 probably not interested. But this is data, as I 7 recall Dr. Wood testifying, that was purchased by 8 the Department of Water Resources for reanalysis 9 by him, and that's what he did. These -- this is 10 the result of that analysis, not the oil field 11 analysis. 12 And the purpose of this was not an oil 13 field when it was reprocessed and acquired by 14 IDWR. And if you want a landmark, I think it was 15 somewhere in the '80s. 16 Q. Okay. And then for this 17 couple-decade-old seismic information aimed at 18 finding oil or gas in deep rock strata, is it 19 really suitable for interpretation of the 20 shallower sediments? Are you an expert in this 21 field? 22 A. No. 23 Q. In your opinion, is it appropriate to 24 use for the shallower sediments? 25 A. Apparently Dr. Wood and others have
Page 1252 1 years old. There's question that there can be 2 some measured amount of faulting that has come up 3 through the entire section. 4 But the idea that these deep-seated 5 offsets on these faults propagate up along a 6 single line and offset the upper section as much 7 as they offset the lower section is not true. 8 There's a lot more offset on the deeper section, 9 in the upper sedimentary section, there's a lot 10 more evidence of faulting in the older Terteling 11 Springs formation, and very little evidence of 12 faulting in the Pierce Gulch, that I've seen. 13 Q. Thanks. 14 And for this seismic profile testing, 15 when was that conducted? 16 A. I can't remember the date. 17 Q. A number of years ago? 18 A. Oh, a number of decades ago. 19 Q. 30, 40 years? Okay. 20 A. I honestly don't know. 21 Q. Okay. 22 A. It's probably described in... 23 Q. All right. And then -- so this was 24 taken by an oil company exploration? 25 A. Yes.	Page 1254 1 thought so, and they've presented the data in that 2 light. 3 Q. Okay. So if we can have you go on to 4 Exhibit 45 to figure 3, titled "Deep Well 5 Locations and Transect Lines for Hydrogeologic 6 Cross-sections." 7 A. Yes. 8 Q. Are the locations of those two seismic 9 lines shown on this -- are the locations of those 10 two seismic lines shown on this figure the ones 11 that we refer to in figure 2? 12 A. To my -- to my understanding, no. I 13 believe that this is a section out by Middleton, 14 but I -- I'm not sure. 15 Q. So they're not the Chevron seismic 16 lines shown in -- just where it says "Chevron line 17 1B-25"? 18 A. I can't answer that question. I don't 19 know. 20 Q. Okay. 21 A. I don't think so. 22 Q. Okay. I believe Dr. Wood testified 23 that these two lines were about 8 miles west of 24 the M3 property, the ones that are at least 25 showing here on the Chevron lines; is that true?

Page 1255 1 A. If that's what he said. 2 Q. Okay. Looking at the map, would you 3 say that they're about 8 miles on figure 3? 4 A. It looks pretty close. 5 Q. Okay. And can you tell me about how 6 far those two lines extend north of, say, 7 Highway 44? 8 A. Well, I'm not positive I can see 9 Highway 44 here. But if it is where I think it 10 is, and if you're referring to the Chevron line 11 IB-25 -- 12 Q. Right. 13 A. -- it looks like it could extend 3 1/2 14 miles north of Highway 44 -- 15 Q. Okay. 16 A. -- as I interpret Highway 44 to be on 17 this map. 18 Q. Okay. And my eyesight isn't so good 19 either. 20 So to me, that appears to leave maybe 21 another 10 to 12 miles of unexplored subsurface 22 between these two lines and the rim of the Payette 23 Valley; would you agree with that? So going north 24 of -- I'm trying to clarify the question. 25 Going north of the furthest extent of	Page 1257 1 our minds. I believe you talked to it quite a 2 bit, maybe in a general sense just so everybody 3 can be brought back up to speed, what is being 4 displayed in this figure 4. 5 A. Figure 4 of -- 6 Q. Of Exhibit 45. 7 A. Well, figure 4 is a cross-sectional 8 representation of the subsurface that is drawn by 9 correlations between geophysical logs, borehole 10 geophysical logs, at the location shown on 11 figure 3, the previous page, the map. 12 Q. Okay. And then can you identify the 13 horizontal scale for the resistivity information 14 on the Oroco Oil and Gas well and the El Paso 15 Natural Gas well? What is the scale? What is 16 that distance? 17 A. I'm afraid I don't understand your 18 question. You're referring to the scale of the 19 cross-section. It says right there, "Horizontal 20 distance not to the scale." 21 Q. Okay. And then do you know -- and 22 thank you. 23 Do you know the distance between those 24 two wells? 25 A. Well, I think you just stated, it
Page 1256 1 that Chevron seismic line, is that still another 2 10 or 12 miles just to the rim of the Payette 3 Valley that's been unexplored? 4 A. Unexplored by deep petroleum seismic 5 exploration, yes, that's true. 6 Q. Do we have any seismic data for that 7 area? 8 A. Not that I'm aware of. 9 Q. Okay. So still referring to this 10 figure 3, do you see the locations of the Oroco 11 O&G well and the El Paso Natural Gas well No. 1? 12 A. Yes. 13 Q. And I believe that Dr. Woods (sic) 14 testified that these two wells were about 18 miles 15 apart. 16 Do you agree with that? 17 A. It looks close to me. 18 Q. And Dr. Woods also testified that the 19 El Paso Natural Gas well No. 1 was about 12 miles 20 from the M3 property. 21 Do you agree with that? 22 A. It looks close. 23 Q. Okay. Going to figure 4 in Exhibit -- 24 the same exhibit. Will you please identify what 25 information is presented on this figure. Refresh	Page 1258 1 was -- wasn't it -- you said 17 or 18 miles. I 2 can't remember. 3 Q. Okay. All right. And then can you 4 explain why the resistivity signatures for the 5 Pierce Gulch Sand Aquifer and those two wells do 6 not seem to compare very well? 7 A. Well, I disagree. I think they 8 compare quite well. 9 Q. So would you say that the signature of 10 the resistivity in the El Paso Natural Gas well, 11 that that section that delineates the top of the 12 Pierce Gulch Sand Aquifer and the bottom of it is 13 similar to how that is extrapolated to the Oroco 14 well? You're saying that those two resistivity 15 sections are similar? 16 A. In my opinion, they are. I think 17 there's good correlation between those units. 18 Q. So from looking at it ocularly, you're 19 saying those two look similar? 20 A. In my opinion as a professional well 21 log analyst, yes. I've looked at a lot of 22 geophysical logs. And you may look at the darker 23 lines or the more oscillatory expression that you 24 see in the El Paso Natural Gas, but you must 25 remember that these things are taken by different

Page 1259 1 instruments and they're processed differently. 2 But overall, what Dr. Wood is trying 3 to show here is that you have the characteristic 4 signature of the pro delta slope, the bottom of 5 the Pierce Gulch Sand Aquifer, which is pretty 6 distinguishable in not only these wells, but in 7 numerous other wells across the basin and into 8 other basins. 9 And then when you also put this lower 10 signature of the -- what we're calling the 11 Terteling Springs Aquifer, it's a thin unit, down 12 beneath the Pierce Gulch Sand Aquifer and under a 13 thick mudstone unit, it's a good correlation. 14 Q. Okay. And then do you believe that 15 the -- what do you believe is the origin of the 16 Pierce Gulch sands at the Oroco O&G well? And 17 maybe I can clarify that question. 18 Is the Pierce Gulch sand at the Oroco 19 O&G well at that location from the Boise River or 20 likely from the Payette River? 21 A. Well, it's not really from a river. 22 It's from a very large lake that occupied this 23 area. And these sands were deposited in a big 24 delta along the shores of the lake. And then 25 numerous streams, rivers worked it after the lake	Page 1261 1 Q. What would you say? 2 A. I don't have a comment on it at this 3 time. 4 Q. Okay. Would you say that the Idaho 5 Batholith from where these two rivers flow from 6 greatly precedes the filling of the lake with 7 sediments? 8 A. I would say that's definitely true. 9 Q. Okay. So would you say that there's a 10 large likelihood that the Pierce Gulch sands that 11 are downstream in the Emmett area or downstream 12 are from the Payette River? 13 A. I can't understand your logic. If you 14 mean they're from the Idaho Batholith, yes. 15 Q. Are they worth -- because the deltas 16 were formed by rivers; correct? 17 A. Correct. 18 Q. Did the Payette River likely flow 19 through the Emmett Valley as the lake was filling 20 up? 21 A. I -- I don't -- I can't answer that. 22 I don't know that. 23 Q. Okay. 24 THE HEARING OFFICER: Mr. Thornton, why 25 don't we take a break right now. Our morning
Page 1260 1 drained, began to work it out in a sheet across 2 the valley. But everywhere that the lake was, as 3 the lake drained, these sediments were getting 4 worked across the now exposed lakebed. 5 Q. And is not two of the major 6 tributaries to Lake Idaho in the Emmett area at 7 the Oroco well, the Payette River and the Boise 8 River? Are those two of the major ones? 9 A. I don't know what rivers were present 10 and occupying at the time that this happened. 11 Q. So do you know the age of the Idaho 12 Batholith from which the Payette River and the 13 Boise River largely flow from? Being a geologist 14 in the area, what's the age of the Idaho 15 Batholith? 16 A. It's cretaceous. 17 Q. And in years for the layman, that is 18 how many millions? 19 A. It varies. There's many lobes of the 20 Idaho Batholith. But we can just say that it's 21 extremely old. 22 Q. And the Atlanta lobe portion of that 23 is somewhere probably in the 40 to 60 million year 24 range, would you say? 25 A. No.	Page 1262 1 break. 15 minutes. 2 MR. THORNTON: Okay. Yeah, that's fine. 3 Thanks. 4 THE HEARING OFFICER: Be back at 10:15. 5 (Recess.) 6 THE HEARING OFFICER: We're recording 7 again. 8 Mr. Thornton, questions? 9 MR. THORNTON: Okay. 10 Q. Mr. Squires, again on Exhibit 45. 11 A. Yes. 12 Q. I'm going to ask you some questions in 13 terms of the scales that are on -- represented by 14 figures 3 and 4 to help me understand what appears 15 to be some discrepancies. 16 And on figure 3 we talked earlier that 17 the location between the Oroco well and the 18 El Paso Natural Gas well was about 18 miles apart. 19 I think you agreed with that on figure 3. 20 A. If you say so, and you want to get me 21 a scale. It's looks okay. 22 Q. We can give you a ruler, if you'd 23 like. 24 Can you get him that ruler? 25 If you'd like to use this or not.

Page 1263 1 A. It's somewhere between 18 and 20, it 2 looks like. 3 Q. Okay. And then on figure 4 -- and 4 you'll see that figure 4 has a horizontal distance 5 scale on the upper plot in figure 4 there. 6 And then on that one, what is the 7 scale between the Oroco well and the El Paso 8 Natural Gas well? 9 A. Well, it looks like it's about -- it 10 looks like it's about right. 11 Q. About 23 miles, is what we got. Is 12 that correct, or not? Not to try to shoot out too 13 many questions, on figure 3 we scaled it as about 14 18 miles, and on figure 4 we scaled it as about 15 23 miles. 16 THE HEARING OFFICER: I'm not sure he 17 scaled that yet. Do you want to give him an 18 opportunity? 19 MR. THORNTON: Okay. 20 THE WITNESS: It looks to me like it's 21 somewhere -- going by these township/range 22 registry marks on this map, it looks like it's 6, 23 12 -- 17 miles on the figure 3. And I would say 24 that it's a little over 2 inches, so 2- -- I'm in 25 agreement with the 23 and 17, 18.	Page 1265 1 Q. Okay. So, Mr. Squires, is it standard 2 practice in the science of hydrogeology to 3 extrapolate subsurface data over such large 4 distances with any degree of certainty? 5 A. Well, sure it is, if you can. 6 Q. Can you in this case? 7 A. Yes. 8 Q. And what data do you have between 9 those two points to help connect the dots, between 10 those 17 to 20 miles? 11 A. Well, we don't -- we have our 12 understanding of how stratigraphy works and how 13 depositional systems work, and we see the aerial 14 extensive signature over a much larger scale. In 15 other words, there's no reason to think that 16 something's different. 17 Q. And so as a licensed professional 18 geologist in the state of Idaho, are you 19 comfortable, then, with the assumption that the 20 Pierce Gulch Sand Aquifer extends with no 21 discontinuities over some 17 to 20-some miles of 22 unconfirmed, unknown subsurface information to the 23 Payette River Basin? 24 MR. FEREDAY: Objection. I don't think 25 that that fairly represents the facts in evidence.
Page 1264 1 Q. (BY MR. THORNTON): Okay. I think 2 would you agree that that -- that that is, as 3 depicted on figure 4, while you have the 4 resistivity cross-sections for those wells, while 5 in appearance on that figure they may look close, 6 are they in fact many miles apart, between the 7 Oroco well and the El Paso Natural Gas Company 8 well? 9 A. Well, if you're referring to the lower 10 figure where it says "Horizontal distance not to 11 scale," the idea there was to try to shorten it up 12 so that you could fit it on one page. 13 Q. Correct, yeah. Would you agree that 14 there -- those two wells are somewhere between 18 15 and -- 17 and 20-some miles apart? 16 A. I would -- I would say that's true. 17 Q. Okay. 18 A. I would probably go -- you know, I'm 19 just not sure how accurately these are plotted on 20 the map. 21 Q. Okay. 22 A. Because they were taken from a larger 23 map. 24 Q. Okay. 25 A. But it's somewhere in that range.	Page 1266 1 THE HEARING OFFICER: Sustained. 2 Mr. Thornton, the characterization as unconfirmed, 3 and I think there's one other term in there, I 4 think that does mischaracterize what Mr. Squires 5 has said. 6 MR. THORNTON: Okay. 7 Q. So in your professional opinion, do 8 you have an opinion on what is between those large 9 distances, 17 to 20-some miles, but no real data; 10 is that correct? 11 A. That's correct. 12 Q. Okay. And then if you could refer to 13 Exhibit No. 68. And that is a paper by Dr. Woods 14 titled "Hydrogeologic Framework in the Boise 15 Valley of Southwest Idaho." 16 MR. FEREDAY: Excuse me, Mr. Hearing 17 Officer. Just for the record, it's Dr. Wood. 18 MR. THORNTON: Dr. Wood. Thank you. 19 MR. FEREDAY: With no "s." 20 MR. THORNTON: Thank you for that. I 21 appreciate that. 22 MR. ALAN SMITH: Exhibit 68. 23 MR. THORNTON: Exhibit -- Exhibit 68 is one 24 of the documents that was provided by IDWR staff. 25 Q. And if you go to page 7 when you have

Page 1267 1 a chance to get to that. 2 A. You know, I don't seem to have an 3 Exhibit 68. I go from 65 to 101, unless it's -- 4 MR. LAWRENCE: I believe it's loose from 5 the witness exhibits, not contained in a binder. 6 THE HEARING OFFICER: Perhaps it's still 7 here. It's right here. 8 I've given Mr. Squires what's been 9 marked, I think received into evidence as that, 10 Exhibit No. 68. 11 THE WITNESS: Do you have one, Mr. Hearing 12 Officer? 13 THE HEARING OFFICER: I don't. 14 THE WITNESS: Because if you don't, I'm 15 very familiar with this document, now that I see 16 what it is. You're welcome to use this one. 17 THE HEARING OFFICER: I do not have a copy. 18 But if you want him to refer specifically, that's 19 fine. 20 THE WITNESS: I know the document, unless 21 it's necessary. 22 Q. (BY MR. THORNTON): Okay. I'll just 23 read one -- 24 THE HEARING OFFICER: I'll look over your 25 shoulder.	Page 1269 1 is that if you don't know what the physical facies 2 or the physical depositional environment of a unit 3 is, you must be very careful about correlating it 4 over long distances. And the reason he refers to 5 along strike is because we know that when we're 6 correlating these deep sections where the dip of 7 the strata can be 640 feet a mile, we don't drill 8 very many things that deep. 9 We're mainly concerned with the upper 10 thousand feet for water supply, because we reach 11 warm temperatures below a thousand feet. So if 12 you have two wells that are along strike and the 13 dip is, say, 600 feet a mile, you can never reach 14 the same strata down the dip of the aquifer 15 because it's below it, because we're not drilling 16 1200-foot deep wells. 17 But in the case here of M3, which I 18 believe is what you're asking about, we know what 19 the facies is. That's the whole purpose in this 20 exercise, that we've identified this delta in this 21 Pierce Gulch Sand Aquifer. That's the facies of 22 which we're talking about. We know what that 23 facies is. That's what we're correlating in these 24 well logs. 25 And we have -- we're very, very
Page 1268 1 THE WITNESS: Okay. 2 Q. (BY MR. THORNTON): So we've got that 3 68. And then on page 7, in the top left-hand 4 side, Dr. Woods -- I'm sorry -- 5 MR. FEREDAY: Dr. Wood. 6 MR. THORNTON: Dr. Wood. 7 THE WITNESS: I'm there. 8 Q. (BY MR. THORNTON): In that upper 9 left-hand side, Dr. Wood identifies and states, 10 "One should view with distrust cross-sections 11 attempting to correlate over distances of several 12 miles unless the section is along a strike -- or 13 is along strike and a sedimentary facies is 14 identified." 15 How do you interpret what Dr. Woods is 16 stating? 17 A. Well, I can't speak to what Dr. Wood 18 is thinking. But I can tell you that this 19 document -- I'm familiar with this document. I 20 know what it was prepared for. It was originally 21 prepared for a short course that I put on here in 22 the valley. And I believe I can interpret what 23 that means. 24 Q. And your interpretation is what? 25 A. Well, what Dr. Wood is trying to say	Page 1270 1 fortunate in this basin to have the benefit of oil 2 well drilling, petroleum industry drilling that 3 went to great depths to where we can see this 4 signature over very long distances. 5 So in my opinion, what Dr. Wood was 6 referring to was when you don't know what the 7 facies is and you're going down dip where the 8 wells can't follow. But both those requirements 9 are met in the data that he presented as part of 10 our report. 11 We know what the facies is. We can 12 correlate it along strike. We know what the 13 depositional system is. And we have these rather 14 deep wells. Some of them are 14,000 feet deep 15 where we can trace the aquifer in the 16 characteristic geophysical signature across great 17 distances. 18 Q. So I'm confused because I thought I 19 heard you say just a little while ago that you had 20 no real data between those two wells, and you're 21 extrapolating your opinion, but no data. Now I 22 think I hear you saying you have data. 23 What? 24 A. I haven't said that there's any more 25 data. I'm just saying that we do have data. We

Page 1271 1 have data that exists in the wells. If you're 2 saying is there a deep well between the two 3 petroleum wells over that 18-mile distance, no, we 4 don't have any wells out there. 5 Q. Okay. And the -- 6 A. But I suggest if you did drill a well 7 out there you'd find the same signature and the 8 same characteristic geophysical representation of 9 the Pierce Gulch Sand Aquifer and the underlying 10 Terteling Springs formation. 11 Q. In the Payette River system above 12 Emmett, I believe you stated that the Pierce Gulch 13 Sand Aquifer was partially formed where the deltas 14 formed by the Payette River; is that correct? 15 A. I never said that the Pierce Gulch 16 Sand Aquifer or anything about it being above 17 Emmett. I think I heard Dr. Wood say in his 18 geologic mapping he mapped some in the foothills 19 at the VanDusen Ranch, which is north of Emmett. 20 But I don't have any knowledge myself of the 21 Pierce Gulch sand extending in the Emmett area. 22 And I have not postulated that there's any flow 23 through the Pierce Gulch Sand Aquifer to Emmett, 24 ever. 25 Q. Okay. Is there Pierce Gulch sand in	Page 1273 1 MR. THORNTON: Okay. 2 THE HEARING OFFICER: And I think 3 Mr. Squires has consistently said he doesn't know 4 what river systems were in existence at the time. 5 MR. THORNTON: Okay. 6 THE HEARING OFFICER: I think we've covered 7 that particular subject. 8 MR. THORNTON: Okay. 9 MS. PADILLA: Gary, I'm getting beeping. 10 THE HEARING OFFICER: Okay. Let's change 11 tapes. 12 We're recording again. Sorry for the 13 interruption. 14 Q. (BY MR. THORNTON): And if we could 15 refer to -- we had it listed as Exhibit 209, and 16 it's the Treasure Valley Hydrologic Project. 17 And perhaps you have a -- 18 MR. FEREDAY: Exhibit 33. 19 MR. THORNTON: Exhibit 33. 20 Q. It's a very large document. And I'm 21 not sure how they're tabbed. I'd like to refer to 22 one section that is titled "The Geochemistry and 23 Isotope Study." And it is a good probably halfway 24 through that document. 25 MR. FEREDAY: I believe that's Exhibit 33G.
Page 1272 1 Emmett? 2 A. Not to my knowledge. 3 Q. Is there a Pierce Gulch Sand Aquifer 4 going to Emmett? 5 A. Not to my knowledge. 6 Q. To the Payette River? 7 A. To the Payette Basin. 8 Q. Downriver from Emmett, perhaps? 9 A. Downriver from Emmett. 10 Q. And how far downriver? 11 A. Well, it -- I don't know exactly. 12 Some distance above Leatha. 13 Q. And is Leatha about 8 miles 14 downgradient from Emmett, approximately? 15 A. Approximately. 16 Q. Is it, in your opinion, that the 17 Payette River formed a delta similar to the Boise 18 River in terms of protruding into Lake Idaho? 19 MR. FEREDAY: Objection. Asked and 20 answered. 21 THE HEARING OFFICER: Sustained. I think, 22 Mr. Thornton, we've spent a lot of time 23 questioning Mr. Squires about what river systems 24 may have formed the deltas and deposited the 25 sands.	Page 1274 1 MR. THORNTON: 33G? Thanks. 2 And, Mr. Hearing Officer, I want to 3 make sure that -- I believe, but I could be 4 incorrect, that this is an exhibit that's already 5 been introduced and accepted. 6 MR. FEREDAY: Yeah. 7 MR. THORNTON: I see Mr. Fereday saying 8 yes. Thanks. 9 THE HEARING OFFICER: Yes. 10 MR. THORNTON: Did you have a chance, 11 everybody, to get to the geochemistry and isotope 12 study? 13 THE HEARING OFFICER: I'm there, 14 Mr. Thornton. 15 MR. THORNTON: Okay. 16 Q. And then on -- more in the executive 17 summary on small Roman numeral iv, the second 18 paragraph, if you will, first bullet on that page, 19 and the two sentences state, "Contemporary seepage 20 from rivers and/or irrigation diversions is not 21 the primary source of recharge for most deep -- 22 for most deeper, regional aquifers. Paleo-river 23 channels, fractured granite aquifers in the Idaho 24 Batholith and tributary sedimentary aquifers are 25 the most likely sources to recharge to the

Page 1275 1 regional flow system." 2 The question I have is, how does this 3 statement here reconcile with your identification 4 of the source of recharge for the Pierce Gulch? 5 A. It's the second-to-the-last bullet 6 that you're referring to? 7 Q. Yeah, it's on small Roman numeral 8 page iv, starts with "Contemporary seepage from 9 rivers and/or irrigation diversions." 10 A. Okay. Well, Mr. Thornton, I would 11 point out that we have an expert today that's 12 going to talk about geochemistry. But I'll answer 13 your question in a general sense. 14 Q. Okay. 15 A. I think it compares very well with our 16 conceptual model. I -- it says, "Contemporary 17 seepage from rivers and/or irrigation diversion is 18 not the primary source of recharge." And I'm 19 interpreting that to say when we draw water out of 20 the well at M3 or down-valley, we know, as I've 21 stated before, that the water is all coming from 22 the Boise River. Okay? 23 So right now, as we speak, there's 24 water leaking out of the Boise River into the 25 aquifer system. Present day, modern, contemporary	Page 1277 1 of like if you -- if you are -- if your wife is 2 irrigating the peas at the bottom of the garden 3 you got a 100-foot hose and she wants you to turn 4 on the water and you turn on the water, well, 5 there's fresh water at the spigot where you are, 6 but the water down where she is has been in the 7 hose awhile. So it's going to take awhile for 8 that modern water to get through. 9 Q. And you identified that it is 10 ancestral water. 11 And do you have -- we went through 12 this a couple weeks ago. But do you have a 13 relative time period in terms of tens, hundreds, 14 thousands, tens of thousands of years? 15 A. Well, I can -- I can leave that for 16 our -- we have a very qualified geochemist here 17 that will -- 18 Q. Okay. 19 A. -- that will attest to that. I think 20 that's better. I think he'll do a better job than 21 I will at describing that. 22 Q. Okay. 23 A. But I will say that I think we have a 24 pretty good handle on it. 25 MR. THORNTON: Okay. All right. I think
Page 1276 1 seepage is seeping into the aquifer today. 2 When we draw that out 15 miles or 3 whatever downgradient, we're drawing out water 4 that's been in the system a lot longer. Okay? 5 And I think -- what I'm interpreting this to say 6 is that -- as we have said, is -- it comes back to 7 this idea that the water that we're drawing out in 8 the M3 and in the other wells that were tested as 9 part of the Treasure Valley Hydrologic Project is 10 ancestral water. It's water that was recharged 11 before development, before there was an irrigation 12 component. 13 And I think that's what this is 14 saying. It's not -- it's not the irrigation 15 diversions. Now, are irrigation diversions 16 providing recharge today to the upper part of the 17 system? Sure. But the water that we're drawing 18 out down at the bottom of the system or somewhere 19 in the flow path has no indications of irrigation 20 or flow through soils or applied water. It has no 21 indication of that whatsoever. It only shows that 22 it's derived from the Boise River. But it's had a 23 residence time in the aquifer. 24 So what we're drawing out shows no 25 indication that it's modern-day water. It's kind	Page 1278 1 we're getting close to finishing. 2 THE HEARING OFFICER: Okay. 3 MR. THORNTON: If I can have about 30 4 seconds here. 5 THE WITNESS: And I believe Mr. Glanzman is 6 up right after me so you'll get that question 7 answered. 8 MR. THORNTON: Good. He's prepping for it 9 right now. 10 Q. Okay. So, Mr. Squires, in your 11 testimony today, it seems to indicate that whether 12 or not the PGSA discharged flows to the Payette 13 River is not important to your model, is that 14 true, it's not necessarily important? I believe I 15 heard you say that. 16 A. It's not important to the numerical 17 model that we've created with respect to the water 18 right application for M3 Eagle. 19 Q. Okay. And then why then have your 20 documents, M3's documents, Hydro Logic documents, 21 spent so much effort to show that some of the flow 22 does go to the Payette River? 23 A. Well, I wouldn't say that we've made a 24 concerted effort in any way to say that it flows 25 to the Payette. Our investigations and our

Page 1279 1 research tell us that it does. And that's kind of 2 a new finding. So we're -- we're putting that out 3 there. 4 But you must realize that there seems 5 to be an understanding here that all of the work 6 that we've done has to do -- I mean we're 7 characterizing the aquifer system. That's what 8 we're doing. We're putting out research on the 9 aquifer system and how it behaves. 10 But as I've said before, I don't think 11 the fact that the water -- and as you've heard 12 staff testify, Mr. Vincent's testimony, I don't 13 think it really has a bearing on this case whether 14 the water gets past M3 and it's past M3 by several 15 miles, and then ends up flowing to the Payette 16 River. 17 I think it does have implications to 18 our overall understanding of the flow systems, the 19 recharge and the amount of recharge in the 20 aquifer. Because if there is a significant amount 21 of discharge that's moving off to the Payette 22 River Valley, which I believe there is, just as 23 there's a very significant amount of discharge 24 that's moving off to the Snake River Valley south 25 of the New York Canal, then we need to account for	Page 1281 1 both around 2700 square miles? 2 A. Do I? I don't know. 3 Q. Could you describe on this figure what 4 your conceptual idea would be of the formation of 5 these delta deposits on the Boise River we've 6 talked about a lot, but where did the delta 7 formations from the Payette River, especially as 8 the lake was full and then it started slowly going 9 down, where did they merge? 10 MR. FEREDAY: Objection. Asked and 11 answered. 12 THE HEARING OFFICER: I'll overrule the 13 objection. This is a different question than I've 14 heard. Let's see if Mr. Squires knows. 15 THE WITNESS: Sure. Well, we know, to the 16 best of our current knowledge, that the high-stand 17 of Lake Idaho is marked by a series of oolites, 18 that's a near-shore facies, a rock type that's 19 caused by sand grains and other things rolling 20 around in the water and picking up concretions. 21 And it's a very diagnostic and very recognizable 22 rock type or facies. 23 And it is apparent, as Dr. Wood 24 testified in layman's terms, as a bathtub ring 25 around the high-stand of the lake. And we
Page 1280 1 that, because I think the recharge estimates that 2 we've been working off are too low. I think 3 there's a lot more recharge than we've previously 4 thought, because that water has been unaccounted 5 for in all of the previous models with the -- 6 well, at least in the TVHP model. The Douglas 7 U of I model showed flow to the Payette. 8 Q. All right. I think the last question 9 that I will have for you, Mr. Squires, for now is 10 again going to Exhibit 68, the one by Dr. Wood. 11 A. Okay. Yes. 12 Q. And then on figure 1, which is on 13 page 2 of the document. 14 A. Yes. 15 Q. And then can you see the 16 representation of where the Boise River comes 17 across the ancient Lake Idaho as well as the 18 Payette River cutting across the ancient Lake 19 Idaho? Can you see the line for the river? 20 A. I can see the lines of the two rivers. 21 Q. Of the present-day river? 22 A. Yes. 23 Q. Okay. Would you agree that the 24 average basin size of the Payette River at Black 25 Canyon compared to Barber Dam are approximately	Page 1282 1 generally see that at elevations 3600 to 3800 feet 2 around the valley. And of course, the lake 3 levels, even though we have different basins and 4 different base levels for the modern-day rivers, 5 the lake, of course, is a constant elevation. 6 So we see oolite deposits that mark 7 the top of the lake in the Boise Basin, and we see 8 oolite deposits that mark the top of the lake in 9 the Payette Basin. And they're very visible over 10 there at the top of the sand facies of the 11 Terteling Springs formation. 12 And the reason that they're there, if 13 I can refer back to the bathtub ring analogy where 14 the lake is full, it's at its high-stand, and 15 these oolites are forming, and as all the rivers 16 and all the tributaries and drainages go into the 17 lake, they can no longer carry their sand that's 18 being eroded from the Idaho Batholith because they 19 now don't have any motion. They're flowing into 20 the lake so the stuff drops out. That's what 21 forms the delta deposits and the thick sand 22 deposits all the way around the edge. 23 But we've also shown that in Lake 24 Idaho the transition to fine-grained sediments can 25 be pretty abrupt in some cases, to where you get

Page 1283 1 into clays and mudstone rather quickly. 2 So if you can imagine the shore of 3 ancient Lake Idaho as going through the Boise 4 Valley and over into what's now the Payette 5 Valley, you have the same type of depositional 6 system all the way across the foothills from 7 Boise -- maybe you can think about it as though, 8 you know, it's another arm of the lake over there. 9 As the lake drained, there were large 10 river systems. There was a large river out in the 11 area of Highland Valley Summit that's kind of the 12 tip of the -- of what we call the Boise Fan 13 Aquifer. And there were undoubtedly other rivers 14 coming in all along the north part of the plain -- 15 of the lake. 16 Same on the south side, there were 17 rivers entering from the south side of the lake, 18 all around the lake, whatever the drainage areas 19 were, there were rivers. Whether it was called -- 20 you know, obviously, it wasn't called the Payette 21 River. Or what its course was at that time, I 22 don't know. But there were a number of rivers 23 entering into the lake. 24 And the conceptual model is that as 25 the lake now drained, you have drainages, small	Page 1285 1 down, the really clean, doubly reworked sand, now 2 you have more sediment coming in eroding off the 3 Idaho Batholith. And now that sediment was 4 getting broadcast across. 5 And as Spence Wood indicated, you have 6 these delta lobes that are forming that are 7 switching. It's like a -- you've got a river 8 that's coming down through the sediments, and you 9 have a flood event and it spills over, and now 10 it's depositing a lobe over here. And it's just 11 switching back and forth. But they're still all 12 connected hydraulically. 13 And that is the concept that I have of 14 how these things came about. 15 Q. (BY MR. THORNTON): So if you will 16 refer to figure 1 on 45, Exhibit 45. It's a 17 regional map on the wells. 18 A. Yes. 19 Q. Also, would you agree that it gives a 20 relatively accurate spatial location of the 21 Payette River as well as the Boise River as they 22 come out of the Idaho -- well, at least the Boise 23 River -- coming out of the Idaho Batholith, and 24 then they have some basalt flows at the mouth or 25 the throats of those canyons? Would you agree
Page 1284 1 and large, that are now coursing down and cutting 2 down through this delta, this thick deposit of 3 deltaic sediment that's along the shore. And it's 4 now able to move it farther out into the basin. 5 And so you start out with this already 6 worked delta deposit that's worked by fluvial 7 currents and waves, et cetera, that's already been 8 cleaned up. And the fine materials have been 9 moved out farther out into the lake. That's what 10 deposited into the mud that's out in the deep part 11 of the lake. Okay? 12 But now you've got these fluvial 13 streams that are pushing this and they're flooding 14 and they're pushing the sand out over the now dry 15 lakebed as the lake declines. 16 Then, as I said, at first you've got 17 sand that's already worked. And this 18 characterizes the Pierce Gulch sand up in the 19 vicinity of M3 because it's near to the mountain 20 front, it's near to the basin margin. So now it's 21 getting worked again by these rivers. So it's a 22 very, very permeable sand. 23 And then as the lake continues to 24 drain and the rivers are now in size through these 25 deposits, the delta deposit, it's already laid	Page 1286 1 that's relatively -- 2 A. I would say that's not shown here at 3 all. 4 Q. Okay. Can you see Black Canyon 5 Reservoir on the Payette River? 6 A. Yes. 7 Q. Okay. And I believe you can't quite 8 see Barber Dam on the Boise River there, it looks 9 like. 10 The question I have is -- 11 A. Barber Dam is miles upstream. 12 Q. Okay. 13 A. 15 or more miles upstream. 14 Q. Okay. Good. Good point. What I'm 15 trying to understand, and I believe I heard you 16 say, that this -- these deltas into the lake, they 17 were reworked with fluvial processes as the lakes 18 receded; correct? 19 A. Yes. 20 Q. Do you have knowledge as to the 21 contemporary thoughts of how quickly Lake Idaho 22 receded? 23 A. No. 24 Q. Maybe we can refer to document No. 68, 25 again from Dr. Wood. And on page 7, Dr. Wood

Page 1287 1 cites the work of Schumm and Etheridge, 1994, in 2 terms of lowering of the lake, the bottom 3 left-hand side of 7. And it states that "The 4 average lowering of the lake was likely 5 15 centimeters every thousand years seems 6 reasonable," according to Dr. -- 7 A. I don't think that's what that says. 8 I think what that says is that the research by 9 Schumm and Etheridge for a lot of major rivers, 10 not this river, not this valley, that their 11 research of valley incision into bedrock and major 12 rivers is what you stated. 13 Q. Okay. Based on Dr. Wood's paper where 14 he's talking about the lowering of the lake level 15 when it is theorized to go over into Hells Canyon, 16 was that geologic time period; would you agree 17 with that? 18 A. Yes. 19 Q. Okay. So with that in mind, if we can 20 go back to figure 1 on Exhibit 45. 21 A. Yes. 22 Q. Where do you theorize the main delta 23 from the Boise River and the main delta from the 24 Payette River, did they meet, did they not meet, 25 where did they meet between them -- being 20,	Page 1289 1 A. I commented on Dr. Wood's comments. 2 Q. Do you have any certainty -- how do 3 you then have certainty that the Pierce Gulch sand 4 from the Boise River is connected at the Leatha 5 area? 6 MR. FEREDAY: Objection. Asked and 7 answered. 8 THE HEARING OFFICER: Well, I'll let that 9 one stand. Overruled. 10 THE WITNESS: Well, it is because, as I 11 stated in the beginning, I've worked on hundreds 12 of wells in this area, and I've run my own 13 geophysical logs in those hundreds of wells, and 14 I've been fortunate enough to have as mentors 15 people like Dr. Wood and Will Burnham, who studied 16 this for decades before I came along. 17 And what I see in my research is that 18 we've been able to take the sands that we see in 19 the outcrops of the Boise foothills and foothills 20 around them, and we've been able to develop a 21 signature for that in geophysical logs, and we've 22 been able to follow that geologic stratification 23 in that stratigraphic section into the subsurface 24 where obviously you can't see it. You can't 25 observe it, only through drill cuttings, which are
Page 1288 1 30 miles apart? 2 MR. FEREDAY: Objection. Asked and 3 answered. 4 THE HEARING OFFICER: Sustained. 5 MR. THORNTON: All right. 6 Q. Where would you theorize the two major 7 deltas met -- 8 MR. FEREDAY: Objection. 9 Q. (BY MR. THORNTON): -- on this -- 10 THE HEARING OFFICER: Sustained. 11 MR. THORNTON: I don't understand. 12 THE HEARING OFFICER: Well, the reason I'm 13 sustaining is because, again, my understanding of 14 Mr. Squires' testimony and other testimonies, we 15 don't have any idea what river systems existed in 16 the time, whether there were two deltas or 17 multiple deltas existing. 18 And so the reference is -- asks a 19 question that I think has been asked and answered. 20 And I don't think Mr. Squires has further 21 testimony, or I don't want to elicit it from him 22 at this point. 23 MR. THORNTON: Okay. 24 Q. You have talked about the delta lobes 25 coming into Lake Idaho; correct?	Page 1290 1 not real representative. I mean they're not like 2 looking at the sand cliff that you looked at the 3 other day. But we've correlated that several of 4 these major litho-stratigraphic units have a 5 characteristic signature on geophysical logs that 6 we have then been able to trace as they dip down 7 below surface and go into the subsurface basin 8 beneath us. 9 And everywhere that I've worked, I 10 can -- well, not everywhere. But everywhere where 11 I would expect to find that characteristic 12 signature and where I've been able to work and 13 where I've been able to obtain geophysical logs, I 14 find that signature. It doesn't mean I've worked 15 everywhere. But everywhere I've looked, I can 16 find -- find it -- where I expect to find it. 17 And the deep petroleum exploration 18 wells that were drilled out we're going to say 19 around the 1980s, we obtained those records, and 20 those show the same characteristic signature. And 21 they show that that same unmistakable 22 characteristic signature is not only present in 23 the wells that -- the shallow wells, relatively 24 shallow along the lake margin, but it also shows 25 that you can trace that same signature across the

Page 1291 1 Payette Valley. You can trace it down to the 2 south to around Lake Lowell. You can trace it to 3 the Snake River, and even beyond the Snake River 4 over into the -- beyond Ontario, Oregon. And 5 that's what the cross-sections drawn and submitted 6 by Dr. Wood show, that it does indeed extend over 7 there. 8 Q. And do you know with certainty that -- 9 in the lake environment, Lake Idaho as it was 10 receding, that you could tell with certainty the 11 difference between Pierce Gulch sand that came 12 from the Boise River system versus the Payette 13 River system? 14 MR. FEREDAY: Objection. 15 THE HEARING OFFICER: Sustained. 16 MR. THORNTON: All right. I would say I'm 17 done questioning. I don't know how to re-ask that 18 question, so... 19 THE HEARING OFFICER: Okay. Should we just 20 take ten minutes again and get up and walk around, 21 five or ten minutes just to stretch? 22 THE WITNESS: That sounds great. 23 THE HEARING OFFICER: Yes, I think that's 24 helpful to keep our focus. 25 (Recess.)	Page 1293 1 that I disagree with. 2 Q. Okay. You don't think the 18 foot of 3 seal is adequate? 4 A. No. 5 Q. What, in your opinion, would be proper 6 sealing methods? 7 A. Well, I believe that a well should be 8 sealed to full depth, from the land surface to the 9 top of the aquifer. That is the best, most 10 prudent, most productive way to go. But an 11 18-foot surface seal, and even the new 38 proposed 12 surface seal that should take effect in July, in a 13 valley like we have where you have a 60-foot thick 14 river gravel, it really doesn't do anything. 15 THE HEARING OFFICER: Okay. Mr. Smith, I 16 want to be assertive right now. And I guess my 17 question is -- and I know there's been some 18 testimony about the wells -- the domestic wells 19 that have been affected. But I guess my question 20 is, why is the method of construction, at least 21 with respect to the sealing, why is that 22 important, or whether the well drillers have 23 properly constructed those wells or not? Is that 24 important to us? I'm just asking the question. 25 MR. ALAN SMITH: It seems to be important
Page 1292 1 THE HEARING OFFICER: We are recording. 2 Mr. Smith, your turn to examine. 3 MR. ALAN SMITH: Thank you, sir. 4 5 CROSS-EXAMINATION 6 BY MR. ALAN SMITH: 7 Q. I guess you'd rather be sworn in again 8 than sworn at. 9 THE HEARING OFFICER: I trust you won't, 10 Mr. Smith. 11 Q. (BY MR. ALAN SMITH): Mr. Squires, I 12 think we've covered a lot of this on the well 13 drillers and construction methods. I'll try to 14 sum up what I believe your opinions were, if 15 Mr. Fereday will allow me that latitude. And if I 16 say anything you don't agree with, why, you 17 correct me. 18 As I understand it, you recognize 19 there are qualified well drillers, you just don't 20 agree with some of their construction methods? 21 A. That's true. 22 Q. You do recognize that they're doing it 23 according to Water Resource standards and Idaho 24 State law? 25 A. Yes. It is the rules and regulations	Page 1294 1 to Mr. Squires, but... 2 THE HEARING OFFICER: Well, my 3 understanding of the testimony was there were 4 questions about whether wells that had difficulty 5 producing water, whether those wells had gone dry 6 or had not gone dry. And I think with respect to 7 the question of construction, I think that is a 8 legitimate question. 9 But I think the question of seals and 10 whether the wells are contaminated or not 11 contaminated, whether there's -- there may be a 12 question about cross-connection. But I want to be 13 careful that this doesn't become a forum for 14 impeachment of well drillers or -- 15 MR. ALAN SMITH: All right. 16 THE HEARING OFFICER: -- to try to 17 discredit the rules, either as they have been or 18 will be in the future. 19 MR. ALAN SMITH: No, I don't plan to go 20 there. 21 THE HEARING OFFICER: Okay. All right. 22 Thank you. Go ahead. 23 Q. (BY MR. ALAN SMITH): But I think you 24 said in your opinion the 18 foot of seal would not 25 adequately protect the well from contamination?

Page 1295 1 A. It would not protect the groundwater 2 from contamination, the resource itself. 3 Q. So contamination can move -- 4 A. Through the well -- 5 Q. -- from one aquifer to another? 6 A. Yes, it can. 7 Q. And is that by seepage or water or 8 what? 9 A. It's basically caused by the hole 10 that's drilled being bigger than the casing. So 11 it leaves an unsealed annular space outside the 12 casing. And it is relevant to not only 13 contamination, but I think to the testimony in 14 this case, that I believe that measuring water 15 levels in such wells is inaccurate, because of the 16 commingling and the average -- averaging of the 17 heads that occurs in those wells. 18 Q. Okay. Let's go to the M3 project. 19 How long have you worked on that M3 20 project? 21 A. Well, I think -- I think I got started 22 in March of 2006, if my memory serves me. 23 Q. And HLI, is Hydro Logic, Inc., a 24 corporation? 25 A. That's correct.	Page 1297 1 A. No, sir. 2 Q. Are there any bonuses or contracts or 3 agreements, verbal or written -- 4 A. No, sir. 5 Q. -- about that? 6 Is the location of any of the proposed 7 M3 wells known at this time? 8 A. Yes, sir. 9 Q. And where would they be? 10 A. Well, we have already made submittals 11 to the Department of Environmental Quality for an 12 approved public drinking water well site that is 13 at the location of our test well No. 4. We have a 14 second site near Spring Valley 7. And we've 15 identified many other points of diversion, but 16 they will pick and choose amongst those points of 17 diversion based on how the wells that we drill 18 first, how they perform, and the drawdowns that we 19 see from those wells. 20 We're thinking that the water project 21 could be served from as few as four wells, 22 including a backup well. But depending on how the 23 distribution system is finally configured, we may 24 have more smaller wells rather than four large 25 wells.
Page 1296 1 Q. And I think you said you were 2 president? 3 A. Yes. 4 Q. Is Mark Utting an officer or director 5 of the corporation? 6 A. No. He's a project manager, 7 hydrogeologist. 8 Q. How much has HLI been paid to date for 9 its work on the M3 project? 10 A. I think in response to your discovery 11 request, that our bills are somewhere in the 12 neighborhood of 1.3 million. 13 Q. What were you paid by M3 on the -- or 14 what was HLI paid by M3 on the Arizona project? 15 MR. FEREDAY: Objection. Relevance. 16 THE HEARING OFFICER: Sustained. 17 Q. (BY MR. ALAN SMITH): Do you have any 18 financial interest in M3 or M3 Eagle or any 19 affiliate thereof? 20 A. Not one bit. 21 Q. Do you own any stock in those 22 companies or corporations? 23 A. No, sir, I do not. 24 Q. Are you to share in any way in any 25 profits?	Page 1298 1 Q. Didn't you say on direct that five or 2 six wells is what was contemplated? 3 A. Well, again, it's going to depend on 4 the final engineering design for the water system, 5 simply by virtue of the fact this is a site that 6 has a lot of elevation difference on it. So water 7 has to be pumped from the various elevations to 8 different elevations. 9 So as the phasing is settled upon and 10 as the engineering water system is -- comes into 11 view, there could range from four wells to eleven 12 wells. I can't say for sure. But the total 13 volume of withdrawal in the instantaneous 14 diversion rates for this project will not change 15 under any configuration. 16 Q. In your second amended application, 17 what I think you said, if you wrote that, or HLI, 18 some of your staff did, "15 additional wells are 19 contemplated beside the 12 existing wells"? 20 A. Well, I didn't write that document, 21 but I was intimately involved with the development 22 of that document. And the 15 wells that I believe 23 you're referring to are wells that already exist 24 on the property. There's a number of domestic 25 wells that were associated with the property.

Page 1299 1 There's test wells on the property. 2 And if my memory serves me, at least 3 most of that 15 have to do with preexisting wells 4 that are already there, so we named them as points 5 of diversion for the water right. 6 Q. Well, I believe it said 15 additional 7 wells to the 12 existing wells for a total of 8 27 -- 9 A. Well, there's 12 existing, and we 10 provided for up to 15 additional wells, if that is 11 what is needed. 12 THE HEARING OFFICER: Okay. Mr. Smith and 13 Mr. Squires, if you would please wait so that once 14 the question is asked; and, Mr. Squires, if you'll 15 answer and then wait for Mr. Smith. If I don't 16 speak up, the court reporter will. 17 MR. ALAN SMITH: I'll try to slow down. 18 Q. Are there going to be wells drilled on 19 both sides of what we called the panhandle fault, 20 if you know, Mr. Squires? 21 A. There certainly could be. We have 22 points of diversions on both sides of the inferred 23 fault and the deep volcanics, yes. 24 Q. And the length of that fault is not 25 known, is it?	Page 1301 1 this point. I think there's a lot of complicating 2 factors. Intuitively, you would think so. 3 Q. Don't many of the subdivision 4 developers tile and line irrigation canals that 5 pass through the subdivisions, further reducing 6 the aquifer recharge? 7 A. Depends on the location of the canals, 8 because some -- some areas of the valley, the flow 9 is upward and the flow would actually be into the 10 canals. So it would actually be the opposite. 11 Q. And don't these subdivision developers 12 almost always convert to sprinklers rather than 13 flooding, further reducing the aquifer recharge? 14 A. Generally speaking, they convert to 15 pressurized irrigation. 16 Q. Doesn't that transformation from 17 agricultural flooding to sprinklers cause a 18 further decline in the aquifer recharge, in your 19 opinion? 20 A. Depends on the location. In many 21 areas of the valley, the applied irrigation water 22 does not recharge the aquifer. 23 Q. Okay. If wells go dry after a high 24 capacity -- or high-volume well nearby begins 25 pumping, doesn't that indicate to you that water
Page 1300 1 A. You mean in terms of lineal distance? 2 Q. Correct. 3 A. No. We know that it extends between 4 two magnetometer lines that we did. 5 Q. If Hutchings and Petrich are right, 6 would not the length of that fault be important to 7 know since it might affect the water flow in that 8 area? 9 A. There's no indications at all that it 10 affects water flow in that area. And there's no 11 reason to believe that it does. Our conclusion is 12 that it doesn't. 13 Q. All right. Is it your opinion that 14 groundwater originates from the Boise River and 15 from leakage from irrigation canals southeast of 16 Eagle? 17 A. Yes. And from other sources. 18 Q. Is that to the shallower or deeper 19 aquifers, or both? 20 A. To both. 21 Q. Okay. Would you agree that urban 22 sprawl over what was irrigated agricultural land 23 which was flood irrigated will gradually decrease 24 the recharge to the aquifer? 25 A. In my mind, that is not conclusive at	Page 1302 1 level has dropped? 2 A. If that were to happen, if a large 3 production well were to -- to begin pumping and 4 pump continuously and the water was actually drawn 5 down in the domestic well I think you're referring 6 to, to a nearby domestic well such that the water 7 level was below the reach of that well, it would 8 indicate to me that the water level at that well 9 was drawn down. I haven't seen that myself. 10 Q. Are you aware that both the Steiner 11 and Lawton domestic wells had to be replaced 12 within a few weeks after the Brookwood well came 13 online? 14 A. I've heard you mention that. It's 15 very difficult for me to believe that, based on my 16 understanding of the system and the production 17 from the Brookwood well and the locations of those 18 two wells and the testimony of Roger Dittus. 19 Q. Well, if the static level in the well 20 is dropped to 2 or 3 feet below the pump, would 21 you say that that well is probably not 22 functioning? 23 A. Oh, I can't speak to that, because I 24 don't know where the pump is set and I don't know 25 the depth of the well.

Page 1303 1 Q. Well -- 2 A. I can't speak to that. 3 Q. Excuse me. Go ahead. 4 A. I can't speak to that. I don't know 5 the particulars of where the pump is set. 6 I can say that I have designed and 7 completed wells myself where -- that would be fine 8 to have that much submergence. The well would 9 work fine with 2 feet above where the pump is set. 10 Q. Would you say the well driller has two 11 choices, either lower the pump if he can, or if 12 not, deepen the well? 13 A. I think that depends on -- I'm not 14 trying to evade your question. But I think it 15 depends on a lot of factors. I think it depends 16 on how the well is constructed, what condition 17 it's in, what the water level is, and how deep the 18 pump setting is. 19 Q. Are you aware of all of the wells that 20 have had to be replaced or gone dry in the Homer 21 Road and Ballantyne Road areas? 22 A. I'm aware of the Eagle area, 23 Eagle/Star area in general, and in fact across the 24 Treasure Valley that a lot of wells get replaced 25 all the time. I'm not aware myself of any wells	Page 1305 1 A. Not necessarily, no, sir. But I think 2 that could be determined rather easily, and I 3 think this question of wells going dry could be 4 determined quite easily as well, if the people 5 whose wells were allegedly going dry would allow 6 their wells to be measured. But apparently that 7 has not happened. 8 Q. Don't you or HLI state at page 241 of 9 your reanalysis of the 16 aquifer tests the 10 development of additional municipal groundwater 11 supplies -- 12 THE HEARING OFFICER: Just a moment, 13 Mr. Smith. 14 Q. (BY MR. ALAN SMITH): -- and 15 associated water table -- 16 THE HEARING OFFICER: Mr. Smith. 17 MR. ALAN SMITH: Pardon? 18 THE HEARING OFFICER: I think we need to 19 refer to a specific portion of that report for 20 Mr. Squires. 21 MR. ALAN SMITH: All right. 22 Q. Would you go to page 241. 23 THE HEARING OFFICER: And this is 24 Exhibit 12? 25 MR. ALAN SMITH: I believe it's Exhibit 12,
Page 1304 1 that have gone dry, and I've never measured any 2 that have gone dry, except one well out in the 3 Micron area 20 years ago. 4 And I think I've talked about this 5 idea of wells going dry. And I haven't seen any 6 information in any measurements I've taken or 7 others -- presented by others that tells me that 8 wells have actually gone dry. 9 Q. If multiple wells go dry or have to be 10 replaced that are near one another within a few 11 days or weeks of one another, would that not 12 indicate to you that the water level has dropped? 13 A. No, not necessarily. 14 MR. FEREDAY: Objection. This is a 15 compound question. He's already testified that he 16 hasn't seen evidence of wells going dry, with one 17 exception. Your question was in the disjunctive, 18 and I'm not sure which part of it you're asking 19 him to answer. So that's the basis for my 20 objection. 21 MR. ALAN SMITH: Let me rephrase it. 22 Q. If multiple wells have to be replaced 23 within a few weeks of one another where they're 24 nearby each other, does that suggest to you that 25 the water level has declined?	Page 1306 1 the 16 aquifer tests. 2 THE WITNESS: What page, sir? 3 MR. ALAN SMITH: 241, I believe. Top 4 paragraph. 5 THE WITNESS: At the top of that page it 6 starts out "Then 1600 wells"? Is that what you're 7 referring to? 8 Q. (BY MR. ALAN SMITH): I have it as 9 "Development of additional municipal groundwater 10 supplies" -- 11 A. Okay. 12 Q. -- "and associated water table 13 drawdowns may require some existing wells to be 14 deepened and/or replaced." 15 Is that your opinion? 16 A. I think you're referring to the second 17 half of the point No. 19 at the top of the page? 18 Q. I believe it's paragraph 19, yes. 19 A. Okay. 20 Q. Does it not state that there? 21 A. If you read that -- if you read that 22 point 19 correctly, I agree with that. 23 Q. Did you write -- did you write this on 24 the 16 aquifer tests, or cause it to be written? 25 A. Both.

Page 1307 1 Q. Won't the effects of pumping, 2 especially of multiple high-capacity wells, 3 eventually be transmitted throughout the Pierce 4 Gulch Sand Aquifer? And I'm referring to a 5 statement on page 7 of the 16-day aquifer test, 6 third paragraph. 7 THE HEARING OFFICER: Page 7? 8 MR. ALAN SMITH: Page 7, yes. 9 THE WITNESS: Just give me a moment. I'll 10 read that. 11 (Reviews.) 12 That paragraph refers to pumping 13 within the Pierce Gulch Sand Aquifer. It does not 14 refer to aquifers underlying or overlying the 15 Pierce Gulch Sand Aquifer. 16 Q. (BY MR. ALAN SMITH): Okay. Let's go 17 to paragraph 20. 18 THE HEARING OFFICER: Okay. Mr. Smith, 19 would you please speak up. 20 MR. ALAN SMITH: Page 241, paragraph 20. 21 Q. I believe it states there "Pumping at 22 deeper zone will ultimately affect the shallower 23 portions of the aquifer. Likewise, pumping a 24 shallower zone ultimately affects the deeper 25 zones."	Page 1309 1 Q. All right. Didn't you tell us in your 2 earlier testimony, I believe on Friday, that 3 pumping from a deeper aquifer would not affect the 4 shallower aquifer or cause any drawdown to the 5 shallower aquifer? I believe you said that was a 6 layman's misconception. 7 A. I don't believe I said what you just 8 said. I think -- 9 Q. Okay. 10 A. I think what I said and what I 11 understand is that the Pierce Gulch Sand Aquifer 12 is a dipping aquifer. In some places it's -- on 13 the east side of Eagle, it's closer to the 14 surface. And in some places on the west side of 15 Eagle and Star area, it's deep and it's more 16 confined. 17 And I believe our reports clearly show 18 and state that pumping from the Pierce Gulch Sand 19 Aquifer does have an attenuated effect in some 20 locations above in the overlying as yet unnamed 21 and undifferentiated aquifers that many of the 22 domestic wells of this area are completed into. 23 Q. So it does have some effect on it? 24 A. Sure. 25 Q. Okay. Let's go to your inspection of
Page 1308 1 MR. LAWRENCE: Objection. That's not what 2 I -- what paragraph No. 20 states. 3 THE HEARING OFFICER: Okay. I'm on 4 page 241, Mr. Smith. 5 MR. ALAN SMITH: All right. No, it's 6 page 7. I'm sorry. Page 7. 7 MR. JASON SMITH: Third paragraph, kind of 8 towards the bottom again. It's the last sentence, 9 I believe he's looking at. 10 THE WITNESS: Yes, sir. 11 Q. (BY MR. ALAN SMITH): Starts with 12 "Eventually," I believe. 13 A. Yes. As I previously stated, this 14 paragraph is about the Pierce Gulch Sand Aquifer, 15 and not overlying or underlying aquifers. So when 16 it says "In other words, pumping a deeper zone of 17 the Pierce Gulch Sand Aquifer ultimately affects 18 the shallower portions of the aquifer. Similarly, 19 pumping a shallower zone, ultimately affects the 20 deeper zones," I'm referring there to the Pierce 21 Gulch Sand Aquifer itself, not the overlying or 22 underlying zones. 23 Q. So -- 24 A. And I believe that statement to be 25 true.	Page 1310 1 the nearby wells. I believe you stated in your 2 earlier testimony that you inspected over 160 3 nearby wells, did you not? 4 A. I think I stated that we inspected 5 2,250 to 3,000 wells, if you're referring to 6 drilling records. If you're referring to the 7 water-level measurements that we took, which is 8 not inspecting a well, there were 160 9 measurements, approximately 167, I think, in our 10 first round of measurements in 2006. 11 Q. And that was of the nearby well 12 owners? 13 A. Well, it wasn't just the nearby well 14 owners. It was just about every well that we 15 could gain access to in the general area within a 16 relatively short period of time. And that was in 17 wells on both sides of the M3 property. 18 Q. And that would be to the south down 19 toward the feed lot? 20 A. That would be to the south, to the 21 north, to the west, to the east. 22 Q. Okay. The west would be over towards 23 the Hillsdale Estates? 24 A. Yes, sir. 25 Q. And did you personally do that, or did

Page 1311 1 your staff do that? 2 A. My staff and interns, graduate student 3 interns from the University of Idaho accomplished 4 that. 5 Q. And I believe you said you knocked on 6 doors and talked to many of the well owners? 7 A. Yes. And also some of the wells were 8 measured by faculty from the University of Idaho. 9 Q. Did you assure any of the well owners 10 that the M3 wells would not affect them? 11 A. No. 12 Q. So you wouldn't have told them that to 13 avoid potential protests? 14 A. No. I just wouldn't say that, period, 15 under any circumstances. 16 Q. Let's go back to page 241 of the 17 16-day aquifer -- or 16 aquifer test analysis. 18 A. 241? 19 MR. JASON SMITH: 241? 20 MR. ALAN SMITH: Yes. 21 THE WITNESS: Yes, sir. 22 Q. (BY MR. ALAN SMITH): I think I may 23 have already asked you this, but I believe it says 24 "Development of additional municipal groundwater 25 supplies and associated water table drawdowns may	Page 1313 1 Q. -- or other wells in the area? 2 A. No, sir. 3 Q. Did you tell them, as you state in 4 your Squires and Woods (sic) at page 2001 -- or 5 report of 2001, page 14 -- 6 THE HEARING OFFICER: Okay. Mr. Smith, 7 would you identify a document by number so that 8 Mr. Squires can -- 9 MR. ALAN SMITH: I don't think I have the 10 number. It's the Squires and Woods report of 11 2001. Now, I don't know if I have the exhibit 12 number of it. 13 THE HEARING OFFICER: Okay. Let's go off 14 the record for a minute. Let's find the document. 15 (Recess.) 16 THE HEARING OFFICER: We are recording 17 again. 18 Now, Mr. Smith, if you'll refer to the 19 document that we've identified for the record, or 20 refer Mr. Squires to the particular portion you 21 want him to look at, and then ask him a question. 22 MR. ALAN SMITH: All right. 23 Q. It's Exhibit 19E, page 14, I just 24 wanted to ask you if you told these well owners 25 that you or your staff talked to what that last
Page 1312 1 require some existing wells to be deepened or 2 replaced." I believe that's paragraph 19. 3 MR. JASON SMITH: Yeah, we talked about 4 that. 5 Q. (BY MR. ALAN SMITH): Did you tell any 6 of the well owners that, what that statement said? 7 A. No, sir. This report was done long 8 after we measured those water levels. 9 Q. Did you tell them what's stated in 10 paragraph 20 on page 241, that diminishing 11 artesian flows may require them to have to put in 12 pumps to produce water in the future? I believe 13 it's paragraph 20 on page 241. 14 A. If you mean did I go on the site and 15 go up to a house and measure a water level and 16 tell them that, no, I did not, sir. 17 Q. You or your staff? 18 A. No, sir. 19 Q. Okay. Let's go to page 240, 20 paragraph 19. 21 Did you tell any of those well owners 22 that high-capacity wells in the Eagle/Star/M3 23 project area will cause drawdowns that will affect 24 their wells -- 25 A. No, sir.	Page 1314 1 sentence says, "It may take months to decades for 2 larger drawdowns" -- 3 THE HEARING OFFICER: Where on page 14? 4 MR. ALAN SMITH: The last sentence of the 5 paragraph. 6 Q. "It may take months to decades for 7 large drawdowns to propagate through the seemingly 8 continuous section of interbedded sand and thin 9 mud." 10 A. I did not tell any domestic well owner 11 that sentence. 12 Q. And if you'd go to Exhibit 50, 13 page 24. 14 A. Yes, sir. 15 Q. I don't believe that's a quote from 16 you, but I wanted to see if you disagreed with it, 17 that "Pumping in the PGSA is likely to eventually 18 impact the majority of area well owners." 19 Do you agree or disagree with that? 20 A. I disagree with that statement. 21 Q. Okay. All right. Let's go to the 22 second -- second amended application at page 7. 23 THE HEARING OFFICER: Okay. What exhibit 24 number? 25 MR. ALAN SMITH: I believe that's --

Page 1315 1 MR. JASON SMITH: 42. 2 MR. ALAN SMITH: -- 42, Exhibit 42, page 7. 3 That's the tab 4, page 7. 4 THE HEARING OFFICER: 42, and then I assume 5 it's -- 6 MR. ALAN SMITH: Tab 4. 7 THE HEARING OFFICER: -- subpart A -- 8 MR. JASON SMITH: Yeah. 9 THE HEARING OFFICER: -- and then subpart 4 10 under tab A. 11 MR. JASON SMITH: Yeah. 12 Q. (BY MR. ALAN SMITH): Have you got 13 that page, Mr. Squires? 14 A. Yes, sir, I do. 15 Q. Okay. Would you look at the third 16 paragraph, about two-thirds -- 17 THE HEARING OFFICER: Page number again, 18 Mr. Smith? I'm sorry. 19 MR. JASON SMITH: 7. 20 MR. ALAN SMITH: Page 7. 21 THE HEARING OFFICER: I'm trying to burrow 22 down. Okay. Thank you. 23 Q. (BY MR. ALAN SMITH): Third paragraph, 24 about two-thirds of the way down states, "The 25 largest potential for interference effects to	Page 1317 1 old or thousands of years old. 2 Q. Okay. Would you look at page 13 on 3 that second amended application. 4 A. In the same part 4? 5 Q. Yes. 6 A. Yes. 7 Q. Down toward the bottom of the page, 8 subdivision 2(b), "Groundwater originates as a 9 direct infiltration from the Boise River in the 10 east-central Boise area and through leakage from 11 irrigation canals southeast of Eagle." 12 A. Yes, sir. 13 Q. Is that still your opinion? 14 A. I believe that that is a true 15 statement. 16 Q. Is that seepage the primary source of 17 recharge to the Boise River -- or to the PGSA? 18 MR. FEREDAY: Objection. There isn't the 19 word "seepage" appearing in that sentence, but... 20 THE HEARING OFFICER: Overruled. 21 Q. (BY MR. ALAN SMITH): Is it from 22 seepage or leakage -- 23 THE HEARING OFFICER: Just a minute, 24 Mr. Smith. There's a question pending. 25 MR. ALAN SMITH: All right.
Page 1316 1 existing wells is on the west side of the M3 Eagle 2 lands near State and Highway 16." 3 Did you tell any of those well owners 4 that? 5 A. No, sir, I didn't tell any well owners 6 that. 7 Q. Did anybody on your staff do so -- 8 A. No, sir. 9 Q. -- if you know? 10 Okay. Let's go to this recharge 11 issue. 12 Does anyone, hydrologists, geologists, 13 whatever, know the source of recharge to the PGSA 14 or where it is? 15 A. Yes. 16 Q. Does all of the evidence indicate that 17 the recharge occurred a very long time ago? 18 A. It's hard to know what you mean by "a 19 very long time ago." If you mean more than 140 20 years ago, I would agree with that. 21 Q. It's ancestral? 22 A. Yes. 23 Q. Geologically ancestral? 24 A. I'm not sure how you want to define 25 that term. We don't know if the water is 45 years	Page 1318 1 THE HEARING OFFICER: So I don't know 2 whether Mr. Squires is reading to respond. 3 THE WITNESS: I was reading, but I am 4 confused about the question. If we could repeat 5 the question, that would be helpful. 6 Q. (BY MR. ALAN SMITH): Well, my 7 question to you is, is it seepage or leakage from 8 the Boise River from the irrigation canals that's 9 the primary source of recharge to the PGSA? 10 A. Yes. 11 Q. Are you aware that Hutchings and 12 Petrich concluded that contemporary seepage from 13 the rivers and irrigation diversions is not the 14 primary source of recharge for the most deeper 15 regional aquifers? 16 MR. FEREDAY: Objection. This question has 17 already been asked and answered, perhaps not by 18 this party, but I believe it has been asked and 19 answered. 20 THE HEARING OFFICER: Okay. Mr. Smith, if 21 you want to argue, then I'll rule. 22 MR. ALAN SMITH: No, I'm just asking if 23 he's aware of it. 24 THE HEARING OFFICER: Okay. Well, if you 25 have an argument in response to Mr. Fereday's,

Page 1319 1 I'll allow you to make it. If not, I'll rule. 2 MR. ALAN SMITH: That's my only argument. 3 THE HEARING OFFICER: Sustained. 4 MR. ALAN SMITH: I'm asking if he's aware 5 of -- 6 THE HEARING OFFICER: Sustained. We've 7 covered this language previously in Mr. Squires' 8 testimony. 9 MR. ALAN SMITH: Okay. 10 Q. Doesn't Petrich also find that 11 recharge occurring in the shallower aquifer zones 12 does not reach the deeper -- the deeper zones and 13 thereby limits the recharge of the deeper regional 14 aquifers? 15 A. I believe that I recall that that was 16 one of his conclusions, yes. 17 Q. And isn't the bottom line there that, 18 just as you stated on page 7 of the second amended 19 application, tab 4, of your 2007 May report, I 20 believe you state "The actual extent of any future 21 impact cannot be truly known until actual pumping 22 wells are in place." 23 A. I believe that's true, yes. 24 Q. Is that not a little bit late? 25 A. No, sir. I believe that that's the	Page 1321 1 wake up one day and all of a sudden we're going to 2 be past some point of no return and the aquifer is 3 going to be in a state of decline. And I submit 4 that is not going to happen, and that the effects, 5 even minor effects of pumping, will show up in the 6 monitoring data, if we have a quality monitoring 7 network. 8 Q. (BY MR. ALAN SMITH): You realize, 9 however, that's exactly what has happened in the 10 Twin Falls area? 11 A. I'm not convinced that that's happened 12 in the Twin Falls area. 13 Q. Okay. Let's go to -- see if we can 14 figure out why these protestant rascals have made 15 such an issue out of the Payette Basin flow. I 16 believe it's been called a red herring issue. 17 THE HEARING OFFICER: Okay. Before we 18 launch, it is just shortly after noon, this is a 19 new subject, Mr. Smith. And I just want to ask 20 the question whether we want to break at this 21 point or whether you are near the end of your 22 cross-examination. What do you think? 23 MR. ALAN SMITH: I'm getting near the end. 24 But probably five minutes. It may be ten. 25 THE HEARING OFFICER: If you have five more
Page 1320 1 way that we find out. That's the actual real 2 data. 3 But we have been monitoring on the M3 4 site for over three years now, so we have a fairly 5 good idea of what the baseline water levels are. 6 And I submit that any changes caused by the M3 7 pumping will become apparent. 8 Q. So your later studies would modify 9 that statement, then, or you would change it? 10 A. And the statement again is? 11 Q. Well, that the actual extent of the 12 impacts on other wells will not be truly known 13 until actual pumping wells are in place on the M3 14 property. 15 MR. FEREDAY: Objection. This 16 mischaracterizes the statement, which referred to 17 future impacts. 18 THE HEARING OFFICER: Overruled. 19 THE WITNESS: I believe that the best way 20 to measure impacts are real measurements. And I 21 believe that the way that we determine how a 22 resource is to be exploited is through exploiting 23 that resource. That's the only way that we know. 24 I further submit that there seems to 25 be a general understanding that we're going to	Page 1322 1 minutes, let's go ahead and finish. I think 2 that's the right thing. 3 MR. ALAN SMITH: Maybe ten. 4 THE HEARING OFFICER: If you have ten 5 minutes, let's finish. 6 THE WITNESS: Even if it's a half hour. 7 THE HEARING OFFICER: If you think you have 8 a half hour or 45 minutes, let's break. 9 MR. ALAN SMITH: No, no. 10 THE HEARING OFFICER: Okay. 11 Q. (BY MR. ALAN SMITH): Let's go to the 12 second amended application filed in support of the 13 M3 water right request. The May 4th, 2007, tab 4, 14 which I believe is now a public record since it's 15 been filed in support of this application. 16 THE HEARING OFFICER: Okay. This is 17 Exhibit what? 18 MR. FEREDAY: 42A4. 19 THE HEARING OFFICER: Okay. 20 MR. ALAN SMITH: Exhibit 42. 21 THE HEARING OFFICER: A4. What page? 22 MR. ALAN SMITH: Tab 4, page 1. 23 THE WITNESS: Yes. 24 Q. (BY MR. ALAN SMITH): Did you author 25 this or participate in writing it?

Page 1323 1 A. Yes. 2 Q. Okay. Would you look at the very 3 first page. And I believe it says -- it's about a 4 third of the way down that first paragraph. It 5 says, "Because the Payette Valley near Leatha is 6 almost 300 feet lower than the Boise Valley near 7 Eagle, groundwater flows out of the Boise River 8 Basin and into the Payette River Basin through the 9 sands of this aquifer." 10 So that issue appears to have been 11 raised by M3 and -- 12 MR. FEREDAY: Objection. Is this testimony 13 or is this a question? Maybe there is a question 14 coming, but I haven't heard one. 15 THE HEARING OFFICER: Well, let's see. 16 Q. (BY MR. ALAN SMITH): Has that issue 17 been by raised by M3 and HLI on the very first 18 page of tab 4? 19 A. Sure. I'll do my best to answer what 20 I think -- what I infer your question is. 21 Q. Well, I think you can answer it yes or 22 no. 23 Who raised the issue first? This was 24 in 2007. 25 A. I think that we have recognized in our	Page 1325 1 going to have no effect because the water flows to 2 the Payette anyway? 3 A. Oh, I didn't say that at all. I said 4 that impacts to existing area water users in the 5 lowlands near Eagle are predicted to be small. 6 Q. And what do you mean by "small"? 7 A. Well, if they're measurable, which it 8 may be tough to measure the impacts. But whatever 9 they are, I believe we will be able to monitor the 10 effect on the pumping within the Pierce Gulch Sand 11 Aquifer. 12 Q. Would you agree that you're making 13 assurances to Water Resources and the public and 14 the north Eagle well owners that the impact is not 15 going to be significant at all? 16 A. No, I didn't say that, sir. 17 Q. I have just a couple more questions 18 concerning the aquifer recharge. And I believe 19 this is from the Idaho Water Resources memo, 20 page 18. 21 MR. FEREDAY: Would that be Exhibit 50? 22 MR. JASON SMITH: Yes. 23 MR. ALAN SMITH: 50. Right. 24 THE WITNESS: And page, sir? 25 Q. (BY MR. ALAN SMITH): Page 18. Down
Page 1324 1 research that there is a connection between the 2 two basins, and it makes sense on a number of 3 lines of evidence that water does flow from the 4 Boise Basin to the Payette Basin. 5 Q. All right. Let's go a little further 6 down in that same paragraph on page 1. "The 7 groundwater proposed to be withdrawn by M3 Eagle 8 or its development would be from subsurface flow 9 that has already departed the Boise Basin" -- have 10 you found that? -- "on its way to the Payette 11 Basin so that impacts to existing area water users 12 in the lowlands near Eagle are predicted to be 13 small." 14 A. I'm still trying to find that, sir. 15 Just a moment. 16 Q. Okay. It's about two-thirds of the 17 way down. The sentence starts, "The groundwater 18 proposed." 19 A. Yes, I read that sentence. 20 Q. Okay. Would you take a minute and 21 read that. 22 A. I just read it. 23 Q. All right. Are those not two of the 24 assurances that you're making there to Idaho Water 25 Resources and the public that the M3 pumping is	Page 1326 1 toward the bottom they're quoting from Petrich's 2 2004 at page 19. And he's talking about "The age 3 of water in the regional aquifers range from 4 thousands to tens of thousands of years." And he 5 also states that "The youngest waters entered the 6 subsurface a few thousand years ago and are found 7 along the northwestern boundary of the basin -- 8 northeastern boundary." 9 A. Yes, sir. I mean I'm not answering -- 10 I'm asking what your question is. 11 Q. Okay. Do you agree with that 12 statement? 13 A. Oh, I definitely do not. I think it's 14 based on a misconception. I think it incorrectly 15 represents anything about the age of the water in 16 the aquifer, and I think it's quite incorrect. 17 Q. Didn't you and Glanzman state in your 18 geochemical report that both the Pierce Gulch 19 Aquifer and the Terteling Springs formation 20 groundwaters originated from geologically 21 ancestral Boise River water? And I think I -- 22 A. Yes, sir, that's true. 23 MR. ALAN SMITH: That's all I have. 24 THE HEARING OFFICER: Okay. Thank you, 25 Mr. Smith.

Page 1327 1 Mr. Edwards, questions? 2 MR. EDWARDS: No questions. 3 THE HEARING OFFICER: Okay. That's a good 4 place to stop. Let's come back about a quarter 5 after 1:00. And we'll go back to redirect with 6 Mr. Squires. Thank you. 7 (Lunch recess.) 8 THE HEARING OFFICER: We're recording. So 9 everyone's here ready to go after the noon recess. 10 Mr. Fereday, redirect testimony. 11 12 REDIRECT EXAMINATION 13 BY MR. FEREDAY: 14 Q. Mr. Squires, with regard to your 15 measurements in this SVR-7 nine-day aquifer test, 16 I believe I heard you say that you measured to 17 within 2/100ths of a foot in one of the monitoring 18 wells, monitoring well SVR-9 to be specific. 19 Is that a correct number? 20 A. No, sir, it's not. When I read the 21 transcripts of my testimony, I realized that I 22 said 2/100ths of an inch, rather than 2/10ths of 23 an inch that we measured in the Spring Valley 7. 24 So it was a mistake on my part. 25 Q. So the correct number is measurement	Page 1329 1 completed within the Pierce Gulch Sand Aquifer, 2 and then the other zone was in an overlying 3 aquifer. 4 And it -- I think I said that I felt 5 that that aquifer was perched. I used that term, 6 which is maybe not the most descriptive term. But 7 I believe that that overlying aquifer does sit on 8 top of a clay -- a clay unit. But I think that 9 the clay beneath it is saturated. 10 Q. So there wouldn't be such a thing 11 as -- with regard to the PGSA in the vicinity of 12 M3 Eagle an underlying unsaturated zone; is that 13 your testimony? 14 A. No, there would not be. 15 Q. Okay. Do you recall responding to 16 Mr. Thornton this morning about the amount of 17 water that flows through a swath of territory 18 right underneath the M3 property? 19 A. Yes, I do. 20 Q. And you, I believe, mentioned some 21 amounts in terms of million gallons per day. 22 Have you had a chance in the break to 23 review the numbers that you gave, and if so, could 24 you tell us what the actual numbers might be if 25 you've made a mistake?
Page 1328 1 within 2/10ths of an inch in that case; is that 2 right? 3 A. Of a foot. 4 Q. I'm sorry. 2/10ths of a foot; is that 5 right? 6 A. Typically, we try to measure -- and 7 all hydrogeologists strive to measure to 8 hundredths of a foot. But the measured drawdown 9 in the Spring Valley 7 -- in the Spring Valley 9 10 during the Spring Valley 7 aquifer test was 11 2/10ths of a foot drawdown. 12 Q. Thank you. 13 I believe you also mentioned an 14 underlying unsaturated zone in part of your 15 testimony. 16 Do you recall that? 17 A. You know, I don't recall that, but I 18 can say that I don't know about any part of the 19 aquifer that is unsaturated below the saturated 20 section. In other words, where it's saturated, I 21 believe it's saturated to depth. 22 You may have been referring to I think 23 when I discussed test well No. 1, M3 test well 24 No. 1, there were five zones, five piezometer 25 zones in that well. And the four lower zones were	Page 1330 1 A. Well, I think that in our original 2 first year characterization report, we estimated 3 that under a 5-mile swath of the Pierce Gulch Sand 4 Aquifer that underlie the M3 property that there 5 was 20 to 30 mgd. 6 Q. Is that million gallons per day? 7 A. Million gallons per day traveling 8 through the aquifer under the gradient we knew at 9 that time under a 5-mile wide swath of the 10 aquifer. 11 Q. Have you refined those numbers since 12 then? 13 A. Yes. We have refined those numbers 14 because, as you will recall, we recalculated 15 through our second set of well measurements and 16 survey points that we recharacterized and refined 17 the gradient somewhat, and we have also refined 18 the boundary conditions on the site so that we 19 think that just under 4 miles is a better 20 representation of the part of the Pierce Gulch 21 Sand Aquifer that underlies the M3 site. 22 And our most recent calculation is 23 that 24 -- that 24 mgd, I believe, is the refined 24 number. And that equates to about 34 cfs, if that 25 makes sense. So if I misstated that, I apologize.

Page 1331 1 But I believe those numbers are correct. 2 Q. Okay. 3 A. And you can pursue those with my 4 colleague, Mark Utting. He's probably more 5 familiar with those numbers since he did those 6 calculations. 7 Q. With regard to Mr. Thornton's 8 questions about one of Dr. Wood's reports 9 involving his comment about geologic features 10 along strike and that are represented by facies 11 formations, do you recall that interchange? 12 A. I recall, yes. We've talked about 13 strike on a number of occasions. 14 Q. Could you describe for the Hearing 15 Officer what "along strike" means. 16 A. Well, strike is a geologic term, and 17 it refers to where a dipping plain or a dipping 18 stratum would break ground surface, projected to 19 ground surface. So it is a line. 20 And we've talked about this idea of 21 the dipping aquifer, that it's a plain in space 22 that's dipping down Big Gulch and down underneath 23 Star. And I think we've indicated on a number of 24 occasions that the aquifer is, you know, fairly 25 shallow over on the east side of Eagle, a couple	Page 1333 1 I've indicated that first -- as the lake drained, 2 the reworking of the already clean sediments is 3 near to the shore, perhaps in this 4-mile swath 4 that underlies M3, because we're seeing very, very 5 large transmissivity values in that swath. I mean 6 really, really large. 7 And that makes sense to me. And that 8 is also along strike. So if you have a lower -- 9 if you have a lower base level in the Payette 10 Valley and you have a sand layer that comes up dip 11 along strike, and it's a very permeable area and 12 it's getting backed up down valley, it makes sense 13 that the water wants to flow that way along strike 14 into a more permeable part of the aquifer. 15 Does that answer your question? 16 Q. Yes. And is that the kind of 17 formation that you understand Dr. Wood to have 18 been referring to in that paper that was 19 discussed? 20 A. Oh, yes, it was. Because what he was 21 referring to is that along strike -- and this is a 22 good -- this is a good question. 23 If I can use this as an example. 24 Here's the dipping plain that is the Pierce Gulch 25 Sand Aquifer (indicating).
Page 1332 1 hundred feet, I think we referred to in last 2 week's testimony, or week before last testimony. 3 And it's much deeper -- several hundreds of feet 4 deep beneath Star, perhaps 400 feet or deeper. 5 Well, if you project that plain in 6 space up where it breaks the surface, that is the 7 line of strike. And that is the representation of 8 our green line, the so-called green line on our 9 maps. 10 Well, that is the direction of strike. 11 And what makes that significant, in my mind, in 12 this whole idea about flow to the Payette or 13 flow -- you know, is that generally speaking as 14 these facies move down valley or downgradient, as 15 the lake drained, I've characterized that the 16 sediments grow finer to basinward. 17 And that's generally what we see, as 18 you move down away from the front you see more and 19 more of the influence of clays and you see, you 20 know, more interbeds. And when you get down in 21 the Marsing area, there's just a thick sea of mud 22 down there. 23 Well, the idea of this concept of 24 strike has to do with the permeability, too, of 25 the sediments, the near-shore sediments, because	Page 1334 1 Q. Now, you're holding up an 8 1/2 by 11 2 group of papers that you're slanting in one 3 direction? 4 A. Correct, as a representation of the 5 dipping Pierce Gulch Sand Aquifer. And if -- and 6 where a horizontal plain meets this, that is the 7 line of strike. 8 And what Dr. Wood was saying is if you 9 have two wells that are along strike, you see the 10 aquifer would be at the same level on any wells 11 that are drilled along this line. They're all the 12 same depth. Okay? 13 Same here (indicating), if you drilled 14 the wells over here. 15 Q. Further down the slope? 16 A. Further down the plain, further down 17 the slope of the aquifer. If they were drilled 18 perfectly along strike, you would encounter the 19 aquifer at the same depth everywhere. 20 But if you drilled a well up here at 21 the top of the -- at the upslope part of the 22 aquifer, and you drilled a well down here at the 23 lower part of the aquifer (indicating), you would 24 encounter the aquifer at greatly different depth. 25 And I think what Spen was referring

Page 1335 1 to, that some of these aquifers, you know, they 2 dip several hundred feet a mile, in some cases. 3 So you don't have to get very far separated down 4 dip opposite to strike to where you can't follow 5 the traces. 6 And so he was saying -- he was 7 inferring that, look, you can do a lot better job 8 of correlating along strike because they're pretty 9 much at the same depth, and over long distances 10 down-dip, it becomes more difficult. 11 Q. But over long distances along strike 12 is geologically feasible? 13 A. Yeah. And down-dip as well, if you 14 have deep enough wells to penetrate the aquifer. 15 But he also indicated that one must 16 also know the type of depositional environment. 17 And we know the depositional environment. 18 Q. Thank you. 19 I'd like you to refer now to 20 Exhibit 50, which is the staff's March 2nd 21 memorandum. Page 18, at the bottom going to the 22 top of 19. Here we have a paragraph that says, at 23 least in substantial part, "The staff's 24 preliminary calculations of travel time suggest 25 that water entering the regional aquifer from the	Page 1337 1 about this by Mr. Thornton this morning? 2 A. Yes, I do. 3 Q. What is your response to this, and 4 does it have -- what is your response to this 5 statement in connection with your description, 6 Mr. Squires, of the model boundary that I think 7 you referred to as a headgate? 8 A. Well, I agree with the Department 9 staff, that if you use the transmissivity and 10 gradient that we have programmed into the M3 11 model, that I subject it is, you do calculate a 12 rather quick flow time between the edge of our 13 model and the M3 area. 14 Q. And the edge of the model is on that 15 Cole Road line that you discussed earlier; is that 16 right? 17 A. The extension of the Cole Road line 18 that's actually the dividing line between 19 townships. 20 Q. What's the significance of that model 21 domain edge with respect to what the staff is 22 saying here? 23 A. Well, I think that the M3 -- I thought 24 that I referred to this in my previous testimony, 25 but the M3 model domain, the headgate, if you
Page 1336 1 southeast corner of the model domain that M3 2 used" -- 3 THE HEARING OFFICER: Okay. I'm looking. 4 MR. FEREDAY: Bottom of page 18, top of 5 page 19, Exhibit 50. 6 THE HEARING OFFICER: Which paragraph? 7 MR. FEREDAY: The very bottom. 8 THE WITNESS: Very last. 9 THE HEARING OFFICER: Starts "However, 10 our"? 11 MR. FEREDAY: Starts "However, are 12 preliminary." 13 THE HEARING OFFICER: Okay. 14 Q. (BY MR. FEREDAY): This statement -- 15 and I'll paraphrase it, I think, accurately here. 16 But this statement says that the staff's 17 preliminary calculations of travel time suggest 18 that water entering the regional aquifer from the 19 southeast corner of the M3 model domain would 20 reach the M3 property in a relatively short amount 21 of time. And they say that that amount of time is 22 an order of magnitude less than the estimated age 23 of the water in the regional aquifer system. And 24 they cite the Petrich report, 2004. 25 Do you recall being asked questions	Page 1338 1 will, the input to the model, is within the Pierce 2 Gulch Sand Aquifer. I mean those inputs -- the 3 Pierce Gulch Sand Aquifer stratifies that -- or 4 straddles that model boundary. There is 5 additional miles of Pierce Gulch Sand Aquifer 6 above the model boundary, because even the Swift 7 wells that we've talked about are to the east of 8 the model boundary. They're clearly in the Pierce 9 Gulch Sand Aquifer, and several miles above there 10 are still within the Pierce Gulch Sand Aquifer, in 11 my concept of how it lays in. 12 Q. So are you saying, then, that there is 13 some travel time that's not accounted for in your 14 modeling that occurs upgradient from the model 15 boundary? 16 A. That is what I'm saying. And not only 17 within the Pierce Gulch Sand Aquifer, but within 18 other sand deposits, like the Terteling Springs 19 sand, sand facies of the Terteling Springs in the 20 upper basin where we know there is a reach, a 21 losing reach of the Boise River, the so-called 22 above Capitol Bridge reach. 23 But it also relates to the fact that 24 when we talk about an order of magnitude less than 25 the estimated age of the water in the regional

Page 1339 1 aquifer system, I think there's a misunderstanding 2 generally about the ages calculated in the 3 Treasure Valley Hydrologic Project. And I think 4 that because I'm soon to go off here and our 5 expert Mr. Glanzman is more versed in the age 6 dating of water than I am, I submit that it would 7 be better to have him comment. 8 The physical nature of the system is 9 that the path from a molecule of water entering 10 the system to the M3 is more tortious than is 11 being calculated by the edge of the model and the 12 direct path goes. 13 MR. FEREDAY: Thank you very much. No 14 further questions. 15 THE HEARING OFFICER: Okay. Mr. Thornton, 16 recross examination? 17 May I remind the parties, too, that 18 the recross needs to be within the scope of the 19 questions that were asked by Mr. Fereday. 20 MR. THORNTON: The ones that were just 21 asked by Mr. Fereday; correct? 22 THE HEARING OFFICER: Yes. I need to limit 23 it, or we could be here a lot longer. 24 MR. THORNTON: I'm just formulating. 25 THE HEARING OFFICER: Okay. Shall we go	Page 1341 1 A. That would be anyone as a three-point 2 problem, and that -- that's true, if that's all 3 you have. Of course, we have a lot more data 4 points than that. 5 Q. And then how many data points do you 6 have? 7 A. Well, I think in our reports, that 8 would be in the amended -- second amended 9 application or the hydrogeologic framework first 10 year characterization report. 11 MR. LAWRENCE: That's Exhibit 42, tab A4. 12 MR. THORNTON: Page number? 13 THE WITNESS: I'm coming. 14 This is in Exhibit 42, tab A, tab 4, 15 M3 Eagle Regional Hydrogeologic Characterization 16 North Ada County and Gem County, Idaho, Year One 17 Progress Report, dated May 4th, 2007. And if you 18 go to the figures and go to figure 2 and 19 figure 3 -- they're on opposing pages -- figure 2 20 shows one, two, three, four, five -- seven 21 geophysical logs that we used to do what you're 22 suggesting, to project and define the base of the 23 Pierce Gulch Sand Aquifer. 24 And then if you go to figure 3, you'll 25 see the locations of many of those wells and other
Page 1340 1 off the record, Mr. Thornton? 2 MR. THORNTON: I'm ready. I'm sorry. 3 THE HEARING OFFICER: Okay. We're ready, 4 Mr. Squires. 5 THE WITNESS: Oh, I'm sorry. 6 7 RECROSS EXAMINATION 8 BY MR. THORNTON: 9 Q. Mr. Squires, you just testified that 10 correlating data between wells along the strike of 11 the sand layer is acceptable; is that correct? 12 A. Well, if you can make a correlation, 13 that's true. 14 Q. Along the strike of the sand layer. 15 Excuse me. 16 A. If there's a correlation there, it's 17 certainly acceptable. 18 Q. And is that -- would you agree that 19 that's appropriate over long distances? 20 A. Certainly can be. 21 Q. Okay. And then referring to your 22 illustration, the finding a dip in strike when you 23 have your white, 8 1/2 by 11 piece of paper, is it 24 not a common practice -- is it a common practice 25 to have three data points to define dip in strike?	Page 1342 1 wells represented by the triangular portions of 2 the -- on the map. 3 Q. (BY MR. THORNTON): And that is -- is 4 that on -- 5 A. That's figure 3. It's the next 6 opposite page to figure 2. 7 Q. All right. 8 A. And in that particular map -- 9 Q. Excuse me. The map you're referring 10 to is figure 3; correct? 11 A. Yeah. 12 Q. Okay. 13 A. It appears that we have about 13 data 14 points -- 13 or perhaps even 14 data points in 15 that map that we based the dip of the bottom of 16 the base of the Pierce Gulch Aquifer. 17 Q. And so where are the -- on this 18 figure 3, where are the data points for the 19 Payette River area? 20 A. Well, they're not on here. Those are 21 in a later document that we've already talked 22 about using the deep exploration wells showing the 23 same geophysical character that's shown in 24 figure 2. 25 Q. How many deep exploration wells were

Page 1343 1 there? 2 A. Well, overall, there were quite a 3 number. We presented, I think -- I better go to 4 the exhibit. That's the submittal by S.H. Wood -- 5 MR. LAWRENCE: That's Exhibit -- 6 THE WITNESS: -- submitted on 7 November 26th. 8 MR. LAWRENCE: -- 19. 9 THE WITNESS: If memory serves me, there 10 were at least eight data points. 11 Q. (BY MR. THORNTON): And you're 12 thinking eight data points in the Payette Valley? 13 A. No. In the Payette -- directly in the 14 Payette River Valley, I know that we have two that 15 we presented: And that was the Ted Daws well and 16 the Oroco -- I can't remember right now. I'd have 17 to look at that. 18 MR. FEREDAY: Mr. Hearing Officer, it might 19 help to refer to Exhibit 19A and 19C, which are 20 Dr. Wood's reports that I believe Mr. Thornton is 21 referring to. 22 Q. (BY MR. THORNTON): And if I could 23 ask, Mr. Squires, are those known as the El Paso 24 Natural Gas/Virgil Johnson, and in addition the 25 Oroco O&G/Ted Daws?	Page 1345 1 well drilled by El Paso Natural Gas and the Oroco 2 Oil and Gas/Ted Daws well. 3 Q. All right. Okay. And the dashed line 4 that is on figure 3 that is between the El Paso 5 Natural Gas No. 1 well just to the -- I guess it 6 would be to the north of -- well, I think you can 7 see that on the map, and then there's a dashed 8 line that goes to the El Paso Natural Gas No. 2, 9 that dashed line -- 10 A. Yes, that's what we refer to as the 11 line of section. 12 Q. Yeah. 13 -- does that define the strike? 14 A. No. 15 Q. Okay. What defines the strike? 16 A. Well, the strike -- 17 MR. FEREDAY: Objection. It's been asked 18 and answered. 19 THE HEARING OFFICER: Overruled. 20 Q. (BY MR. THORNTON): Okay. 21 THE HEARING OFFICER: I think some 22 clarification would still be helpful. 23 THE WITNESS: Yeah, the line of strike is 24 the -- it's the direction that -- where a dipping 25 layer would break a horizontal plain.
Page 1344 1 A. Those are some of the wells, yes. 2 There's eight geophysical logs that got submitted 3 with that document, with that information. 4 Q. And are those the two that are in the 5 Payette Valley, the Ted Daws and the Virgil 6 Johnson wells? 7 A. I know it's Ted Daws, but I want to 8 just look at the information to see if it's the 9 Virgil Johnson. 10 Q. Okay. 11 A. And I want to look at -- 12 Q. I just wondered if I could suggest -- 13 it may or may not be what you're after. On 14 figure -- on Exhibit 45, figure 3. 15 A. Yes. 16 Q. Perhaps that will... 17 A. Yeah, the El Paso Natural Gas/Virgil 18 Johnson and the Oroco Oil and Gas/Ted Daws wells, 19 those two wells are in the Payette River Valley. 20 Q. And in a prior discussion, those, 21 again, were 18, 23 miles apart, between your 22 El Paso No. 1 versus your El Paso No. 1 and 2 on 23 figure 3; correct? 24 A. I think we said that they're somewhere 25 between 17 and 23 miles between the Webber State	Page 1346 1 Q. (BY MR. THORNTON): Right. 2 A. And it's a good question because these 3 lines that are shown on the map here are more what 4 we call apparent dip. They don't go along the 5 line of strike, nor do they go down-dip -- 6 Q. Okay. 7 A. -- per se, you know, exactly. And so 8 I don't know what else I can say to that. 9 Q. Okay. 10 A. But the line between El Paso Natural 11 Gas No. 1 well and the El Paso Natural Gas/Virgil 12 Johnson well is not along strike. 13 Q. Okay. Could you refer in this 14 figure 3 the approximate location of the strike 15 that you were talking about, where it is on this 16 map, in general? 17 A. Well, I can tell you where it is on 18 the M3 Eagle property. 19 Q. Okay. 20 A. And it's the green line that we've 21 referred to. 22 Q. Okay. So I believe you just said that 23 between El Paso Natural Gas No. 1 well and El Paso 24 Natural Gas No. 2 was not on strike; correct? 25 A. That is correct.

Page 1347 1 Q. Okay. I'll refer back to document 2 No. 68, which is Dr. Wood's paper on hydrologic 3 framework in the Boise Valley. 4 A. Yes. 5 Q. Page 7, the top left where Dr. Wood 6 states "One should view with distrust 7 cross-sections attempting to correlate over 8 distances of several miles, unless the section is 9 along the strike and the sedimentary facies is 10 identified." 11 I believe, did you not just say that 12 those two points/cross-sections were not on 13 strike? 14 A. I did say that, yes. 15 Q. And how would you reconcile Dr. Wood's 16 statement that we should view with distrust this 17 cross-section over several miles that's not on 18 strike? 19 A. Well, I think I pointed out earlier 20 that first of all, we know what the facies is. 21 And not only do we know what the facies is, but we 22 have also a representative characteristic 23 signature within the geophysical logs that we can 24 identify with that facies. 25 And so it's very clear in my mind that	Page 1349 1 distinctive geophysical log character, but he also 2 has very deep wells to work with. So I believe 3 his correlations are correct. 4 I believe that it very clearly shows 5 that there is a continuance of the sand from the 6 Boise Basin to the Payette Basin. I don't think 7 there's any question about that. 8 And furthermore, I think it is the 9 basic underlying understanding of the depositional 10 environment, just like this morning when we talked 11 about the Terteling Springs Aquifer and the 12 locally-named Willow Creek Aquifer that that flows 13 from the Boise Basin to the Payette Basin. 14 Well, this is just another strata in 15 that same depositional environment. There's no 16 reason to think that the overlying aquifer doesn't 17 behave the same in the Pierce Gulch Sand Aquifer 18 as it does in the underlying and older Terteling 19 Springs -- sand facies of the Terteling Springs. 20 Q. So do you know for certain that the -- 21 what you are identifying as Pierce Gulch sand over 22 down-dip or downgradient from Emmett, down the 23 valley, that identified in the El Paso Natural Gas 24 No. 2, do you know for certain that that isn't 25 part of the depositional feature brought in by the
Page 1348 1 the geophysical log signature that we see in all 2 of these wells represents the same stratigraphic 3 depositional system. 4 And so you'd have to ask Dr. Wood what 5 he actually meant precisely when he made that 6 statement, but I think what he is saying is that 7 if you -- in the lack of good information -- he's 8 not talking about geophysical logs here, he's just 9 saying based on the information that we typically 10 have and because of the dip of the aquifer, you 11 must be -- you must question correlations that are 12 down-dip, because over long distances, as I 13 described, if you have even a 2-degree or 3-degree 14 dip, you're still talking about 320 feet 15 difference per mile. 16 And since the average depth of wells 17 in the Boise Valley is somewhere -- I'm going to 18 suggest in the neighborhood of, you know, 19 350 feet, once you get more than a mile away, 20 correlation between those wells cannot be done 21 because the aquifer's already 350 feet deep below 22 where your other well is if you're down strike. 23 But in this particular case, not only 24 does Dr. Wood know the facies, not only does he 25 have a very distinctive and questionably	Page 1350 1 Payette River, not the Boise River? 2 A. Well, I don't know that for certain. 3 I don't know what rivers existed at the time that 4 was being deposited. But the basic depositional 5 environment, which is a lake, starts out with the 6 lakeshore, that basic depositional environment I 7 believe is similar all around Lake Idaho. I 8 have -- I've recognized these same geophysical 9 characters on the south side of the plain where 10 they now go up to the Owyhee Mountains. 11 Q. Can you describe why the Pierce Gulch 12 sands in the Emmett Valley downgradient to, say, 13 the Leatha area or in this area for Natural Gas 14 No. 2, you're saying that's 300 feet lower, is 15 that correct, approximately, than the M3 property? 16 A. I think that Spence Wood made those 17 comments, that he predicted even back in 1994, 18 before he even had as much data as we have now, 19 that it might be on the order of 300 feet. 20 Q. Okay. So the depositional process, 21 when that was occurring when the Lake Idaho was 22 there, the question is, would not the elevation of 23 the depositional feature in the Emmett area be the 24 same elevation as a depositional feature in the 25 Boise Valley?

Page 1351 1 A. No. What we -- I think I indicated 2 earlier that as far as the high stand of the lake 3 that we see all around the northern margin of the 4 plain, we see the characteristic oolite deposits 5 that represent the high stand of the lake between 6 elevation 3600 and 3800. 7 Now, the present-day valleys, 8 obviously those rivers run into the Snake in 9 different areas. The Payette Basin runs into the 10 Snake at a much lower elevation than does the 11 Boise River. So it has a lower base level. So 12 it's operating against a lower base level. And 13 just by the natural physics of depositional 14 systems, that river is at a lower -- a lower 15 elevation than the Boise Valley. 16 And any river that runs into the Snake 17 as you move down valley will be at a lower 18 elevation. 19 Q. Were those delta deposits out of the 20 Payette River and the Boise River at different 21 elevations during the lake when the lake was at a 22 constant level surface? 23 MR. FEREDAY: Objection. This has been 24 discussed at length. And I believe it's beyond 25 the scope of redirect.	Page 1353 1 are drilled up closer to the strike and a series 2 of wells that are drilled down-dip, aren't those 3 lower wells going to eventually draw water away 4 from the shallower aquifer or the wells that are 5 closer to the strike? 6 A. Well, I -- I think that that's -- 7 that's a difficult question to answer, and the 8 reason being that we have a pressure in the 9 aquifer. And the way that the groundwater's 10 moving in the aquifer is to a gradient in the 11 aquifer. 12 And I think that if you have -- if you 13 have pumping wells -- let's use the example of if 14 you have pumping wells in Star, which is down-dip 15 in the aquifer compared to wells that are in east 16 Eagle, say Lexington Hills, and those are 17 separated by a number of miles, they're completed 18 into the same aquifer, and they have different 19 head levels, slightly different head levels, well, 20 there is a flow gradient most likely between the 21 Lexington Hills well and the Star well that 22 indicates that there's some flow in that 23 direction, because flow is, generally speaking, to 24 the west and the northwest, depending where you 25 are in the flow.
Page 1352 1 THE HEARING OFFICER: Sustained. 2 MR. THORNTON: No more questions. 3 THE HEARING OFFICER: Okay. Mr. Smith? 4 MR. ALAN SMITH: Thank you, sir. 5 6 RECROSS EXAMINATION 7 BY MR. ALAN SMITH: 8 Q. Mr. Squires, let's go back to this 9 strike. If you have a series of wells that are 10 drilled up closer to the strike, then the series 11 of wells down-dip, I think as you called it, 12 aren't those eventually going to draw water away 13 from the shallower wells, shallower aquifer? 14 THE HEARING OFFICER: Okay. Mr. Smith, I 15 will need you to speak up. 16 MR. ALAN SMITH: Okay. 17 THE HEARING OFFICER: It's almost not 18 audible for the rest of us that are here. 19 MR. ALAN SMITH: Okay. 20 THE HEARING OFFICER: You'll need to really 21 try hard to speak up as you continue. 22 MR. ALAN SMITH: I will. 23 THE HEARING OFFICER: Thank you. 24 Q. (BY MR. ALAN SMITH): Going back to 25 this strike. If you've got a series of wells that	Page 1354 1 But you could just as easily -- I mean 2 you could have wells in the up-dip section. And 3 if you had a well field in the up-dip section, 4 then you could lower water levels up there. I 5 mean you have to lower water levels in the system 6 to cause water to flow to a well. This is an 7 unmistakable thing. It's -- it has to happen. 8 It's how you get water to flow to a well. 9 It's not unlike your bathtub. You 10 could envision it as your bathtub. If you had a 11 bathtub filled with water and you also filled it 12 with sand -- okay? -- so you have a saturated 13 sand, and when you pull the plug on your bathtub, 14 just as a normal course, forget the sand for a 15 minute, and you see that cone that forms around 16 the drain, that's like a cone of depression from 17 the well. 18 That creates the low pressure over 19 there that makes the water in the bathtub flow to 20 the drain. That's why it flows out of the 21 bathtub. 22 And a well is very much like that, it 23 creates a low-pressure area in some part of the 24 aquifer, and water flows toward that well from all 25 directions. But you cannot get water to flow to a

Page 1355 1 well, any well, your well, a domestic well, supply 2 well, irrigation well, any well, you cannot get 3 water to flow toward that well without lowering 4 the pressure in the vicinity of that well. That's 5 how wells work. 6 Does that answer your question? 7 Q. I think so. Is it possible that the 8 wells up near the strike will have to be deepened 9 or redrilled? 10 A. Well, again, I'm trying to lead you 11 away from this idea that it doesn't really relate 12 to strike. Strike is a geometrical thing of how 13 the aquifer is. But I think I can be able to 14 maybe answer your question, if you'll permit me. 15 We just made this concept that you 16 have to lower water level to make water flow to a 17 well. And I think you have seen in our previous 18 testimony and in our previous graphs that show 19 that water levels -- when you pump a well, water 20 levels draw down around it. And we've seen water 21 levels in monitoring wells draw down, you know, 22 several feet. I think we talked about 7 feet in 23 the State and Linder monitoring well due to the 24 new Eagle field well or whatever. 25 Well, some wells, many wells,	Page 1357 1 in the aquifer, to cause water to flow to these 2 wells. And I do believe that there are certain 3 wells in the Boise Valley that are precariously 4 obtaining water without having its feet wet by 5 very much. 6 And so I predict that there will -- as 7 we've said in our reports, there will be wells for 8 which the water levels will decline enough to 9 impact their production. That is going to happen. 10 And we've stated that all the way 11 through, and I think it's a pretty widely known 12 phenomenon. It's the way aquifers work. 13 MR. ALAN SMITH: No further questions. 14 THE HEARING OFFICER: Okay. Mr. Edwards? 15 MR. EDWARDS: No. 16 THE HEARING OFFICER: Thank you, 17 Mr. Squires. 18 Next witness, Mr. Fereday? 19 MR. FEREDAY: Mr. Richard Glanzman, please. 20 THE HEARING OFFICER: Mr. Glanzman, did I 21 pronounce it correctly? 22 MR. GLANZMAN: Yes, sir. 23 /// 24 /// 25 ///
Page 1356 1 especially domestic wells, have relied on and have 2 enjoyed very shallow groundwater levels in this 3 area, because water is not very far below ground 4 in most of this area. So wells don't have to be 5 drilled that deep. 6 And I think out of the 3,000 wells 7 that we investigated, 60 percent of them are 8 shallower than 150 feet. Those are -- you know, 9 that's -- so as a community, we're enjoying very 10 high water levels. 11 Some of those wells -- I mean but 12 those wells range from 30 feet to 400 feet. And 13 some of those wells are not completed deep enough 14 into the water table, as you had suggested a 15 situation where maybe there was 2 feet of water in 16 the well. Some of those wells are not completed 17 deep enough to allow additional well fields to be 18 developed without the water level being lowered, 19 because as you get wells all around the valley and 20 the cones of depression begin to coalesce, you 21 will see predictably a decline in the overall 22 aquifer pressures. 23 Now, that doesn't mean at all that 24 you're mining the aquifer. All that means is that 25 you're lowering the water pressures, the pressures	Page 1358 1 RICHARD K. GLANZMAN, 2 having been called as a witness by M3 Eagle LLC, 3 was duly sworn and testified as follows: 4 5 THE HEARING OFFICER: Thank you. Please be 6 seated. 7 8 DIRECT EXAMINATION 9 BY MR. FEREDAY: 10 Q. Mr. Glanzman, please state your name 11 and spell it, and also give us your business 12 address. 13 A. My name is Richard K. Glanzman, 14 G-l-a-n-z-m-a-n. I'm at 2752 South Braun, 15 B-r-a-u-n, Way in Lakewood, one word, Colorado 16 80228. 17 Q. And what is your business, sir? 18 A. I'm a geochemist. 19 Q. What is your educational background in 20 geochemistry or geohydrology? 21 A. I've got a bachelor of science degree 22 in geology from the University of Utah, and then a 23 master of science in geochemistry from the 24 Colorado School of Mines. 25 Q. And how long have you been working in

Page 1359 1 this field? 2 A. About 18 years training and experience 3 in water basin studies, basically in geochemistry 4 with the U.S. Geological Survey. Then relevant to 5 this hearing an additional 23 years with CH2M Hill 6 working on water balance of about 50 percent 7 municipal water and well field studies and 8 contaminant hydrology. 9 Q. Have you conducted geochemical studies 10 around the country? Or where have you done this 11 work? 12 A. Worldwide. 13 Q. Worldwide? 14 A. Yes. Starting in Colorado, western 15 area of the United States, expanding out to 16 worldwide, Great Britain, Saudi Arabia, Indonesia, 17 Taiwan. 18 Q. Have you any experience working on 19 geochemistry in Ada County, other than in this 20 case? 21 A. Yes. Several studies, both with 22 CH2M Hill and other studies with Mr. Squires. 23 Q. I'd like to refer to Exhibit 32, 24 tab I, I believe it is. I believe that's your 25 resumé.	Page 1361 1 THE HEARING OFFICER: Yes. 2 (Recess.) 3 THE HEARING OFFICER: Now we're recording. 4 Okay. 5 Q. (BY MR. FEREDAY): Mr. Glanzman, you 6 have provided a PowerPoint here today; is that 7 correct? 8 A. That is correct. 9 Q. And I have given copies of this to the 10 protestants and also to the Hearing Officer. And 11 I see we have it projected up here. And I'd like 12 to invite you to speak from this, if that would be 13 convenient for you; is that acceptable? 14 A. That is acceptable. 15 Q. With regard to your work for M3, you 16 produced, along with Mr. Squires, I take it, what 17 has been introduced as Exhibit 43, the geochem 18 report? 19 A. That is correct. And that is the 20 slide that's up at the moment, the cover of that 21 particular document. 22 Q. Okay. And could you give us just an 23 overview of what it is you did in preparing this 24 report? 25 A. I assembled the aqueous geochemistry
Page 1360 1 I just wanted to ask you, 2 Mr. Glanzman, whether that is still an accurate 3 resumé? 4 A. Yes, it looks like my master resumé 5 from CH2M Hill. 6 Q. So that is an accurate -- 7 A. It is accurate. 8 Q. -- resumé? 9 A. Yes. 10 Q. I'd like you to tell us now what work 11 you've been asked to do and have done for the M3 12 Eagle project. And I note that you have a 13 PowerPoint here, or at least I understand you do. 14 And if you'd like us to go through that, we can do 15 that on the screen and also you can refer to it in 16 hard copy, if you'd like. 17 A. I'd like to do that very much. I've 18 been asked to take a look at the aqueous 19 geochemistry, worked with Ed Squires to -- 20 THE COURT REPORTER: I'm having a hard time 21 hearing you. I need you to keep your voice up. 22 Maybe we can move that mic closer or speak up 23 or... 24 MR. FEREDAY: Can we go off the record just 25 for a second, please?	Page 1362 1 on the groundwater and other -- any chemistry that 2 was developed for this M3 project with Ed Squires 3 where we worked together. My working on the 4 geochemistry; Ed working on the geohydrology. 5 As it says on that overview, Ed 6 Squires presented that hydrogeology in the last 7 few days. 8 As a total we had 84 chemical analyses 9 that were interpreted and part of this 10 interpretation. 11 Q. Now, Mr. Glanzman, you're a 12 geohydrologist yourself, are you not? 13 A. I am. 14 Q. Okay. Continue. 15 A. As a geochemist I want to know what am 16 I starting with as far as aqueous geochemistry. 17 In this case we have precipitation and Boise River 18 chemistry that we have as end members as potential 19 recharge to the aquifers that we're going to be 20 discussing. 21 Q. Now, by "end members," is that then 22 referring to, more or less, the extremes of what 23 you might deal with in the possible universe of 24 recharge sources? 25 A. They are the primary resources being

Page 1363 1 considered. 2 Q. Okay. 3 A. And then we are also considering the 4 potential for mixing between the aquifers that are 5 shown here and the wells -- well areas that are 6 shown. For the groundwater geochemistry, we 7 looked at the Pierce Gulch Sand Aquifer, Terteling 8 Springs formation, Willow Creek Aquifer, Spring 9 Valley Ranch wells, and the Emmett wells as 10 discrete areas. 11 Next slide, I believe, will show you 12 where those are. Well, it's difficult to see. 13 Emmett wells are located up here to 14 the north end. Down at the south end we have 15 wells -- depth intervals of wells completed within 16 the Terteling Springs. The green line, which is 17 very difficult to see. It's very difficult to see 18 the green line that Ed was referring to, but there 19 is a green line up here that separates right 20 through there (indicating), Willow Creek Aquifer 21 on the north and Pierce Gulch Aquifer here on most 22 of the south side of that line. 23 Q. Now, would it be accurate to say that 24 the three Lynn wells and SVR-6 and SVR-10 are 25 within the Willow Creek Aquifer?	Page 1365 1 back down to the southeast again and the Gary Lane 2 well, for example, the Terteling Springs Aquifer, 3 I take it, is deeper than the Pierce Gulch Sand 4 Aquifer at that location? 5 A. Yes. Let's go to the next slide. 6 Q. Okay. 7 A. And we've got a vertical -- oh. 8 Q. No. 9 A. To the cross-section. 10 Q. The cross-section. Is that page 13? 11 A. That's page 13. There we go. 12 This is a cross-section that shows the 13 vertical relationship between the Pierce Gulch 14 Aquifer, which has an upper and lower part, and 15 those will be important when we get into 16 discussion of the groundwater from the Pierce 17 Gulch. 18 Then you have the Terteling Springs 19 Mudstone that underlies that, that has a central 20 sand aquifer that we've got water analyses for 21 that we were just referring to -- 22 Q. Okay. 23 A. -- the Gary Lane. There's well 24 completions in the south end of the area that we 25 studied that are completed in that small
Page 1364 1 A. That is correct. 2 Q. And you mentioned earlier that some of 3 the wells down to the southeast -- I'm not sure 4 which ones you were pointing to -- perhaps State 5 Street or -- 6 A. I apologize for interrupting. 7 Q. -- down to the southeast. 8 A. Yeah, down to the southeast for the 9 Terteling Springs. 10 Q. Yeah, you mentioned -- 11 A. Yes. 12 Q. -- that some of those completions are 13 in the Terteling Springs. 14 Could you explain that, please. 15 A. The Gary Lane well, there are depth 16 wells of the Swift well. So three in particular. 17 And there are depth intervals in the State and 18 Linder well that are completed in the Terteling 19 Springs. 20 Q. Do they also have depth intervals 21 completed in the Pierce Gulch Sand Aquifer? 22 A. They do. The 84 analyses include many 23 depth intervals and discrete wells, as well as one 24 spring. 25 Q. Now, the Terteling Spring -- to go	Page 1366 1 sandstone, within those mudstones. 2 Then across the way we have the -- 3 just a second there. We have the Willow Creek 4 formation on the right-hand side of that graph. 5 Give you the general idea of the vertical 6 distribution of that cross-section. 7 And if we go back to the last slide, 8 you can see where that cross-section extends 9 across the mapped area. 10 Q. Okay. Is that back to page 4, I 11 believe it is? 12 A. That is on page 4. You can see this 13 dotted, dashed line that goes across here. That 14 is where that cross-section is. 15 We'll be coming back to that 16 cross-section periodically throughout this 17 discussion. 18 Q. Thank you. 19 So you mentioned these end members of 20 rainfall and the Boise River. 21 What can you tell us about your work 22 starting with that -- at that point? 23 A. The most basic principle that we use 24 is a total dissolved solids. It gives us an idea 25 of how much -- or excuse me, how much solubility

Page 1367 1 we're dealing with; what minerals we might be 2 dealing with; what is their distribution within 3 each of the aquifers; how do they vary from 4 rainfall from the Boise River; how much are we 5 increasing the total dissolved solids. 6 And as you can see on this 7 slide, the rainfall has only 5.4 milligrams per 8 liter, total dissolved solids from USGS Wood and 9 Low, 1988, references in the report. 10 Boise River water was 52 milligrams 11 per liter, ten times more. So just exposure to 12 the surface environment itself increases the total 13 dissolved solids an order of magnitude ten times. 14 And then each of the aquifers, we've 15 taken the averages, and we have the distribution 16 of each of the -- for each of the aquifers and for 17 the well areas. We have the range of total 18 dissolved solids. 19 As you can see, the lowest average 20 total dissolved solids is in the Willow Creek 21 Aquifer, WCA on that graph. But the Pierce Gulch 22 Sand Aquifer and the Terteling Springs formation, 23 PGSA and TSF, have the next lowest average. But 24 you can see they have a fairly broad distribution. 25 Getting down to the Spring Valley	Page 1369 1 or more percent of the total dissolved solids. 2 Q. And I see where you've moved to slide 3 six now. 4 What is major ion chemistry? 5 A. Major ion chemistry is the ions that 6 have the highest concentration, both 7 positively-charged and negatively-charged that are 8 dissolved in the water forming the total dissolved 9 solids. Of those, they are calcium, magnesium, 10 sodium plus potassium. Potassium is -- in this 11 graph is combined because you have similar 12 chemical characteristics. Those are the 13 positive-charged ions. 14 Negative-charged ions are the 15 bicarbonate, the sulfate, and the chloride. 16 Q. Now, did you obtain major ion 17 chemistry from these 84 samples that you mentioned 18 earlier? 19 A. Each of these 84 analyses has a 20 complete analysis of the major ions plus a number 21 of trace elements that we'll be talking about 22 later. 23 Q. What percentage of groundwater 24 chemistry is comprised of these major ions? 25 A. All groundwater and surface water
Page 1368 1 Ranch wells, it has the next highest. And 2 finally, the Emmett wells have the highest average 3 total dissolved solids. 4 Q. What does this slide tell you, or what 5 do these data tell you, Mr. Glanzman, about these 6 various aquifer units? 7 A. Looking at the various distributions 8 of total dissolved solids, the PGSA, the TSF have 9 minimal solubility product -- or minimal 10 solubility minerals within the aquifer; in other 11 words, there's not very much that's soluble within 12 those aquifers. 13 As we go up -- and the Willow -- or 14 excuse me. The WCA with a very low level, that, 15 we'd need to think about a little bit. And then 16 the other two, they have -- either there's 17 something else going on that we need to know about 18 or they have minerals that have a higher 19 solubility. 20 So in order to determine now -- 21 okay? -- whether there is mixing and whether there 22 is -- what the potential source is, we have to 23 look at the major ion chemistry that makes up the 24 total dissolved solids. 25 There are seven ions that make up 98	Page 1370 1 chemistry is dominated by these major ion 2 chemistry. 3 Q. So what do we see shown here in this 4 trilinear diagram on slide six, sir? 5 A. Well, as you can see, all the points 6 are plotted for all of the various units there, 7 and it looks pretty complex. 8 Q. All 84 points are -- 9 A. All 84 points are on there. And you 10 can see that it is quite widespread and seeming to 11 be quite complex. We'll get to -- we'll separate 12 each of those out, and you'll see they simplify 13 very rapidly, in most cases. 14 Q. Now, when you say you separate them 15 out, are you separating them out according to 16 aquifer location? 17 A. Yes, that is correct. 18 Q. Okay. 19 A. Art Piper designed this diagram. The 20 lower left triangle is the positively-charged 21 ions. The lower right is the negatively-charged 22 ions. What he wanted to know -- and this is 23 precomputer time -- thank goodness we have that 24 now. One point could -- you could plot one point 25 that gives you the percentages of all of the

Page 1371 1 positive-charged ions, another point -- this is on 2 the lower right -- lower right we talk about the 3 negative ions. One point on that gives you the 4 percentage of each of the three negative ions. 5 Then if you project those points up 6 into the diagram, you have one point that tells 7 you all about the six ions, how they relate to one 8 another within that water analysis. 9 Q. Is the Piper diagram an accepted 10 method in your field, sir, for analyzing water 11 chemistry? 12 A. Has been for more than 40 years, yes. 13 Q. Who was Mr. Piper, or who is he? 14 A. Art Piper was a USGS employee in 15 charge of the California division of the state 16 office of the USGS. And at that time there was no 17 computer, so he needed a way of characterizing and 18 visually showing what the major ion chemistry 19 looks like and how it relates from one well to 20 another or from one sample to another of any type 21 of increased geochemistry. 22 Q. And even since the advent of 23 computers, we still use the Piper diagram? 24 A. Repeatedly. 25 So on the next diagram -- or excuse	Page 1373 1 aqueous geochemistry changes as the groundwater 2 moves through the aquifer. 3 Q. But here what you're saying, then, is 4 that you see very little change in the fundamental 5 groundwater chemistry, despite 15 miles of 6 difference between sample points? 7 A. That is correct. 8 Q. What does this tell you about the 9 makeup, the physical makeup of the aquifer unit 10 itself? Is it full of clay? Is it full of sand? 11 Is it full of fine sand? Is there anything you 12 can tell us about that? 13 A. It has to be filled with 14 coarse-grained material in which water can move 15 through rapidly, because if it is left to its own 16 devices under any length of time, it will increase 17 and change major ion -- increase total dissolved 18 solids and change major ion chemistry, which is 19 what normally happens in aquifers over that 20 lateral distance. 21 Q. Okay. Now, I see there are two 22 cross-shaped indicators uptrending toward 23 precipitation out of that Boise River cluster. 24 What are those and why are they there? 25 A. As you can see from the index -- or
Page 1372 1 me, the next slide, what we're showing here is the 2 Pierce Gulch Aquifer analyses. You see up here 3 we -- they all group right around in a cluster 4 here (indicating) that envelopes the Boise River, 5 which is right here (indicating). And it's far 6 away from the precipitation. 7 What we want to do -- if we want to 8 evaluate mixing, what we do is we draw a line 9 between the end members, Boise River out to 10 precipitation, and wherever that line, the 11 percentage moving along that line gives you some 12 idea of the percentage contribution from both of 13 those sources. 14 So in this case we're saying that 15 90 -- 85 to 90 percent of the water in the Pierce 16 Gulch Aquifer is from the Boise River. That's 17 quite unusual. 18 Q. Why do you say it's unusual? 19 A. Those deltaic sands -- I have in my 20 40-plus years' experience have never seen a group 21 of wells along a 12 to 15-mile lateral distance 22 that cluster like that. 23 Normally what happens is that you see 24 a trend in some direction. And we will see those 25 in the other slides, where you see where the	Page 1374 1 the index up here, we've separated -- we tried to 2 separate as best we could wells that were 3 completed in the lower Pierce Gulch Sand Aquifer 4 and the upper Pierce Gulch Sand Aquifer. 5 What we were trying to do was discover 6 if precipitation was favoring the upper part; in 7 other words, was there a surface water 8 infiltration that got into the upper part that 9 would be shown by the major ion chemistry or is 10 there water moving up from the Terteling Springs, 11 for example, into the Pierce Gulch Aquifer. In 12 other words, we're trying to evaluate mixing. 13 Q. Now -- 14 A. The plus -- 15 Q. Go ahead. 16 A. In answer to your question on the 17 pluses, the pluses are the lower Pierce Gulch Sand 18 Aquifer. And you'll notice that they are the two 19 that are trending toward precipitation. In other 20 words, here we have the lower part of the Pierce 21 Gulch Sand Aquifer looking like it's got 22 precipitation, an additional component of 23 precipitation mixing with it. 24 Q. Now, why would that be? 25 A. Could we go back to the cross-section?

Page 1375 1 Q. Yes. 2 A. That's No. 13. 3 Q. No. 13. 4 A. There we are. That well is this one 5 right here (indicating). And it's where, as Ed 6 was describing -- or Ed Squires was describing 7 earlier where this lower Pierce Gulch Sand Aquifer 8 comes upgradient and comes near the -- 9 Q. Comes up -- 10 A. -- up near the surface. And that is 11 M3 Eagle test well 2, zone 1. So that's why 12 precipitation is indeed mixing in with the Pierce 13 Gulch Sand Aquifer at that well location. 14 Q. And I take it from your testimony just 15 a minute ago that that might be to the tune of 10 16 or 15 percent, something along those lines? 17 A. There about. I mean as an estimate. 18 Q. What does this -- to go back to slide 19 7 where we last were, what does this tell you 20 about the nature of this aquifer? Does it appear 21 to be compartmentalized? Is there interruption in 22 groundwater flow indicated in any way from this 23 geochemistry? 24 A. No, there is not. And you can see in 25 the positive-charged ions in the lower right	Page 1377 1 question? 2 A. Stagnation would have the same effect. 3 If you envision the most stagnant water that we 4 know of is in oil field brines, they become sodium 5 chloride type waters. And there is a regular 6 progression of major ion chemistry that tells you 7 how stagnant that is. In this case, this is 8 calcium-bicarbonate water. There is no stagnant 9 water here. 10 Q. What does this tell you about 11 transmissivity in this aquifer, if anything? 12 A. It agrees with Ed Squires' estimate of 13 very high transmissivity aquifer. 14 Q. I see we have slide No. 8 up there. 15 Could you tell us what this shows. 16 A. This slide is a synopsis of what's in 17 the report on the Boise Pierce Gulch Sand Aquifer. 18 We just briefly put -- went into several of those 19 aspects. 20 First of all, it is Boise River 21 recharge in the Pierce Gulch Sand Aquifer. It has 22 very little precipitation. It is a discrete 23 regional aquifer within the Boise aquifer. In 24 other words, we can define what it is within that 25 aquifer.
Page 1376 1 triangle -- 2 Q. The lower left? 3 A. Yeah, lower left. Excuse me. Lower 4 left triangle, we're looking at -- here is where 5 you would investigate for ion exchange or the 6 potential for ion exchange where calcium and 7 sodium would exchange. And we would see a trend 8 that would go this way along that graph 9 (indicating). And you can see that that cluster 10 does not have that trend. 11 Q. And what does that mean to us? 12 A. That means you don't -- you have 13 minimal, if any, ion exchange, which means you 14 don't have any clays. Clays are minimal in that 15 aquifer, which is the same thing as we were saying 16 earlier about rapid transit through a 17 coarse-grained aquifer. 18 And no, we don't have any partition. 19 We don't have any major changes. We don't have 20 any measurable changes in the major ion chemistry 21 or the total dissolved solids that would indicate 22 compartmentalization. 23 Q. Okay. What about stagnation of 24 groundwater in any particular area, what do you -- 25 what do these tell us with regard to that	Page 1378 1 Q. Now, why do you say it's a discrete 2 regional aquifer based on geochemistry? 3 A. Because of that cluster we just saw, 4 it is highly characteristic, no other groundwater 5 that we have has those characteristics. As a 6 matter of fact, other groundwaters, as we will see 7 in a moment, have different groundwater 8 chemistries. So it is discrete, identifiable, 9 documented that this -- this segment of the 10 aquifer -- of the Boise aquifer is discrete. 11 Q. Does this discrete aquifer description 12 you've just given comport with the geologic 13 setting and physical and stratigraphic 14 descriptions that Mr. Squires and Dr. Wood have 15 testified to? 16 A. Yes, it does. 17 Q. Continue, please. 18 A. Again, the average total dissolved 19 solids is a fairly low 191, ranges from 82 to 404. 20 Remember that even -- well, if you remember the 21 total dissolved solids for the Boise River is only 22 52, that again tells us that 82 -- that's pretty 23 close to the Boise River total dissolved solids. 24 It has a near notarial pH; in other 25 words, causing the pH either to go alkaline or

Page 1379 1 acidic. It's highly oxidized. And there's 2 another clue. 3 The oxidation potential, plus 334. A 4 normal alluvial aquifer has in the region of 200 5 to 300. Any alluvial aquifer has a plus 200 to 6 300. This is quite oxidized. 7 Q. Now, what is 334 mv? What does that 8 mean? 9 A. Millivolts. And this is the activity 10 of the electrons in the water. It is the redox 11 potential. 12 Q. What's "redox potential"? 13 A. It is the activity of the electrons in 14 the water.its analogy would be the pH is the 15 activity of the protium, p-r-o-t-i-u-m, ions in 16 the water. In other words, the hydrogen ion -- 17 positively-charged hydrogen ion. 18 Q. So what's the significance of it being 19 highly oxidized? 20 A. That means it cannot be stagnant, it 21 cannot be compartmentalized, and it must be 22 moving. This is a typical of what you would see 23 in surface water. 24 Q. That is not typical? 25 A. This value that you see here for that	Page 1381 1 A. Yes, I do. 2 Q. Continue. 3 A. This would be supportive of that. 4 Q. Okay. 5 A. Again, the TOC is very low. 8/10ths 6 of a milligram per liter. 7 Q. What's "TOC"? 8 A. Total organic carbon. The nitrate 9 nitrogen, .42, very low. Ammonia nitrate, I think 10 is -- yeah, .08 milligrams per liter. All of 11 those are very low nitrate. Means that it hasn't 12 been exposed to the surface environment, and 13 certainly doesn't include irrigation waters. 14 Q. Does not? 15 A. Does not. It has low iron and 16 manganese. You might already have known that from 17 the pH and the redox potential. 18 Q. Yes, I recognized that immediately. 19 And there is a very low arsenic concentration, 20 well within the drinking water standard of 21 0.01 milligrams per liter. Low arsenic. 22 And your question about productivity 23 of this aquifer, we could judge that perhaps by 24 comparing it to the Floating River, Goddard, and 25 HP wells.
Page 1380 1 redox at 334 millivolts is what you would normally 2 see for a surface water. That's very oxidized. 3 Q. Okay. Continue. 4 A. It has the same major ion chemistry 5 over the TDS and spatial ranges. In other words, 6 that whole TDS from 82 to 404 total dissolved 7 solids doesn't change major ion chemistry. That's 8 amazing. That has to be a very coherent 9 mineralogy throughout that system with limited 10 clays. A very unusual aquifer. 11 Q. What does that suggest to you with 12 regard to productivity of the aquifer, if 13 anything? 14 A. I can only -- that has to do with the 15 volume of water that was able to be transmitted. 16 As transmissive and as oxidized as this water is, 17 it must be moving rapidly through that aquifer. 18 Q. Okay. 19 A. So it must have a high productivity, 20 given the thicknesses and other characteristics 21 that Ed Squires has already described. It is 22 quite saying the same thing. 23 Q. Do you agree with what Mr. Squires has 24 said about his view of the productivity of this 25 aquifer?	Page 1382 1 THE COURT REPORTER: Say that again. 2 Q. (BY MR. FEREDAY): Floating Feather? 3 A. Floating Feather, Goddard, 4 G-o-d-d-a-r-d, and HP. These are names of wells 5 that are on that diagram, if you want to go back 6 to it. 7 Q. Mr. Glanzman, is there any doubt in 8 your mind that the Floating Feather, Goddard, and 9 HP wells, as well as the wells in the Pierce Gulch 10 Sand Aquifer on the M3 property are all in the 11 same aquifer? 12 A. I have no doubt. 13 Q. Okay. What about the quality of this 14 water for drinking and municipal purposes? 15 A. As you can tell from the chemistry 16 that's been presented, it's an excellent quality. 17 Q. Did you hear the testimony of 18 Mr. Roger Dittus? 19 A. Yes, I did. 20 Q. Did you hear anything in his testimony 21 about his experience with United Water wells that 22 would in any way conflict with your view of this 23 aquifer? 24 A. No, I did not. 25 Q. Let's continue, then. You -- I think

Page 1383 1 you mentioned a minute ago that you were going to 2 show us why the PGSA geochemistry varies from that 3 of other aquifer units in this area. 4 Does this slide help us do that? 5 A. This does -- this is an excellent 6 slide to give us that ion exchange characteristic 7 that we were talking about earlier that the Pierce 8 Gulch sand does not have. And you can see this 9 illustrated in the Terteling Springs formation 10 groundwaters where that trend right along the base 11 of the diamond is generated by an exchange of 12 calcium to sodium-dominated groundwater as the 13 groundwater flows down the Terteling Springs sand. 14 So that isn't an anion exchange. You 15 can see there is no change, zero change in the 16 water chemistry of the negatively-charged ions. 17 It's all positive charged, changed from calcium to 18 sodium. 19 Q. And does that differ from what we see 20 in the PGSA? 21 A. PGSA clearly did not show that trend. 22 Q. What about precipitation in the 23 Terteling Springs formation? 24 A. The Terteling Springs formation 25 extends down from the Boise River end member away	Page 1385 1 creating ammonium ion that is present in the 2 Terteling Springs, so that the -- even though we 3 have low iron and issue manganese, and certainly 4 the sulfate is indicative of low oxidizing to 5 reducing conditions. We don't have measured EH or 6 oxidation reduction potentials for these 7 groundwaters. 8 The arsenic, however, is similarly low 9 to that of the Pierce Gulch Sand Aquifer. 10 Q. Okay. What about the Willow Creek 11 Aquifer? I think that's your next one. 12 A. It is the next one. The Willow Creek 13 Aquifer has a considerable more variability. 14 Again, you'll see that the distribution is -- we 15 do have ion exchange occurring in the Willow -- 16 Willow Creek Aquifer. 17 But we also have a considerable 18 scatter and a similarity to the Terteling Springs 19 in a couple of the groundwaters. So this is a 20 very interesting water. It has a low total 21 dissolved solids, but it has ion exchange and it 22 also has a wide distribution that's again -- that 23 is out in an area of the water -- major ion 24 chemistry that hasn't been seen before. 25 Let's take a look at the next slide.
Page 1384 1 from precipitation, so that the Boise River is the 2 recharge for the Terteling Springs sand. Zero 3 from precipitation. 4 Q. And the next slide. Are you ready to 5 move on, or is there something more on this one? 6 A. No, that's fine. This is exactly -- 7 again, it is a Boise river recharge, even more so 8 than with the Pierce Gulch. This is Boise River. 9 Major ion chemistries, as we've 10 talked, indicate ion exchange. The linear change 11 in the water chemistry type from 12 calcium-bicarbonate to sodium-bicarbonate. That's 13 what I showed you there. The average TDS is only 14 206. Very close to that of the Pierce Gulch. So 15 the precipitation will give you a little bit of 16 change in the total dissolved solids. 17 Range of 148 to 361. Average pH is a 18 little more alkaline, 7.54, becoming a 19 sodium-bicarbonate, water causes that. But 20 nondetect nitrate nitrogen. Nondetect. It is -- 21 the ammonia, however, is quite high, 22 3.4 milligrams per liter. 23 Q. Why do you think that would be? 24 A. That's activity of microbial enzymes 25 in the subsurface under reducing conditions are	Page 1386 1 Q. Okay. 2 A. Again, what we're talking about now in 3 Willow Creek is this little cluster of wells here 4 (indicating) north of that green line that Ed 5 Squires was talking about earlier and that you 6 enumerated the names of those wells. 7 Q. Uh-huh. 8 A. If we look at the total dissolved 9 solids of those wells, those five wells that we 10 see here -- and let's talk about these two 11 specific ones here. 12 Q. That would be SVR-6 and SVR-10? 13 A. SVR-10. Those are less than 14 100 milligrams per liter total dissolved solids. 15 Q. And what does that tell us? 16 A. Very dilute groundwater. The most 17 dilute groundwaters -- among the most dilute total 18 dissolved solids groundwaters we have. When you 19 step over that green line -- okay? -- over into 20 the Pierce Gulch Sand Aquifer that extends all the 21 way along here (indicating), the total dissolved 22 solids primarily of the Pierce Gulch -- or the 23 Pierce Gulch Aquifer primary range of total 24 dissolved solids is 200 to 250. 25 So we have more than double by just

Page 1387 1 stepping across that green line. That's amazing. 2 That means there cannot be movement of water from 3 the Willow Creek into the Pierce Gulch, or vice 4 versa. 5 And we will see that nitrate and 6 arsenic also tells us the same thing. There 7 cannot be an exchange of water across that green 8 line from the Willow Creek into the Pierce Gulch, 9 nor vice versa. 10 Q. Have you heard Mr. Squires describe, 11 at least generally, his views about the Willow 12 Creek Aquifer and how it sits in a separate 13 area -- 14 A. Yes. 15 Q. -- area from -- separate from the 16 PGSA? 17 A. Yes. And if we go to the 18 cross-section, which is the next one. 19 Q. Yes. 20 A. The other thing that's interesting is 21 that the water level in the Willow Creek is 22 considerably lower than that in the Pierce 23 Gulch -- 24 Q. Do you agree -- excuse me. 25 A. -- the groundwater chemistry.	Page 1389 1 ready to move there? 2 A. Yes. This is a summary of the Willow 3 Creek Aquifer, as we've summarized the previous 4 two. It is the upgradient -- as Ed Squires has 5 pointed out, upgradient sand facies of the 6 Terteling Springs formation. You saw that in the 7 water chemistry, reflected in the water chemistry, 8 that it is very similar to the Terteling Springs 9 formation. 10 Precipitation recharge is dominant in 11 that aquifer. This is not -- we're out of the 12 Boise River recharge now. This is precipitation. 13 That is the most dilute groundwater in total -- 14 average total dissolved solids of 119, range from 15 70 to only 154 milligrams per liter. I mean that 16 is a very dilute groundwater. 17 Q. That would be much more similar to 18 rain water, then, than many ground waters you've 19 seen; would that be a fair description? 20 A. Many, yes. 21 Q. Okay. 22 A. The average pH is relatively elevated 23 7.6. But you'll see what the nitrate did there. 24 Nitrate jumped up to 1.56 milligrams per liter. 25 Q. And that's NO3N?
Page 1388 1 Q. Do you agree with Mr. Squires' 2 analysis and his description of the Willow Creek 3 Aquifer, generally? 4 A. Yes, I do. 5 Q. Okay. Back to the slide 13. I note 6 that you say that you observed the different water 7 levels in the Willow Creek as opposed to the PGSA. 8 Anything else about this cross-section 9 that you -- that you can tell us that the 10 geochemistry helps to describe, or is there 11 anything more here? 12 A. The most important thing about it is 13 that the groundwater -- the major ion chemistry is 14 considerably different, as you saw on the 15 trilinear diagram, and the total dissolved solids 16 is double in the Pierce Gulch of that in the 17 Willow Creek. 18 Q. Mr. Glanzman, have you ever been to 19 the M3 site or looked at various geological 20 outcrops and features in the Boise foothills? 21 A. Yes. 22 Q. You have done other work in Ada County 23 as well, you indicated earlier; correct? 24 A. Yes, I have. 25 Q. Okay. So the next slide, are you	Page 1390 1 A. NO3N. That's nitrate as nitrogen, is 2 what that means. 3 Ammonia is a reasonably low 4 0.16 milligrams per liter. This is what you see 5 in normal arid zone nitrate concentrations. So 6 this is surficial. It's just saying the same 7 thing that we said before, precipitation moving 8 nitrate from the surface into the groundwater 9 system. 10 The arsenic, however, is a very 11 interesting 0.025 milligrams per liter average, 12 average, greatly exceeding the drinking water 13 standard of .010. More than twice that drinking 14 water standard. And it has a range of arsenic 15 concentrations from nondetect to 0.067 milligrams 16 per liter. That's quite elevated. That's quite 17 elevated. 18 This is a very different water than 19 the Pierce Gulch Sand Aquifer. Again, the nitrate 20 and the arsenic is saying there's no exchange 21 across that green line. 22 Q. What about the drinking water quality 23 of Willow Creek Aquifer? I take it from what 24 you've just testified that there might be problems 25 with it.

Page 1391 1 A. With the Willow Creek? 2 Q. Correct. 3 A. Yes, exceedance of the drinking water 4 standard is right up there. That is -- the 5 drinking water standard of .010 now is -- 6 Q. For arsenic? 7 A. For arsenic, means that this water is 8 really -- should not be ingested. 9 It has an elevated silica of 10 38 milligrams per liter and an elevated 11 fluoride -- it has the highest fluoride of any of 12 the others. And this is suggesting that there is 13 a volcanic sediment component to this Willow Creek 14 that we have not seen in either the Terteling 15 Springs or the Pierce Gulch Aquifer. 16 Again, final line, there's no 17 hydraulic connection with the Pierce Gulch Sand 18 Aquifer and the Willow Creek. 19 Q. Okay. Thank you. 20 Your next slide is a map. I think 21 we're returning to the same map. 22 A. This is the same map. But what I 23 wanted to show you here is we're going to be 24 talking about the Spring Valley Ranch wells. Here 25 we have a transit of about a 4-mile transit,	Page 1393 1 A. That little passel of wells that have 2 about a 4-mile linear extent, yes. So you can see 3 that even that small 4-mile extent has a very 4 large range in major ion chemistry and, as we'll 5 see, total dissolved solids as well. 6 Q. And what does that tell us about 7 those? 8 A. That tells us a lot about what you 9 asked about earlier in that these wells are 10 laterally discontinuous groundwater systems, very 11 locally recharged. So this is the antipathy of 12 what we see in the Pierce Gulch Sand Aquifer where 13 everything is connected. These things, adjacent 14 wells, do not appear to be connected. They're 15 variable depths as well here, so we have to take 16 that into account. 17 So the Spring Valley Ranch wells, 18 precipitation recharge, widely different water 19 chemistry types in the groundwater. That's a very 20 small area. That's only a 3-mile area. Highest 21 average total dissolved solids of group that we 22 have right now, range of 116 to 570 milligrams per 23 liter. 24 I didn't point out the high sulfate 25 concentration. This is not chloride. This is
Page 1392 1 compared to a 12 to 15-mile transit of the Pierce 2 Gulch. And then later we're going to go over and 3 take a look at the Emmett area of wells. So I 4 just wanted to show you where those were again to 5 remind you of where we're going now. 6 Q. Now, those Emmett area wells, those 7 are not in the Pierce Gulch Sand Aquifer, are 8 they? 9 A. No, they are not. 10 Q. And the Spring Valley wells, likewise, 11 not in the Pierce Gulch; correct? 12 A. Let's go ahead and take a look. No. 13 Q. Okay. 14 A. You are absolutely correct, they are 15 not. 16 Again, take a look at the trilinear 17 diagram. We see the ion exchange signature. This 18 is typical of groundwater. This is what you would 19 anticipate seeing. They have a broad scatter all 20 the way from down here into the sodium-bicarbonate 21 water all the way up into the high sulfate, but it 22 trends up toward precipitation. 23 Q. Now, these are for that group of 24 Spring Valley Ranch wells up there to the 25 northeast?	Page 1394 1 high. 65 milligrams per liter, ranging 9 to 2 229 milligrams per liter. That's a -- 3 Q. Now, where would that sulfate come 4 from? From the granitic intrusions there? 5 A. Okay. The sediments range from 6 volcanic to granitic, and that's one of the 7 reasons why we see such a highly variable 8 groundwater major ion chemistry. 9 The high iron here corresponding to 10 the high sulfate suggests this is pyrite. And as 11 you can see, the average arsenic here also exceeds 12 the drinking water. 13 THE HEARING OFFICER: Okay. Just a moment. 14 We need to change tapes again. 15 Okay. We are recording again. 16 Q. (BY MR. FEREDAY): I believe, 17 Mr. Glanzman, you were discussing sulfate and 18 pyrite and the high sulfate values we see here in 19 the Spring Valley Ranch wells. 20 A. We were talking about the elevated 21 percentage of sulfate and the elevated iron 22 concentration, which is not labeled here. I 23 haven't brought it out, but it does have a high 24 iron concentration. 25 If you look at the average arsenic

Page 1395 1 concentration of .014 milligrams per liter, that 2 exceeds, again, the drinking water standard. It's 3 not quite as high as the Willow Creek. The 4 highest level there was .038. But there are -- 5 these groundwaters are -- typically exceed the 6 drinking water standard for arsenic. 7 I think what those are talking to us 8 about is within that mineralogy, the volcanic and 9 granitic mineralogy, we have a sufficiently 10 reducing environment. The pyrite is there, and it 11 is oxidizing, slowly oxidizing and releasing that 12 arsenic. Arsenic is a common contaminant of 13 pyrite. 14 Q. A contaminant associated with pyrite, 15 did you say? 16 A. Yes. 17 Q. What about the permeability of this 18 Spring Valley Ranch well area, does the 19 geochemistry tell us anything about this? 20 A. Major ion chemistry would suggest -- 21 suggest only -- that you could have quite variable 22 permeability. In some area you might have fairly 23 high and others -- in other words, these -- these 24 groundwaters are spatially and hydraulically 25 isolated, not only from the Pierce Gulch and	Page 1397 1 Q. Does this Piper diagram tell you 2 anything with regard to whether this Emmett area 3 aquifer is connected to the Pierce Gulch Sand 4 Aquifer? 5 A. There's nothing in this -- the 6 chemist -- major ion chemistry of these few Emmett 7 wells that would indicate that the Pierce Gulch 8 Sand Aquifer groundwater is present. 9 Q. Anything about the presence of clay in 10 this aquifer in Emmett? 11 A. Clearly it has a fairly elevated -- a 12 sufficient amount of clay present that ion 13 exchange is occurring in the environment. 14 Q. Does it have more clay, based on this, 15 than the Pierce Gulch Sand Aquifer? 16 A. Considerably more, of course, because 17 the Pierce Gulch did not show an ion exchange, 18 where the Emmett wells clearly do, as well as the 19 Terteling Springs formation. 20 Q. Just so we're clear about which wells 21 we're talking about in Emmett, it's Emmett No. 9, 22 Emmett No. 10, and a well called Perin, P-e-r-i-n; 23 is that right? 24 A. That is correct. 25 Q. Okay.
Page 1396 1 Willow Creek, but from themselves. 2 Q. What about the clay content in these 3 wells, anything to be said about that? 4 A. The ion exchange clearly indicates 5 that many of these wells are very clay rich. 6 Q. Now I think it's time to visit Emmett. 7 A. We go to Emmett. Now we see an even 8 better indication of what does it look like when 9 we have an end member of precipitation going down 10 to a Terteling Springs type of groundwater 11 chemistry. You can see there's a linear line 12 almost between the -- extending from the Terteling 13 Springs indicative nature all the way up to 14 precipitation. 15 We see the ion exchange 16 characteristic. We also see an increase of the 17 sulfate and chloride a bit. So this is a clear 18 indication that this groundwater is from 19 precipitation. May well be from recharge in the 20 Payette River -- or from the Payette River. That 21 can't know -- we've been trying to find 22 information on the surface water chemistry of the 23 Payette River and have been unsuccessful, at least 24 as far as we've gone in getting that chemistry, or 25 that would have been most interesting here.	Page 1398 1 A. And then if you go into the original 2 report, there is a trilinear diagram labeling all 3 the wells, if you want to know. 4 Q. Okay. So here is the slide 5 summarizing your findings on the Emmett wells' -- 6 A. It is. 7 Q. -- geochemistry? 8 A. It is. We have three wells that we 9 pointed out. Precipitation is certainly the 10 recharge. Average total dissolved solids, 11 however, is a really relatively elevated 303 12 milligrams per liter. This groundwater has a 13 history. 14 It isn't well written in the few 15 analyses we have. And since we don't have the 16 surface water, we can't tell about that history. 17 But it's clearly different than what we see in the 18 Boise Basin. 19 Q. Do you have TDS values from the 20 Payette River to compare here? 21 A. I do not. 22 Q. That would be helpful, perhaps. 23 A. It would be very helpful, yes, to have 24 a lot more chemistry on the Payette area. It 25 apparently has not been studied well.

Page 1399 1 Q. You mean on the Emmett area? 2 A. The Emmett area. I'm sorry. 3 Q. Yes? 4 A. But the Emmett, in general, is very 5 little known about it, other than it's a very 6 large sandbox. 7 Q. When you say "it's a very large 8 sandbox," why do you say that? 9 A. There is a lot of sand present, both 10 in the outcrops and within the base -- the Payette 11 River. I've studied the providence of the sands 12 of the Snake River from Owyhee all the way through 13 Hells Canyon, and when we hit the Payette, there's 14 a lot of sand in that Payette River that 15 discharges out of there. So it -- that's the 16 origin of that. And I apologize for the 17 colloquialism. 18 Q. That's fine. Have you visited the 19 area around Emmett in connection with the M3 work 20 that you've done? 21 A. Yes. 22 Q. And have you observed the oolite 23 bathtub ring that both Dr. Wood and Mr. Squires 24 have described over on the Emmett side? 25 A. Yes.	Page 1401 1 Average arsenic is less than 2 detection, basically. Very low levels of arsenic. 3 So the groundwater trends -- chemistry trends from 4 near precipitation toward the Terteling Springs 5 formation mineralogy. 6 MR. FEREDAY: Mr. Hearing Officer, I'd like 7 to break here just for a few minutes, if that's 8 okay with everyone. 9 THE HEARING OFFICER: I've been looking for 10 a time. So let's break for -- what do we need? 11 Ten minutes or fifteen? 12 MR. FEREDAY: Ten should be fine. 13 THE HEARING OFFICER: Ten minutes. Okay. 14 Let's come back about ten after 3:00. 15 (Recess.) 16 THE HEARING OFFICER: Now we're recording. 17 Q. (BY MR. FEREDAY): Mr. Glanzman, 18 you've just been describing your conclusions about 19 these Emmett well water quality samples, water 20 chemistry samples. And I'd like to know whether 21 you see anything in the geochemistry in those 22 three Emmett wells which would conflict with the 23 stratigraphy or structural description of the PGSA 24 as provided by Mr. Squires and Dr. Wood? 25 A. No, I do not. To elaborate a little
Page 1400 1 Q. And do you find their testimony to be 2 accurate as far as you can discern as a 3 geologist -- 4 A. I do. 5 Q. -- on that score? 6 A. I do. As a matter of fact, if anyone 7 here wants to see where these oolites form and how 8 they form, just go down to Bear Lake down there in 9 northern Utah. They're forming there today. 10 Q. Right there at the lake margin on the 11 shore? 12 A. Yes, it is. 13 Q. On the beach? 14 A. On the beach. There are oolitic sand 15 beaches on Bear Lake. 16 Q. And oolites, again, are a particle 17 that is coated with some sort of a calcite? 18 A. It's calcium-carbonate. Yes, it is 19 calcite. Like an onion ring, basically. 20 Q. So continue with this slide, please. 21 A. The Emmett wells, again, precipitation 22 dominant, high TDS. Nitrate, nondetect. Ammonia, 23 again, like the Terteling Springs, we have 24 ammonium present, but it's at a very low 25 concentration.	Page 1402 1 bit on that, the scientific curiosity on my 2 part -- well, complaining about the lack of data 3 from the Payette, it would be nice to have had. 4 It would have made no difference. 5 Q. Okay. And that is because the 6 differences between those -- the geochemistry we 7 do have and the PGSA chemistry is so significant 8 that you see no connection; would that be fair? 9 A. That's fair. 10 Q. Your next slide I see has a summary. 11 Could you just quickly take us through that, 12 please, sir. 13 A. Yeah. On this slide we're just trying 14 to summarize all the information that we had 15 before, some of the most pertinent information. 16 For example, the Pierce Gulch Sand Aquifer 17 groundwater, discrete regional aquifer, and I 18 think we defined that. It's not hydraulically 19 connected to any other designated aquifer or area 20 wells from the major ion chemistry. It is 21 recharged by the Boise River. 22 The Terteling Springs formation 23 groundwater is also recharged by the Boise River. 24 Willow Creek Aquifer, the groundwater 25 is recharged by precipitation. Elevated arsenic.

Page 1403 1 It has elevated arsenic above the drinking water 2 standard, probably originating from volcanic 3 sediments that are incorporated within their 4 mineralogy. 5 The Spring Valley Ranch well area is 6 recharged by precipitation with highly variable 7 chemistry and also elevated arsenic above the 8 drinking water standard. 9 And then in the Emmett area, the 10 groundwater is recharged by precipitation and may 11 be -- or it's quite similar to the Terteling 12 Springs formation sediment mineralogy. 13 Q. Thank you. 14 Mr. Glanzman, I assume you have heard 15 testimony about the staff's memorandum in this 16 case, their March 2nd memorandum? 17 A. Yes, I have. And I've read them. 18 Q. Have you read that staff memorandum? 19 A. Yes, I did. 20 Q. That's Exhibit 50, I believe. 21 Do you recall the staff's comment in 22 that memorandum about the ancestral Boise River 23 and the seeming disconnect between a concept of an 24 ancestral recharge source and the high 25 transmissivity values in the Pierce Gulch Sand	Page 1405 1 page 56 of their report. 2 Q. Of Exhibit 33G, I believe? 3 A. Yes, it is. 4 Q. Okay. And what can you tell us about 5 this table with regard to your comment earlier 6 about zero to 1,000, zero to 2,000, and modern? 7 A. You'll notice in the upper part of his 8 table here he lists a lot of minimum groundwater 9 residence times as zero. And the maximum, then, 10 is listed, and then a best estimate. And the 11 upper about one-third of the analyses are all 12 less-than values. 13 Q. Yes. 14 A. So he has said that in -- if you go to 15 page 55, he clearly indicates and states, "Note 16 that the practical limits of the carbon 14 age 17 dating method are 5,000 to 30,000 years. 18 Therefore, residence time estimates for the basin 19 margin aquifers and some down valley aquifers must 20 be considered accordingly." 21 Q. Now, that's on page 55 of Exhibit 33G; 22 correct? 23 A. That's correct. 24 Q. The Hutchings and Petrich geochem 25 report --
Page 1404 1 Aquifer? Do you remember something along those 2 lines? 3 A. I remember reading that, yes. 4 Q. What do you mean by "ancestral" in 5 your Exhibit 43 geochem report, sir? 6 A. I think I used the word "ancestral," 7 and there is a "geologically ancestral" also in 8 there. I was trying to get away from the use -- 9 getting -- the Hutchings report clearly indicates 10 that this is not modern. He uses zero. A 11 geochemist uses the word "modern" to mean 1952 and 12 before. 13 Q. Now, when you say Hutchins and Petrich 14 use zero, what do you mean? Do you mean zero 15 years? Zero to 1,000? Zero to 2,000? 16 A. Yes, they do. 17 Q. Okay. 18 A. Zero to less than 2,000. 19 Q. Okay. And if you could just refer to 20 slide 22, please, and tell me, if you know, what 21 that is. 22 A. Slide 22? 23 Q. Yes. And we'll come back to the 24 previous slide in a moment. 25 A. This is their table 5. And that's on	Page 1406 1 A. Yes. 2 Q. -- in the Treasure Valley Hydrologic 3 Project; correct? 4 A. That's right. That is correct. 5 Q. Tell me about their statement here. 6 Do you agree with that, that the practical limits 7 of the carbon 14 age dating method are 5,000 to 8 30,000 years? What does that mean? 9 A. I agree with that. I think John 10 Hutchings has done a very good job of his 11 calculations on carbon 14 radio isotope analysis. 12 His models are what normally would have been used 13 and beyond. He has done a considerable amount of 14 work to try to do and try to give a residence time 15 in the aquifer. 16 Q. A residence time of what? 17 A. That's where we need to be more 18 direct. We both needed to be more direct in how 19 we are expressing ourselves. 20 A geochemist assumes everyone knows 21 what they're modeling. And what they're really 22 modeling when we model carbon 14 is the age of the 23 carbon that is dissolved in that water. That is 24 not the same thing as the age of the groundwater. 25 That's very different.

Page 1407 1 Q. Okay. Let me see if I understand 2 this. Hutchings in his report and for the 3 Treasure Valley Hydrologic Project warns that ages 4 less than 5,000 have to be considered accordingly, 5 meaning that we don't really know the age if it's 6 less than 5,000? Is that generally accurate? 7 A. That is accurate. His corrections 8 that he was applying to that did not allow a more 9 accurate date below 5,000 years. 10 Q. So would it be accurate, then, to say 11 that in a given hypothetical based on carbon 12 dating found in a well sampled in the PGSA that we 13 don't know whether it's 160 years or 1600 years 14 old, that water has been in that aquifer for that 15 period? 16 A. We're talking about the water, the age 17 of the water. And no, we do not. 18 Q. Okay. 19 A. We know what the carbon -- we're 20 trying to calculate what the age of the carbon in 21 the aquifer is, and hoping that that tells us that 22 the carbon has never been separated from the time 23 it recharged all the way through the aquifer. And 24 it's the same carbon all the time, or we can 25 correct back to that carbon.	Page 1409 1 1952. 2 Q. Let me see if I understand this. If 3 we have something, let's say water, that occurs in 4 nature that's -- that was exposed to the 5 atmosphere in 1952 or that was exposed -- that was 6 exposed to the atmosphere, it will carry tritium 7 and therefore tell us that it's 1952 or younger; 8 is that correct? 9 A. It should. 10 Q. Okay. 11 A. It would be 100 percent modern carbon 12 to begin with. 13 Q. Okay. 14 A. Now, that's as a surface water. Now 15 it's going to infiltrate into the subsurface, and 16 it is going to see carbon of different ages as it 17 infiltrates to the groundwater system and then 18 gets transported down into various aquifers. 19 That carbon age can be as old as 2,000 20 years. So it could start off actually before it 21 gets to the aquifer at 2,000 years old. We're 22 talking about the carbon age here. That's what 23 we're modeling. We're not modeling the age of the 24 groundwater itself. It is not part of the water. 25 Only by dissolving.
Page 1408 1 Q. When on page -- slide 22, the table 5 2 from the Hutchings report that you've been 3 referring to, when they say groundwater residence 4 time, then, to return to that point, is that a 5 correct statement or is that incorrect, in your 6 view? 7 A. It's not literally correct. He is 8 ascribing what I have just described, that the 9 carbonate that he's measuring the age of in the 10 groundwater is the age of the groundwater. And 11 that is not the case. They are quite separate 12 issues. 13 For example, in his -- in his report 14 here, he's using 100 percent modern carbon. 15 100 percent modern carbon is 1952 groundwater by 16 definition. 17 Q. Why is that? 18 A. That's prior to atmospheric testing, 19 nuclear testing. 20 Q. Nuclear testing that put tritium in 21 the atmosphere in 1952? 22 A. Not only did it put tritium in the 23 atmosphere, but the carbon 14 to 110 percent 24 volume carbon. So after 1952, we actually had a 25 higher level of carbon 14 than we had prior to	Page 1410 1 Q. Okay. Let me give you a hypothetical. 2 Let's say that there's a gallon of water that 3 comes out of the Boise River in let's say 1860. 4 1860. 149 years ago. 5 THE HEARING OFFICER: That was a very good 6 year. 7 Q. (BY MR. FEREDAY): Is it possible for 8 that -- and let's say that that water is now 9 present underneath Spring Valley 7 and is now 10 pumped out of Spring Valley 7 well and you sample 11 it, is it possible for that gallon of water to 12 carry a carbon date of 2,000 years? 13 A. Yes, it is quite a possibility. The 14 current ages that we've established for 15 infiltration of water through modern carbon 16 sediments ranges all the way from 74 percent 17 modern carbon to 100 percent modern carbon. 18 Q. Mr. Glanzman, have you done age dating 19 studies of groundwater in your career? 20 A. A lot of it, yes, I have. As a matter 21 of fact, we actually did -- Ed Squires and I did 22 do some age dating on the Goddard 2 well, which 23 John Hutchings also did, and came up with similar 24 results for the age of the carbon. 25 Q. And that age was --

Page 1411 1 A. About less than -- 2 Q. -- if you -- 3 A. Less than 2,000 years. 4 Q. And look back at table 5. If we look 5 at table 5, I see Goddard No. 2 is the third entry 6 there. 7 Is that the same well? 8 A. That is the same well. 9 Q. And while we're here, is TVHP-1 the 10 State and Linder well that we discussed earlier in 11 this hearing, the TVHP-1 well? Excuse me. Not 12 State and Linder. State Street well. Excuse me. 13 The State Street well, the TVHP-1, or do you know? 14 A. HP is one of the wells. 15 Q. Okay. And is HP in the Pierce Gulch 16 Sand Aquifer? 17 A. It is. 18 Q. And the Goddard 2? 19 A. Goddard 2. 20 Q. Do you know whether the two Meridian 21 wells are? 22 A. I would direct that question to Ed 23 Squires. 24 Q. Okay. All right. But these -- but 25 let's just take HP, for example.	Page 1413 1 saying -- I just have not analyzed it. But if you 2 took only 10 percent thermal spring water and 3 added it to the Boise River, you would have had an 4 age starting out at 2,000 years. 5 So there are a lot of variables when 6 we're trying to describe what the age of the 7 groundwater is. We have a very good definition of 8 the age -- different ways of measuring age less 9 than 50 years. But when we get up to a thousand 10 and certainly 5,000 years, it's -- that range from 11 50 years to 5,000 is really -- we don't have 12 anything that really is all that good. 13 Q. With regard to the Hutchings and 14 Petrich report at page 58, this is again 15 Exhibit 33G, in paragraph 5 near the bottom of 16 that page they discuss residence times of Treasure 17 Valley groundwater and note in that paragraph the 18 following: And I'll quote from it. "The youngest 19 waters entered the subsurface a few thousand years 20 ago and are found along the northeastern boundary 21 basin." 22 Do you believe that based on what 23 you've told us about the statement in Hutchings 24 and Petrich itself on page 55, practical limits of 25 age dating are 5,000 to 30,000 years, and based on
Page 1412 1 Best estimate, less than 3,000 years 2 or zero to 3,000, meaning it could be anything 3 prior to 1952 but up to 3,000 years in residence; 4 is that correct? 5 A. We don't know where it is in there, 6 yes. 7 Q. Okay. 8 A. And that's the age of the carbon. 9 Q. Yes. 10 A. Where this is not the age of the 11 groundwater. We have to make that distinction, 12 particularly when we're in such a complex basin as 13 we have here in the Boise Valley. 14 Q. Okay. 15 A. The other thing that I think that the 16 report could have considered -- 17 Q. Is this the Hutchings/Petrich report? 18 A. Yes, the Hutchings. 19 -- was that in thermal springs up in 20 the north there of what we've been considering the 21 area we've been working in, the thermal springs 22 have an age of about 20,000 years. We have about 23 a 10 percent, 15 percent, something else in the 24 Pierce Gulch Aquifer. 25 Well, it could have been -- I'm not	Page 1414 1 the chart that that statement on page 58 is -- is 2 correct? 3 A. He's talking about -- actually talking 4 literally about the residence time of the carbon, 5 not the age of the groundwaters. The cold 6 springs, the maximum age we've seen on the cold 7 springs is about a thousand years, less than a 8 thousand years. 9 So cold springs on the margin of the 10 valley, about a thousand years. But between a 11 thousand and certainly, as he says, between -- 12 between about 50-some years and 5,000 years, we 13 don't know. And it is carbon that we're dating. 14 It isn't the groundwater. 15 Q. So I take it you disagree, then, with 16 the statement that the youngest waters entered the 17 subsurface a few thousand years ago. 18 Wouldn't it be more accurate to say 19 that we don't know? 20 A. We don't know. 21 Q. Let's go to the next slide. Or maybe 22 back to the first one. You -- I think we started 23 here, and I don't think I let you get quite 24 through that before I started peppering you with 25 questions.

Page 1415 1 Is there anything else on this slide 2 you'd like to point out? 3 A. No, I think we've fairly well covered 4 everything that's on that slide. 5 Q. And on that I see you say carbon 14 6 dating is indeterminate at less than 5,000 years? 7 A. Yes, just repeating what is in their 8 report. 9 Q. Okay. What about your statement at 10 the bottom that residence time of the groundwater 11 from the M3 wells is best estimated by hydraulics, 12 what do you mean by that? 13 A. Since the groundwater chemistry is not 14 determinate, then we have to use the hydraulics 15 alone to tell us about what that flux looks like 16 and then about the transport time from possible 17 recharge to our location at M3. And that would be 18 far more accurate than anything we've done. 19 Q. Okay. Continuing here, perhaps to the 20 next slide that you have, did you recall reading 21 in the staff memo their suggestion that additional 22 isotope studies might be appropriate for the 23 Pierce Gulch Sand Aquifer? 24 A. Yes, I did. 25 Q. Are you familiar with the various	Page 1417 1 and I've done both. 2 Q. Have you done any stable isotope 3 evaluations here in the Treasure Valley? 4 A. We did -- we initially did not do it 5 because we thought that the young age of the 6 groundwater in the Pierce Gulch and the agreement 7 with the physical settings and particularly the 8 major ion chemistry was definitive enough. It was 9 telling us sufficient amount of information. We 10 didn't need anything else. 11 But we went ahead and analyzed several 12 of the groundwaters -- the M3 test well No. 1, 13 test well No. 2, test well No. 3 -- and sampled 14 them for both deuterium and oxygen-18 stable 15 isotopes. 16 Q. And what was the result of that 17 evaluation? 18 A. Shown on that present slide is 19 deuterium ranges from minus 124 to minus 126 per 20 mil. 21 Q. And per mil means per thousand? 22 A. Per thousand. Oxygen-18 -- a standard 23 unit for stable isotopes. 24 Oxygen-18 ranges from minus 15.9 to 25 minus 16.1. That groundwater hasn't been exposed
Page 1416 1 isotope studies that can be done in groundwater, 2 including those that relate to age dating? 3 A. I am very familiar with it, and we do 4 generally as a geochemist differentiate isotopes 5 from age dating. If we're talking about age 6 dating, we're involving isotopes, but isotopes 7 were usually referring to stable isotopes. 8 Q. And what are stable isotopes? 9 A. They do not decay with time. And 10 particularly when we look at stable isotopes that 11 are important, we want stable isotopes that form 12 water molecules themselves. The deuterium and 13 oxygen-18 isotopes are two of those stable 14 isotopes that we use as -- because they are a part 15 of the water molecule. 16 Now we're not talking about something 17 that is dissolved in the water-like carbon. We're 18 talking about something that is actually the water 19 molecules themselves. 20 Q. So can you use deuterium and oxygen-18 21 to date water? 22 A. We have for over 40 years. There's a 23 great deal of experience and case studies 24 involving the use of deuterium and oxygen-18 to 25 differentiate sources and mixing of groundwaters,	Page 1418 1 to irrigation, or the oxygen-18 isotope range 2 would have been quite broader than that. This is 3 another indication. 4 Wood and Low, when they looked at the 5 Boise River at Eckert Road, showed that the Boise 6 River has a deuterium stable isotope value of 7 minus 125 per mil, right in the middle of our 8 range. 9 Again, additional information that 10 indicates that this water in the Pierce Gulch 11 Aquifer came from the Boise River. 12 Q. But what does it tell us about the -- 13 about when it came from the Boise River? 14 A. It doesn't tell us anything about 15 that. It just tells us that was its source. 16 Q. And why doesn't it tell us anything 17 about age? 18 A. It doesn't decay. It has no age 19 relationship. Deuterium, when it hits the surface 20 and infiltrates, doesn't change. It's a packet of 21 water that has that same deuterium value as it 22 migrates, as far as it migrates, unless it mixes 23 with another groundwater. 24 In this case, clearly the wells that 25 were sampled up there, it has mixed with no

Page 1419 1 groundwaters. Not only that, it hasn't been 2 exposed to any irrigation water, which would have 3 altered -- significantly altered the oxygen. 4 Q. So is it a fact that stable isotope 5 testing can be used to determine source but not 6 age, as the staff has suggested? 7 A. That's exactly the case. 8 Q. What would additional isotope studies 9 of the PGSA deliver to the Department or to the 10 public with regard to understanding more about the 11 Pierce Gulch Sand Aquifer, in your opinion? 12 A. May I reinterpret the question a bit? 13 Q. Yes. 14 A. I'm going to use the staff's use of 15 isotopes. 16 It would further age dating of 17 samples, provide additional information that would 18 be useful for this part of the Boise Basin that 19 we're discussing today, the M3 in particular. 20 Q. Right. 21 A. Would it alter anything that we've 22 discussed? No. There would be nothing added by 23 additional work on age dating. 24 The next slide will answer your 25 question on, I think, the deuterium level.	Page 1421 1 any use to us. 2 Q. So would the geochemistry studies 3 recommended by the staff in their Exhibit 50 4 reduce uncertainty, as they suggest in that memo? 5 A. I do not see how. 6 Q. Does any line of geochemical evidence, 7 Mr. Glanzman, contradict what Hydro Logic has 8 explained in their reports and through 9 Mr. Squires' testimony with regard to the -- let's 10 just tick them off -- the transmissivity of the 11 Pierce Gulch Sand Aquifer? 12 A. No. 13 Q. What about its extensiveness 14 regionally? 15 A. No. 16 Q. What about its productivity -- 17 A. Not -- 18 Q. -- is there anything that you see in 19 geochemistry? 20 A. No. 21 Q. What about the question of faulting 22 creating boundaries or compartments in any part of 23 this aquifer? 24 A. Not in the Pierce Gulch Sand Aquifer. 25 MR. FEREDAY: Okay. That's all the
Page 1420 1 Q. Okay. 2 A. We took a look at what the range of 3 the deuterium and oxygen values were for the Boise 4 River, Payette River, and the Snake River at King 5 Hill versus the Snake River at Weiser. That's 6 what we usually do to kind of get a feel for 7 should we do some deuterium or oxygen values, and 8 what information would that provide us. 9 We look at that range, the deuterium 10 ranges only from minus 133 to minus 125 per mil. 11 That is a very, very small deuterium range to do 12 anything on source or mixing. 13 The next one on the oxygen was even 14 more surprising. It's only 1.1 per mil difference 15 with the oxygen-18 isotopes, minimal evaporation. 16 Now, this is not to say that we 17 didn't -- if we went out and picked up groundwater 18 from -- that had been infiltration from 19 irrigation, the oxygen-18 isotope would clearly 20 indicate a difference. Okay? 21 That's not what we're involved with 22 here at M3, however. So additional stable isotope 23 work applied to anything that we're doing here 24 would have no use. It would apply -- it would 25 give us no additional information that would be of	Page 1422 1 questions we have. 2 THE HEARING OFFICER: Okay. Thank you. 3 Mr. Thornton? 4 MR. THORNTON: Okay. Just a minute to 5 formulate. 6 THE HEARING OFFICER: Sure. Do you want to 7 go off the record? 8 MR. THORNTON: Yeah, please. 9 THE HEARING OFFICER: Let's take a rest. 10 (Recess.) 11 THE HEARING OFFICER: We are recording 12 again. 13 Cross-examination, Mr. Thornton. 14 MR. THORNTON: Okay. 15 16 CROSS-EXAMINATION 17 BY MR. THORNTON: 18 Q. Mr. Glanzman, if you could refer to 19 Exhibit 32I. I think you've -- if you could refer 20 to that. 21 A. Yes, sir. 22 Q. 32I. 23 A. Uh-huh. Yes, sir. What part? 24 Q. It would be the last -- 25 A. What page?

Page 1423 1 Q. Yeah. Actually, I've got a couple 2 questions before that. So sorry. I apologize for 3 that. 4 A. Okay. 5 Q. But on 32I, not the last page, do you 6 agree that that reflects accurately your 7 background and your expertise relating to the 8 matter before this hearing? 9 A. I believe so. 10 Q. Okay. And then are you licensed to 11 practice geology in the state of Idaho? 12 A. Not in the state of Idaho. I am in 13 Wisconsin and in Wyoming. 14 Q. Okay. And then if you could refer to 15 Exhibit 32I, beginning on the last page. 16 A. Water Budget for the Treasure Valley 17 Aquifer System. 18 Q. Yeah. This one, 32I, I believe it 19 is -- you just had it in your hands. It is titled 20 "Richard Glanzman, Geochemist." 21 Do I have that right? 22 A. Yes, sir. Last page -- 23 Q. And on that -- underneath -- yeah, 24 last page, at the top. And it states, "Pierce 25 Gulch Sand Aquifer."	Page 1425 1 specifically. But 95 -- 85 to 90-plus percent is 2 Boise River. 3 Q. Okay. And I think I just heard you 4 say now, plus you stated earlier, that 5 precipitation may have a small percentage, 5, 6 10 percent? 7 A. Yes. 8 Q. Okay. And does that imply that that 9 precipitation is infiltrating down through the 10 ground when it hits into the aquifer or through 11 some other mechanism? 12 A. It's part of the recharge. It 13 couldn't have been exposed to any evaporative 14 process. So it's definitely not part of the 15 irrigation, nor has it been exposed to evaporative 16 processes, evapotranspiration. So it's just part 17 of the recharge right now. It's undefined what 18 that small percentage is. It looks like it could 19 be precipitation. As I also testified, it could 20 be water from the thermal springs, which would 21 give us that carbon date that we were looking at. 22 Q. Okay. So could you describe to me the 23 method that you think the precipitation which is 24 the Pierce Gulch Sand Aquifer, how would that 25 happen?
Page 1424 1 A. Yes. 2 Q. And that statement says, "Groundwater 3 chemistry indicates that the Pierce Gulch Sand 4 Aquifer is a discrete aquifer recharged from the 5 Boise River with no apparent hydraulic connection 6 with other aquifers." 7 And the question I have is, are you 8 implying in that statement that there's no 9 hydraulic connection existing between the Pierce 10 Gulch Sand Aquifer and any other shallower 11 aquifers above it? 12 A. This is referring to the aquifer study 13 and the wells studied in the M3 area. It does 14 indicate that's what it means. 15 Q. And so are you stating that there's no 16 other connection with any other aquifers above, 17 shallower aquifers above? 18 A. That's what I'm saying. 19 Q. Okay. And then that paragraph states 20 that "The Pierce Gulch Sand Aquifer is recharged 21 from the Boise River," implying no other sources 22 of recharge; is that correct? 23 A. I believe I said that there was a 10 24 to 15 percent difference that looked like it could 25 be precipitation. And we don't know what that is	Page 1426 1 A. If -- I don't know what the hydrologic 2 history of the Boise River has been. I've used 3 the average Boise River water chemistry. It could 4 very well have a distribution that is very similar 5 to what we see in the Pierce Gulch Aquifer. 6 So when I'm saying I have used the 7 point for the average Boise River, I don't know 8 what the whole distribution was over the period of 9 time that that recharge occurred in the past. So 10 I -- I don't really know that that isn't all Boise 11 River water. 12 Q. So if you could help me understand, 13 the precipitation that you were talking about that 14 is potentially a small portion of the recharge, is 15 that precipitation that we see on an average 16 annual basis, or are you talking hundreds, 17 thousands of years ago? 18 A. We're not talking about precipitation. 19 I'm talking about component of recharge to the 20 Pierce Gulch that is not defined, but at the very 21 simplistic approach that I have used with the 22 trilinear diagrams, I only have two end members. 23 I could have added the thermal springs groundwater 24 as well, and I could have used all the Boise River 25 water chemistry I could get my hands on to see

Page 1427 1 what its distribution would be, and if that didn't 2 encompass all the rest of this, so there really 3 wasn't anything other than the Boise River. So at 4 this point, that small percentage did not disturb 5 me. 6 Q. Okay. Question again, and hopefully 7 it's not too redundant. I believe I heard you say 8 that precipitation may be a small portion of 9 recharge to the Pierce Gulch Sand Aquifer; is that 10 correct? 11 A. We clearly showed that to the -- for 12 test well 2, that there was a small percentage of 13 recharge where the Pierce Gulch Sand Aquifer comes 14 near the surface, yes. 15 Q. So in your opinion, is that the only 16 place that precipitation could access the Pierce 17 Gulch Sand Aquifer in that area, that test well? 18 A. Let me be redundant again. We have a 19 distribution based on two end members, which are 20 averages. I don't know what the difference is. 21 It could be all Boise River. It could be thermal 22 springs water. It could be precipitation. Right 23 now that is undefined, but it's only 10, 24 15 percent of the difference, and it's consistent. 25 Q. Okay. And then earlier Mr. Squires	Page 1429 1 A. I wouldn't consider the Boise River 2 gravels as being separable from the Boise River 3 itself. 4 Q. Okay. So Mr. Squires has further 5 postulated that the Pierce Gulch Sand Aquifer is 6 reasonably unconfined in the eastern and northern 7 portions. 8 Would that imply the Pierce Gulch Sand 9 Aquifer does not actually communicate or have some 10 hydraulic connection with those other aquifers? 11 A. I don't truly understand the 12 connection. 13 Q. Okay. So if you go back to 14 Exhibit 32I, trying to help clarify my question, 15 on the last page. 16 A. Yes. 17 Q. Again, the statement that says, 18 "Groundwater chemistry indicates that the Pierce 19 Gulch Sand Aquifer is a discrete aquifer recharged 20 from the Boise River with no apparent hydraulic 21 connection with other aquifers." Okay. 22 A. Okay. 23 Q. And then the question that I have is 24 Mr. Squires is talking about the Pierce Gulch 25 Aquifer in the upper portion, eastern and northern
Page 1428 1 has postulated that in some areas the Pierce Gulch 2 Sand Aquifer may come into direct contact with the 3 gravels of the Boise River. 4 Would that be considered a hydraulic 5 connection with other aquifers? 6 A. The actual act that there's a 7 sedimentation feature? 8 Q. I would say it's based on the exchange 9 of water from the river to the gravels of the 10 Boise River to the Pierce Gulch. 11 A. Could you rephrase? I -- 12 Q. And I will try to do that. 13 A. Thank you. 14 Q. Mr. Squires has postulated that in 15 some areas of Pierce Gulch Sand Aquifer, I believe 16 he's referring to the Capitol Bridge area in 17 general -- I may not have that correct -- that the 18 Pierce Gulch may be recharged from that section of 19 the river commonly, I think, referred to as the 20 gravels of the Boise River. 21 And then does that not constitute a 22 hydraulic connection with another aquifer? 23 A. Because it's in contact with the Boise 24 River gravels? 25 Q. Yeah.	Page 1430 1 portion, is reasonably unconfined with a potential 2 for exchange with those other aquifers. But I 3 hear you saying it's not. So I'm confused with 4 regard to that. 5 MR. FEREDAY: I'll object there, 6 Mr. Hearing Officer. I don't think that the 7 testimony of Mr. Squires was to that effect. But 8 if this is -- if there's a good-faith basis for 9 that question, perhaps we can continue. 10 MR. THORNTON: I can withdraw that 11 question, if that helps, and try another way. 12 THE HEARING OFFICER: Let's try. 13 MR. THORNTON: Okay. 14 Q. So what area is the Boise River 15 recharged -- is the Pierce Gulch Sand Aquifer 16 recharged? Can you show me on a map? 17 A. No, I cannot. That was outside the 18 real area of our interest, the M3. 19 Q. Okay. 20 A. Part of it was in the M3 area, 21 probably in the Pierce Gulch, down there near the 22 Goddard 2. I mean but obviously there's recharge 23 above that. So the recharge is not a point; it's 24 an area. 25 Q. And the area for you would be what?

Page 1431 1 A. Above the M3 area. It's east of the 2 area. 3 Q. And above the M3 area, is there not 4 shallow aquifers, deep regional aquifer, Pierce 5 Gulch Sand Aquifer going up there, irrigation 6 canals? Is there not the potential for lots of 7 recharge sources to the Pierce Gulch? 8 A. Those recharge losses are certainly 9 90-plus percent, probably, Boise River connected, 10 yes. 11 Q. So you're saying that there's not much 12 recharge? I didn't quite understand your answer. 13 I'm sorry. 14 A. No. If I'm following your question, I 15 believe, which was the water sources above -- east 16 of the M3 area outside the area that we studied, 17 did those represent a recharge area. 18 And I answered that it is a recharge 19 area up there, Boise River recharge area. 20 Q. Okay. If we could go, I believe, to 21 your PowerPoint presentation. I'm not sure what 22 exhibit that number was. If you'll put that in 23 front of you. 24 A. Yes, I have it. 25 THE HEARING OFFICER: I don't know that	Page 1433 1 sheets on the back end I thought that we did not 2 discuss. 3 MR. FEREDAY: Correct. 4 THE HEARING OFFICER: And I'm wondering if 5 those have some additional value, whether they 6 ought to be detached since they were not 7 presented. 8 THE WITNESS: The entire thing that's 9 presented here, other than the responses to the 10 staff, are a synopsis of what's in the original 11 report. The slides that are in the ending of that 12 are actually figures from that report. The only 13 thing they may do is show the -- you can see down 14 there there are figure numbers for each of them 15 that came from the report. So there are no new 16 information, if that helps. I mean they can be 17 taken off without any loss. 18 THE HEARING OFFICER: I didn't look 19 carefully at the Piper diagram to see what was 20 represented there. Some of the headings are 21 actually duplicates, I think, of what's contained 22 in the earlier pages. But perhaps what's depicted 23 or drawn or labeled there is different. I don't 24 know. 25 So what's your preference,
Page 1432 1 it's been marked. 2 MR. THORNTON: Okay. 3 MR. FEREDAY: And, Mr. Hearing Officer, 4 we'd be happy to mark and offer that if that would 5 help. 6 Would that fine with you? 7 MR. THORNTON: For me, I think it's 8 appropriate. 9 MR. FEREDAY: Why don't we mark this, then. 10 I frankly had intended to do that. 11 The next number is? 12 MR. LAWRENCE: 71. 13 MR. FEREDAY: 71. 14 (Exhibit 71 marked.) 15 MR. FEREDAY: We would offer it as 16 Exhibit 71. 17 THE HEARING OFFICER: Mr. Thornton, any 18 objection? 19 MR. THORNTON: No. 20 THE HEARING OFFICER: Mr. Smith? 21 MR. ALAN SMITH: No objection. 22 THE HEARING OFFICER: Mr. Edwards? 23 MR. EDWARDS: No objection. 24 THE HEARING OFFICER: Before I bring this 25 into the record, I note that there are a number of	Page 1434 1 Mr. Fereday? 2 MR. FEREDAY: Well, my preference would 3 just be to leave them in, with Mr. Glanzman's 4 explanation that they are just simply further 5 information taken directly from the report. 6 They're duplicates of what are in the report. 7 THE HEARING OFFICER: Okay. 8 MR. FEREDAY: And I think his intention was 9 to refer to them if questions came up, and perhaps 10 they will, that those would be relevant to 11 answering. 12 THE WITNESS: What wells are these points 13 on those trilinears, that's why it's in there, for 14 that purpose only. 15 THE HEARING OFFICER: Okay. The document 16 labeled as Applicant's Exhibit 71 is received into 17 evidence. 18 (Exhibit 71 admitted.) 19 MR. OWSLEY: We have not seen the stable 20 isotope data before. 21 THE WITNESS: That's response to that 22 comment. I said that was -- 23 THE HEARING OFFICER: Okay. Let's go off 24 the record. Let's go off the record. 25 (Discussion.)

Page 1435 1 THE HEARING OFFICER: We're recording 2 again. 3 Mr. Thornton. 4 Q. (BY MR. THORNTON): If you go to, I 5 guess, slide No. 5 or page 5. 6 A. Okay. Total dissolved solids. 7 Q. Yes. And I believe you were stating 8 one of the important parameters you were looking 9 at for differences or similarities in groundwater 10 was the use of total dissolved solids; is that 11 right? 12 A. It's the most basic measurement that 13 we geochemists look at, yes. 14 Q. Okay. And then on this page 5 you 15 have a listing of five different aquifers, or at 16 least areas -- I'm not sure if the Emmett area 17 represents an aquifer, a particular one or not; is 18 that correct? 19 A. It is the Emmett well area, yeah, 20 that's what we're calling it. 21 Q. Okay. And then you have what appears 22 to be a simple arithmetic average -- 23 A. It is the arithmetic average. 24 Q. -- and then a range? 25 Okay. And did you do any assessment	Page 1437 1 Q. Is that correct? 2 A. Yes, it appears to. 3 Q. And then on your trilinear plots on -- 4 maybe just let's just go to page 6, the very next 5 one. And I realize that this is a mixture of all 6 of those areas where you did geochemistry. What I 7 don't notice is any statistics in terms of 8 significance of the spread of data there, and some 9 areas obviously -- well, do you have any 10 statistical information for significance of the 11 spread of that data? 12 A. What statistical measure would you 13 consider significant? 14 Q. Well, yeah. And I would be looking at 15 anything that if you could put error bands around 16 in there or some kind of confidence intervals or 17 brackets to find out how different is the Boise 18 River, say, compared to the Pierce Gulch Sand 19 Aquifer? Long question. I apologize. What I'm 20 trying to understand is, I see a mass of data, but 21 that doesn't tell me, the layperson, if that's 22 significant or not. 23 That -- is that so close that they're 24 all the same, or is there anything that says, 25 "Whoa" -- if you were to say "Whoa, there's quite
Page 1436 1 as to why that range is so much in terms of the 2 PGSA, as an example? 3 A. No, I did not, because the major ion 4 chemistry isn't changing. 5 Q. Okay. And then when you look at, as 6 an example, the Emmett one, the -- the range 203 7 to -- and then I should ask, it says 340 there, 8 but if you go to -- probably a typo. But if you 9 go to page 19, it says "385" and not "340." I'm 10 not sure which one that is. It's probably one of 11 the two. 12 A. I didn't get that corrected. The 385 13 is correct. 14 Q. 385 is correct? 15 A. Yes, it is. 16 Q. The 385 is the correct one? 17 A. Yes, it is. 18 Q. Okay. 19 A. I'll have to check again, but I 20 believe it is. 21 Q. Okay. And then the range of data for 22 the Emmett for TDS, 203 to 385, completely falls 23 within the range of the Pierce Gulch Sand Aquifer; 24 is that correct? 25 A. Yes.	Page 1438 1 a bit of difference here"? 2 A. Are you talking about the cluster of 3 the Pierce Gulch Sand Aquifer? 4 Q. Well -- and I apologize for walking on 5 your -- in the case of page -- on page 6, on the 6 top diamond, you have -- center to that is the 7 Boise River, and then you have a number of other 8 plots where I can look at a scattering of data, 9 some appears to be very tight, and some is -- 10 looks like outliers. What I'm not understanding 11 is how significant is that cluster. 12 Is that telling me that within a 13 95 percent confidence interval they are all the 14 same, or -- you have such a large range. I don't 15 know if this is good data, bad data, or not. 16 A. No, it's excellent data. Okay? The 17 data quality is very good. 18 Q. Okay. 19 A. It's clearly within a 5 percent error 20 margin of mass balance. 21 Q. Okay. 22 A. So the data is good. The distribution 23 here is what I referred to earlier as a complex 24 distribution. 25 Q. Right.

Page 1439 1 A. It's spread all over. Okay? It 2 appears very complex. We -- it would be difficult 3 to -- I don't know what statistical measure that 4 you would like, other than perhaps the average 5 value for each of these components, plus or minus 6 a standard deviation. I have those. 7 Q. Okay. And do you have those so that I 8 could look at -- 9 A. I could get them. 10 Q. -- whether it's one or two standard 11 deviation? 12 A. I would. 13 Q. Yeah, maybe -- 14 THE HEARING OFFICER: Okay. 15 MR. THORNTON: I'm sorry. 16 THE HEARING OFFICER: Gents, you're 17 stepping on each other. 18 MR. THORNTON: I apologize. 19 THE HEARING OFFICER: It's becoming a 20 conversation. 21 MR. THORNTON: Okay. 22 THE WITNESS: I apologize. 23 MR. THORNTON: And I do too. 24 THE HEARING OFFICER: Go ahead. 25 Q. (BY MR. THORNTON): Yeah, I would be	Page 1441 1 MR. THORNTON: Okay. 2 Q. Is it possible to get the details of 3 that information for your statistical analysis? 4 A. I got it right here. 5 MR. FEREDAY: Yeah. 6 Q. (BY MR. FEREDAY): Not to review this 7 second, because it would take time, but 8 potentially could refer to it later. I mean I 9 don't want to take the time to review it this 10 second, but I would like to review it over this 11 evening. 12 THE HEARING OFFICER: All right. Let's go 13 off the record a minute. 14 (Recess.) 15 THE HEARING OFFICER: We're recording again 16 after a recess where we discussed possible 17 statistical analyses of the geochemical 18 information and testimony that Mr. -- or 19 Mr. Glanzman has presented. 20 And after listening, the Hearing 21 Officer would invite Mr. Glanzman to provide to 22 the protestants any existing statistical analysis 23 that he's done related to the geochemical data 24 information that he has that's existing that you 25 have in your possession. And if you can provide
Page 1440 1 interested to see what that data is at one 2 standard deviation or two, especially when we're 3 looking at Pierce Gulch sand data. 4 A. Is there any parameter that you have 5 of interest? 6 Q. Let's just go with total dissolved 7 solids. 8 A. Well, total dissolved solids range has 9 a standard deviation 191, plus or minus 63, 10 coefficient of variance, .329. 11 Q. Okay. 12 A. Pretty respectable. 13 Q. And the coefficient of variance was 14 what, point -- 15 A. .329. 16 Q. .329. And you're considering that 17 good? 18 A. It's not bad. 19 MR. THORNTON: And I guess, Mr. Hearing 20 Officer, a question to you, if I may. I just 21 wondered, is that something we can view other than 22 just hearing, to look at, or not? I mean I hear 23 that, but I don't see it. 24 THE HEARING OFFICER: You can ask for the 25 details of that information.	Page 1442 1 that to the protestants after we finish here, and 2 if there's a need for the Department to copy some 3 of that, we can do that. So I'd invite that 4 exchange and submittal. 5 And then, Mr. Thornton, you'll have 6 tonight to look at that information and ask any 7 questions you may wish of Mr. Glanzman tomorrow 8 morning when we convene. 9 MR. THORNTON: Yes. 10 THE HEARING OFFICER: Fair enough? Is that 11 fair, Mr. Fereday? 12 MR. FEREDAY: That's acceptable. 13 THE HEARING OFFICER: Okay. All right. 14 And as a result of that, then, we'll defer any 15 questioning on statistics until tomorrow morning. 16 MR. THORNTON: Yes, that's fine. 17 THE HEARING OFFICER: Okay. Thank you. 18 You may ask further questions. 19 MR. THORNTON: Okay. 20 Q. On page 22 of the Exhibit 71, your 21 slide presentation. 22 A. Yes, sir. 23 Q. And this was a table, I believe, 24 extracted from the Treasure Valley Hydrologic 25 Project; is that correct?

Page 1443 1 A. Yes. 2 THE HEARING OFFICER: Which sheet is it? 3 I'm sorry, Mr. Thornton. 4 MR. THORNTON: I was on page 22, 5 Exhibit 71. 6 THE HEARING OFFICER: Okay. Thank you. 7 Q. (BY MR. THORNTON): And what in the -- 8 currently or in the recent past, what are the 9 standard methods for dating water? 10 A. Netpath has six, N-e-t-p-a-t-h. It is 11 free software from the USGS. It is what the USGS 12 uses regarding 14 dating purposes. And most 13 everyone who does any dating uses that method. 14 In addition to that, however, 15 Mr. Hutchings -- or Jan Hutchings, also he had -- 16 he used -- he used six methods, of which he 17 indicates three of those methods are the same 18 methods that are in Netpath from the 1970s and 19 1980s. Others are excerpts and additions that he 20 has to those dating methods. 21 So overall there are six well-known to 22 everyone as far as Netpath is concerned that you 23 can enter your data in there, and they ask a bunch 24 of questions. But there are also default values, 25 but that's what most people use.	Page 1445 1 Q. Okay. And then so you have -- and 2 where, in general, is Goddard 2 located at in 3 terms of -- 4 A. You can see it on the map -- 5 Q. Yeah, that would be great. 6 A. -- if you wanted to. 7 THE HEARING OFFICER: Okay. Again, 8 Mr. Glanzman, you need to wait until Mr. Thornton 9 finishes his question. 10 And, Mr. Thornton, you need to wait 11 until he finishes his answer. 12 MR. THORNTON: Yes. Thank you. 13 THE HEARING OFFICER: Thank you. 14 MR. THORNTON: We do good in a pub. 15 THE WITNESS: Yeah, we would. Where is the 16 beer? 17 Q. (BY MR. THORNTON): Yeah. On 18 page 12 -- and I don't know if this helps -- I 19 see -- page 12, the bottom right-hand corner, I 20 see a United Water Idaho Goddard -- 21 A. Yes. 22 Q. -- but I don't know if that's the one 23 you're referring to. 24 A. Goddard 1 and 2 are close enough 25 together that I think that would suffice.
Page 1444 1 Q. And then what data do you have to 2 determine the age of the water in the Pierce Gulch 3 Sand Aquifer? What did you use? 4 A. I used some carbon 14 and carbon 13 5 data that was generated by another study. 6 Q. And where was that study? 7 A. It included Goddard 2 in the Boise 8 Basin. 9 Q. And is Goddard 2, could you -- I just 10 want to -- I'm trying to -- I see a Goddard 1 11 here. I'm trying to find out if Goddard 2 is in 12 the Pierce Gulch Sand Aquifer. 13 A. Oh, yes, it is. 14 Q. It what? 15 A. Yes, it is. Goddard 2 is completed in 16 the Pierce Gulch. 17 Q. And what do you know about the 18 construction of the well for Goddard 2? 19 A. You're asking the wrong person. I'm a 20 geochemist. 21 Q. Okay. So you're saying you don't have 22 an idea if that well was constructed to either 23 State standards or to other -- 24 A. You'd have to direct that question to 25 Ed Squires.	Page 1446 1 Q. Okay. And that area there is the one 2 area you have for dating water that would be in 3 the Pierce Gulch Sand Aquifer; is that correct? 4 A. That's right. 5 Q. Okay. And what was the age or range 6 of age that you had for that water out of the 7 Goddard well? 8 MR. FEREDAY: Objection. Asked and 9 answered. 10 THE HEARING OFFICER: Overruled. 11 THE WITNESS: The age that I generated off 12 of Goddard 2 is almost exactly the same as what 13 Jan Hutchings estimated for Goddard 2. In other 14 words, he said zero. What he really means is when 15 you add ages that were calculated that are in the 16 future, they're negative numbers. I had the same 17 problem with Goddard 2 groundwater. The carbon 18 date for that age is indiscriminate. 19 Q. (BY MR. THORNTON): So when you say 20 "indiscriminate," does that mean that you can't 21 put a bracket around it? Is it 50 years, a 22 hundred years, or -- 23 A. Jan Hutchings put a bracket around the 24 carbon 14 date of less than 2,000 years. Zero as 25 a minimum and 2,000 as his estimate of maximum.

Page 1447 1 Q. And do you have any better data than 2 that, than what is portrayed in that report? 3 A. No. 4 Q. Okay. Earlier in your testimony you 5 had talked about, I guess, the length of time that 6 water chemistry would change when it's in an 7 aquifer; is that correct? 8 A. I don't believe I talked about the 9 length of time that it was in the aquifer. I 10 think it -- 11 Q. I -- I'm sorry. I believe you stated 12 that any length of time of water in an aquifer, 13 the water chemistry changes. That's what I wrote 14 down. 15 A. Normally as the groundwater trans- -- 16 is transporting through the aquifer, moving 17 through the aquifer, it is exposed to more of the 18 mineralogy for a longer period of time, it can 19 change. But the time, however, is not the issue 20 per se. It's the mineralogy of that aquifer. 21 Q. Uh-huh. And does the mineralogy of 22 that aquifer require time to change? 23 A. The mineralogy of the aquifer does not 24 change. 25 Q. Over time does the mineralogy of an	Page 1449 1 A. Yes. 2 Q. Do you have any information in terms 3 of the difference that might occur, or is there 4 any difference in the geochemistry to the Boise 5 River versus what may come off of the Boise front, 6 some of the drainages coming off the Boise front? 7 A. We've looked at the cold springs and 8 the thermal springs. There is some differences in 9 the Boise River water. I have no other data on 10 the tributary streams. 11 Q. Such as like Dry Creek coming off the 12 of the Boise front? 13 A. There is no -- I don't have any data 14 for that. 15 Q. Okay. Do you know if there would be 16 much of a difference in groundwater chemistry in 17 the Pierce Gulch Sand Aquifer, whether it was in 18 the Eagle area versus if there was Pierce Gulch 19 Sands Aquifer in the Emmett area? Do you have 20 data on Pierce Gulch Sand Aquifer -- I'll ask the 21 question differently. I apologize. 22 Do you have information on the Pierce 23 Gulch Sand Aquifer in the Payette Valley? 24 A. No, we do not. 25 Q. Do you have any information that would
Page 1448 1 aquifer change? 2 A. Over millions of years. 3 Q. Millions of years. And I believe you 4 also testified that the aquifer -- Pierce Gulch 5 Sand Aquifer movement was -- I have written down 6 here, was rapid. 7 Do you remember testifying to that, 8 using the term "rapid"? 9 A. Rapid in the context of groundwater 10 velocity, I believe that, yes. 11 Q. What information do you have to 12 describe what "rapid" is? 13 A. I think Ed Squires was talking about a 14 flux and a time of transport between -- a 15 potential time of groundwater flux from its 16 recharge source to the M3 area of about 100 years. 17 To me, that's very rapid. 18 Q. Okay. So long enough that we wouldn't 19 be able to pick up any tritium in there; is that 20 correct? 21 A. A hundred years, yes. 22 Q. Okay. In terms of geochemistry for 23 the Pierce Gulch Sand Aquifer, I believe you were 24 connecting that to the Boise River recharge in 25 that; is that correct?	Page 1450 1 tell you that there would definitely be a 2 difference in groundwater chemistry at the same 3 elevations as, say, Pierce Gulch Sand Aquifer if 4 it was recharged by the Boise River versus the 5 Payette River? 6 A. As I indicated, I don't have water -- 7 surface water chemistry for the Payette River, so 8 I would have to say I don't know. 9 Q. And is surface water chemistry 10 typically indicative of the type of landscape 11 geology, lithology that it's flowing through? 12 A. Typically, yes. 13 THE HEARING OFFICER: Your answer? 14 THE WITNESS: Typically, yes. 15 Q. (BY MR. THORNTON): Okay. And are you 16 familiar with the geology and lithology of the 17 Payette River versus -- watershed sub-basin versus 18 the Boise River sub-basin? 19 A. Not if and when and where to answer 20 any questions. 21 Q. Okay. So do you have any way to 22 differentiate between recharge from the Boise 23 River to the Pierce Gulch Sand Aquifer versus 24 recharge from irrigation using Boise River water? 25 A. Yes.

Page 1451 1 Q. And how do you do that? 2 A. I testified the oxygen-18 values 3 clearly indicate no irrigation input. Nitrate 4 values clearly indicate no irrigation input. Both 5 those I testified to. 6 Q. And yet the recharge area, I believe 7 you said, is an area from the Boise River. 8 Would that not have to go through the 9 topsoil, the upper organic layer of gravels and 10 cobbles to get down to the Pierce Gulch Sand 11 Aquifer? 12 A. We were talking about irrigation. 13 Q. Right. 14 A. Surface water flowing down the Boise 15 River is not irrigated. 16 Q. So can you describe to me how the 17 water chemistry would change coming out of an 18 irrigated field or out of an irrigation ditch 19 versus coming out of the Boise River still going 20 through that organic-rich top layer of valley 21 fill. 22 A. The Spring Valley Ranch is clearly 23 indicative of what near-surface changes from 24 irrigation can show in major ion chemistry. 25 Q. Okay. On your -- looking at	Page 1453 1 THE HEARING OFFICER: Okay. I thought 2 somebody had referred to 75. Or did I miss -- 3 okay. 4 MR. THORNTON: I potentially may have 5 misspoke. 6 THE HEARING OFFICER: So we're looking at 7 71? 8 MR. THORNTON: Yes, 71, and page 12. 9 Q. And that describes the location of 10 your geochemistry studies, location of the wells; 11 correct? 12 A. It does. 13 Q. And how many wells were northwest of 14 the M3 property? 15 A. There appears to be about nine. 16 Q. Okay. And out of that, I believe some 17 of those, would you agree, were in the so-called 18 Willow Creek Aquifer? 19 A. One is. 20 Q. Okay. And how many of those northwest 21 of the M3 property are in the Pierce Gulch Sand 22 Aquifer? 23 MR. FEREDAY: I believe this question's 24 been asked and answered. He testified that the 25 Lynn wells and the SVR-6 and 10 wells are in
Page 1452 1 geochemistry and looking at the whatever six or 2 eight wells or whatever that you did -- I mean the 3 sample for the geochemistry located northwest of 4 the M3 site, I think there's about six or seven 5 northwest of the M3 site. I'm referring, I think, 6 to one of -- your figure 1 on your 7 Glanzman/Squires 2009. Maybe we can go to that 8 document. Let me find that. 9 THE HEARING OFFICER: Do we need to go to 10 an exhibit, Mr. Thornton? 11 Q. (BY MR. THORNTON): And actually, I 12 think we could probably go to your -- 13 MR. FEREDAY: Exhibit 71, page 12. 14 MR. THORNTON: Yeah, Exhibit 71 -- thank 15 you -- page 5 -- or what was that page, Jeff? 16 MR. FEREDAY: 12. 17 MR. THORNTON: 12. 18 Q. So on that exhibit -- 19 THE HEARING OFFICER: Just a minute. 20 Q. (BY MR. THORNTON): This is on your 21 slide show presentation. 22 THE HEARING OFFICER: This is 71, then, 23 not -- 24 MR. FEREDAY: 71. 25 MR. THORNTON: I have 71.	Page 1454 1 Willow Creek, but the others are in the Payette. 2 Q. (BY MR. THORNTON): And are they in 3 the Pierce Gulch Sand Aquifer? 4 THE HEARING OFFICER: Now, just a minute. 5 MR. THORNTON: I'm sorry. 6 THE HEARING OFFICER: Just a minute. We 7 had an objection. And I need to rule on that -- 8 MR. THORNTON: Okay. 9 THE HEARING OFFICER: -- and then we go on. 10 So I -- 11 Mr. Fereday, I understood his question 12 to be different than what you were objecting to. 13 I understood him to be asking -- Mr. Thornton to 14 be asking about wells to the west of the M3 15 property within the Pierce Gulch Sand Aquifer. 16 Wasn't that the nature of your 17 question? 18 MR. THORNTON: Correct. That's what I 19 tried to ask. 20 THE HEARING OFFICER: So as a result of 21 that, I'll overrule the objection. 22 And ask the question again, would you 23 please, Mr. Thornton. 24 MR. THORNTON: Okay. 25 Q. In areas northwest of the M3 area, is

Page 1455 1 there any geochemistry data collected in the 2 Pierce Gulch Sand Aquifer? 3 A. No. 4 Q. And then the geochemistry work and 5 analysis that you did, did that add any additional 6 information, in your opinion, to the hypothesis 7 that the Pierce Gulch Sand Aquifer continues from 8 the M3 Eagle area to the Payette River Valley? 9 A. There is no information that we have 10 that would suggest that the groundwater in the 11 Pierce Gulch Aquifer stops at the northwest 12 boundary of M3 area. It is still moving. 13 Q. Okay. Do you have any information to 14 show that it is connected to the Payette Valley? 15 A. We have no documentation that it is 16 connected to the Payette Valley. 17 Q. And then has the geochemical analysis 18 added any additional information to support the 19 presumption of groundwater flow system from the 20 Boise River drainage to the Payette River 21 drainage, in general? 22 A. Yes. And I think we covered that in 23 numerous cases. 24 Q. Could you describe to me, because I 25 think I missed it, how it connects to the Payette	Page 1457 1 MR. FEREDAY: Objection. Asked and 2 answered. 3 THE HEARING OFFICER: Overruled. 4 THE WITNESS: I believe Ed Squires answered 5 that by the gradients that he has shown. 6 Q. (BY MR. THORNTON): And I'm asking you 7 in terms of geochemical analysis, do you have that 8 data? 9 A. There's no chemistry beyond the 10 boundary of M3. 11 THE HEARING OFFICER: Okay. Now, I think 12 we've covered that subject sufficiently. 13 MR. THORNTON: Okay. 14 THE HEARING OFFICER: I don't want to go 15 through it again. 16 MR. THORNTON: Last question. 17 THE HEARING OFFICER: Okay. 18 Q. (BY MR. THORNTON): And has the 19 geochemical analysis that you have undertaken 20 provided any additional information to support an 21 analysis of impacts of water-level declines from 22 full project development? 23 A. No. 24 MR. THORNTON: Okay. That's my last 25 question.
Page 1456 1 River drainage -- 2 A. No. How it -- 3 Q. -- based on geochemistry? Excuse me. 4 THE HEARING OFFICER: Okay. Where are we? 5 MR. THORNTON: Yeah. Good point. And I 6 apologize. 7 THE HEARING OFFICER: Okay. 8 Q. (BY MR. THORNTON): Has the 9 geochemical analysis added any additional 10 information to substantiate flow from the Boise 11 River Basin to the Payette River Basin? 12 A. Yes, in the -- from the standpoint of 13 total dissolved solids and major ion chemistry, 14 clearly indicating that there is no stagnant water 15 here. There's no compartmentalization. There's 16 no fault that would impede flow to at least the 17 boundary of M3. 18 So the -- from a science standpoint, 19 since it doesn't stop there, you would say that it 20 moves on to wherever it's going to the 21 north-northwest. 22 Q. And what evidence do you have to show 23 that it goes to the north-northwest, based on 24 geochemical analysis that you're testifying as an 25 expert in?	Page 1458 1 THE HEARING OFFICER: Okay. It's ten 2 minutes to 5:00. Do we want to start Mr. Smith's 3 examination? 4 MR. FEREDAY: If there's any chance he can 5 get it done, even if we have to go late, I think 6 it would help, and just leave whatever we have 7 with regard to the statistical issues in the 8 morning. 9 THE HEARING OFFICER: How much do you have, 10 Mr. Smith? 11 MR. ALAN SMITH: Probably about ten 12 minutes. 13 THE HEARING OFFICER: Okay. Let's forge 14 ahead. 15 MR. ALAN SMITH: Thank you. 16 17 CROSS-EXAMINATION 18 BY MR. ALAN SMITH: 19 Q. Mr. Glanzman, let's go to Exhibit 43, 20 page 4. And the last paragraph, first sentence. 21 A. Yes. 22 Q. Do you have that? 23 A. Yes, I do. 24 Q. All right. Would you look at that 25 first sentence in the last paragraph. And I think

Page 1459 1 it says in that sentence, "The average Boise River 2 water chemistry indicates that the PGSA 3 groundwater originated almost exclusively from 4 ancestral Boise River surface water." 5 THE HEARING OFFICER: Okay. I'm in the 6 wrong place, Mr. Smith. 7 Q. (BY MR. ALAN SMITH): Are you drawing 8 a distinction between -- 9 THE HEARING OFFICER: Mr. Smith. I'm in 10 the wrong place again. I'm in 43 -- 11 MR. ALAN SMITH: Okay. Exhibit 43. 12 THE HEARING OFFICER: Page 4. 13 MR. ALAN SMITH: Page 4. And it's the 14 first sentence. I only quoted about the last half 15 of it. 16 THE HEARING OFFICER: It's which sentence 17 in which paragraph? 18 MR. ALAN SMITH: Third paragraph, starts 19 out "The type clustering." 20 THE HEARING OFFICER: I see. Okay. 21 Q. (BY MR. ALAN SMITH): I just quoted 22 the part here about "The average Boise River water 23 chemistry indicates that the PGSA groundwater 24 originated almost exclusively from ancestral Boise 25 River surface water."	Page 1461 1 be -- it is a fair question. That was -- 2 geologically, I usually use, when I'm trying to 3 say it has been suggested to be more than a 4 thousand years old. 5 Q. Okay. Let's go to the -- on that same 6 page, the last sentence in the last paragraph also 7 mentions "geologically ancestral Boise River water 8 in the Terteling Springs formation." 9 So does that indicate that you're 10 talking about water that's thousands of years old? 11 A. No. I was indicating that I don't 12 have a specific age, but it has been suggested 13 elsewhere that it's maybe as much as a thousand 14 years old. 15 Q. But you draw a distinction between 16 carbon dating that I believe Petrich did and water 17 dating, they're not the same? 18 A. No, they are not the same. 19 Q. So when Petrich is talking about -- I 20 believe he -- I believe he said "contemporary 21 seepage from river and irrigation diversions is 22 not the primary source of recharge for most of the 23 deeper regional aquifers" -- that's Petrich 2002 24 at page 58, I have. 25 But when he's talking about
Page 1460 1 Are you drawing a distinction between 2 "ancestral" and "geologically ancestral"? 3 A. No, it's between ancestral and modern. 4 Q. Ancestral and what? 5 A. Modern. 6 Q. Modern. All right. If it's ancestral 7 Boise River surface water that originates almost 8 exclusively, doesn't that indicate that the 9 recharge is occurring over a long period of time 10 ago? 11 A. No. It has no time inclination, other 12 than it's not modern. 13 Q. Okay. Let's go to page 5 of that same 14 exhibit, 43. 15 A. Yes, sir. 16 Q. And the third paragraph, the first 17 sentence there says, "In summary, the aqueous 18 geochemistry analytical results indicate that the 19 PGSA is a distinct regional aquifer containing 20 groundwater originating from the geologically 21 ancestral Boise River." 22 Does "geologically ancestral" mean 23 something different than "ancestral," is what I'm 24 trying to find out? 25 A. It is a good question. And it could	Page 1462 1 "contemporary water," what does that mean? Modern 2 water? 3 MR. FEREDAY: Objection. I don't think 4 that the witness has been directed to an exhibit 5 where that language appears. 6 THE HEARING OFFICER: I agree. I don't 7 know where to look either, Mr. Smith. 8 MR. ALAN SMITH: I don't believe I have the 9 exhibit. I have the quote, and I think it may -- 10 it may be from the staff memo. 11 THE WITNESS: No. It's in the Petrich 12 report page 58, it's item 6, "Temporary seepage 13 from rivers and/or irrigation diversions is not 14 the primary source of recharge for most regional 15 aquifers." You'd have to ask Joan Hutchings what 16 I means by "contemporary." 17 Q. (BY MR. ALAN SMITH): But that would 18 clearly not be ancestral? 19 A. I have no idea. 20 Q. You mentioned that seepage from the 21 Boise River and precipitation was the primary 22 source of recharge. I didn't hear you mention 23 anything about the irrigation canals that 24 Mr. Squires talked about. 25 A. To me, they're an extension of the

Page 1463 1 Boise River, since that's what the water is in 2 them. 3 Q. So you're including irrigation runoff 4 or -- 5 A. No. Hang on. May I interrupt him? 6 THE HEARING OFFICER: Okay. 7 Q. (BY MR. ALAN SMITH): Go ahead. 8 A. Irrigation runoff, I didn't include 9 that. Okay? Irrigation runoff means irrigation. 10 And I said that there is no indication of 11 irrigation water entering the PGSA. 12 Q. Okay. So you think that the recharge 13 comes from the Boise River and precipitation, but 14 not irrigation seepage from the canals, like the 15 New York Canal? 16 A. I have no evidence that there's 17 irrigation returned water as a recharge source. 18 Q. All right. Did I understand you to 19 say that you had not been successful in finding 20 any evidence of water from the PGSA in the Payette 21 Valley? 22 A. Well, we have no documentation in the 23 Payette Valley. 24 Q. Could you -- would you define 25 "geologically ancestral" for me, because I have	Page 1465 1 dissolved solids instead of it being from a 2 relatively high -- or I think you said rapid 3 aquifer movement? 4 A. The total dissolved solids that's 5 moving through the bulk of the water in the Pierce 6 Gulch Sand Aquifer has a range of 200 to 250, 7 260 milligrams per liter. 8 The total range is reflecting perhaps 9 finer-grained sediments in the lower part of the 10 Pierce Gulch Aquifer, not the whole part. So the 11 shallow -- well, the 80 milligrams per liter, 12 indicating that you're near a recharge source, 13 perhaps. That's my interpretation. 14 Q. And are you drawing a distinction 15 between a stable isotope and an unstable isotope, 16 and what's the difference? 17 A. A stable isotope is an isotope that 18 does not change in time. An unstable, we usually 19 call radiogenic or radionuclides, and those do 20 change with time. And carbon 14 is one of those. 21 Q. Would an unstable isotopic study 22 better reveal the age of the PGSA water? 23 A. We have no method of radiogenic, other 24 than the carbon 14, that would be of any interest 25 for this time interval.
Page 1464 1 trouble with the two. 2 A. I believe I did a little earlier. But 3 to me, that means it's somewhat suggestive that 4 the water could be as old as a thousand years. 5 Q. Okay. Could thousands of years of 6 being submerged in a large lake reduce the amount 7 of solids available for the PGS water to pick up? 8 A. A hypothetical case where you have a 9 lake -- 10 Q. I'm asking -- 11 A. -- that is ponded, and is that water 12 infiltrating to the PGSA? Is that what your 13 question is? 14 Q. Well, what I'm trying to find out is 15 if the solids have washed away or having been 16 submerged and dissolved, if that affects your 17 finding of the solids in the PGSA? 18 A. The change in the total dissolved 19 solids in the PGSA indicated no new change in 20 major ion chemistry. 21 Q. What about the evidence of the solids 22 in the water itself? 23 A. That is a range of total dissolved 24 solids in the water. 25 Q. Would that explain the low total	Page 1466 1 Q. And so that would not give us a better 2 understanding of the recharge of the PGSA? 3 A. None that I can think of. 4 Q. Do you know what the IDWR staff 5 hydrologists were suggesting when they talked 6 about an isotopic study? 7 A. My original understanding -- or 8 thought I understood was that they were talking 9 about doing additional stable isotopes. But with 10 the rest of the task clearly indicating that they 11 were thinking about age dating, which is carbon 12 14. 13 And from that standpoint, it was the 14 same kind of information that would have been 15 generated and has been generated by John Hutchings 16 in his report. It would have no effect, as far as 17 the M3 area is concerned. 18 Q. All right. I believe -- would the 19 PGSA sands be washed and the solids reduced over 20 thousands of years of being submerged in water? 21 A. They have -- they appear to have very 22 limited solubility, so I would guess not. I would 23 think it's going to take considerable more time 24 than that. We have no clays, for example. And if 25 it had been degrading or being weathered, as we

1 call it, it would be -- would have been forming
2 clays.

3 So since it has been deposited, we
4 don't see any measurable or significant weathering
5 of the minerals within the PGSA.

6 MR. ALAN SMITH: Okay. I think that's all
7 I have.

8 THE HEARING OFFICER: Okay. Mr. Edwards?

9 MR. EDWARDS: I have no questions.

10 THE HEARING OFFICER: At this point should
11 we adjourn and come back tomorrow morning and let
12 Mr. Thornton ask his additional questions, and
13 then you can ask redirect questions of
14 Mr. Glanzman, Mr. Fereday?

15 MR. FEREDAY: That sounds reasonable.
16 Thank you.

17 THE HEARING OFFICER: Okay.

18 MR. ALAN SMITH: Can we suggest 9:00? I
19 didn't think we gained much by 8:30. That's up to
20 you, sir.

21 MR. FEREDAY: I would prefer 8:30. I
22 thought we did gain some. And obviously we had
23 some trouble waiting for the court reporter. That
24 won't happen tomorrow, I'm sure. So I think we
25 can get going and save ourselves at least half an

1 hour.

2 THE HEARING OFFICER: Let's try 8:30 again.

3 MR. ALAN SMITH: Very well.

4 THE HEARING OFFICER: We'll go off the
5 record.

6 (Proceedings concluded at 5:09 p.m.)

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REPORTER'S CERTIFICATE

I, JEFF LaMAR, CSR No. 640, Certified
Shorthand Reporter, certify:

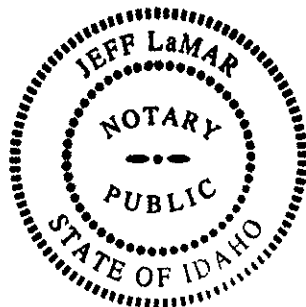
That the foregoing proceedings were taken
before me at the time and place therein set forth,
at which time the witness was put under oath by
me.

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 12th day of May, 2009.



A handwritten signature of Jeff LaMar, written in dark ink over a horizontal line.

JEFF LaMAR, CSR NO. 640

Notary Public

Eagle, Idaho 83616

My commission expires December 30, 2011

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