Mr. Chairman, that we can decipher this question from.

DR. CATLIN: Shall we go up to the front here and describe it?

MR. SILBERG: No, this is fine. This can be off.

JUDGE FARRAR: If you want to be off, we'll be off.

(A discussion was held off the record.)

JUDGE FARRAR: Let's go back on the record and put your answer on the record.

DR. CATLIN: So the wilderness study area boundary for the Cedar Mountains is approximately four and a third miles to the south of the rail line and far west, of course.

JUDGE FARRAR: South of the end of the rail line where it swings into the reservation?

DR. CATLIN: Yes, at the end of the rail line.

JUDGE FARRAR: So the rail line runs a goodly percentage of the entire Cedar Mountain area? In other words, it runs 30 miles out of 35?

MR. SILBERG: Can we go off the record a minute?

JUDGE FARRAR: Yes.

(A discussion was held off the record.)

JUDGE FARRAR: Why don't we put on the record now, the consensus answer to what we thought was a simple question.

Mr. Witness, the southern boundary of the wilderness study area, Cedar Mountain Wilderness Study Area is where in relation to the --

DR. CATLIN: The end of the rail line. It's now -- the southern boundary of the Cedar Mountain Wilderness Study Area by consensus is about one mile north of where the rail line goes to the reservation.

JUDGE FARRAR: All right, then, so in simplistic terms, the rail line would run the entire extent?

DR. CATLIN: It runs parallel to the entire extent of that area.

MR. SILBERG: Parallel to and east of.

JUDGE FARRAR: Parallel to and east of. Fine, thank you.

My last simple question of the day is, the more I've thought about your answer about Burr Trail, the more I'm intrigued about how wilderness works. Why have the areas to the two sides of Burr

Trail not previously been designated as wilderness?

DR. CATLIN: Well, they have been proposed, of course, and they're not designated because a bill has to leave committee and go to a vote. And it has not left committee because the chairman has decided that this bill should not be put to a vote before the House.

JUDGE FARRAR: But never mind this bill. Why wasn't it done 10, 20, 30, 40, 50 years ago? I mean if anyplace looks to the casual observer like wilderness, that does.

DR. CATLIN: The Bureau of Land Management in about 1972 was beginning to think about wilderness, but they had not put together a legislative proposal. In 1976, they were given a mandate to evaluate wilderness and report back to Congress. So nobody wanted to put forward a bill until that mandated congressional process met -- went through the full process, went through the full term. And so bills were not thought about or introduced until BLM inventory wilderness process reached its timetable.

JUDGE FARRAR: Okay.

MR. SILBERG: I do have some recross.

RECROSS EXAMINATION

BY MR. SILBERG:

Q. Dr. Catlin, in response to a question from Judge Lam, you said that you have to analyze all the other actions which may happen in this area. How do you do that for future actions which no one has proposed? How far out in the future should we go to speculate on what else might happen in this area?

A. Well, you should only look at what is reasonably foreseeable in the distant future.

Q. How distant future?

A. I would say the next two or three decades at this point, because we really can't adequately predict what's going beyond that. Is that fair to say?

Q. Yeah, but you think you can predict what's going to happen in Skull Valley in the North Cedar Mountains in the next 20 years?

A. Well, there's several -- you can bracket what one might predict but a range of alternatives. One would be that little is going to change from what it is today. The other would be that all of the proposals and opportunities that the area now allows, either by management or by promotion, occur. So you can look at what people have put out to propose to do and has not yet taken place.

Q. And what has been proposed to do in Skull Valley?

A. Well, what has been proposed to do in Skull Valley --

Q. Besides this project.

A. -- besides this project is to continue to promote unregulated motor vehicle use. So unregulated, by meaning unregulated, I mean a practical sense for the average user who's out there.

Q. Who is promoting unregulated use?

A. Bureau of Land Management by absence of active action on the ground in that area is promoting motor vehicle use.

Q. So promotion is by absence of action?

A. Yes.

Q. And you can predict that that's going to happen for the next 20 years?

A. I can predict increased motor vehicle problems for the next 20 years, yes.

Q. In that particular location?

A. Yes.

Q. Okay. You have a wonderful crystal

ball.

A. I'll share it with you.

Q. I wish you would. And I'm sure your investments in Wall Street are far better than mine.

You said that until the mud flats in Skull Valley, that those were a lower scale of less biologically productive. As a non biologist, you're confident that you can make that judgment?

A. Yes, I can.

Q. Okay. Why can you make a judgment on biological questions when you're not a biologist?

A. Because I have talked to the people who have been doing the inventory work, the wetland areas in the Great Basin, and they have told me the kinds of areas they're looking at and the kinds of areas they're not looking at. And the alkali mud flats that are on the northern part of the unit near the off-road vehicle area are less biologically productive because of the alkaline nature and the soil type nature of that area.

Q. Have you tested the soil type?

A. No, I haven't. But that's knowledge that's been given to me by other people who have.

Q. Have they tested the soil type in that location?

A. No, but they've relied on soil maps and soil identification done by the Natural Resources Conservation Services.

Q. Which soil maps?

A. They've classified -- this used to be the soil conservation service. They've done a mapping job to classify into units soil types, and these maps are on the Internet, they're in public land offices, they're available from the agencies themselves.

Q. But you haven't looked at those maps?

A. Yes, I did.

Q. For the Skull Valley, for the mud flats?

A. In this area, yes, in the past I have, yes.

Q. And what do they show?

A. What they show is the thing I just described, that the northern part of the mud flats area is more alkaline in nature and doesn't have the kinds of fresh water springs and wetland areas that are found in soil types to the south of that area.

Q. I thought you told us that you hadn't looked at that and you talked to other people about that?

A. Well, I have talked to other people and I have seen these maps, yes.

Q. You said in response to a question by Judge Farrar, that if State lands were available, there might be a route that might be able to handle the slope avoiding deleterious impacts like the greasewood community. You haven't done any analysis of that, have you?

A. No.

Q. Okay. The West Valley route would go through the greasewood community; isn't that correct?

A. Through some of it, yes.

Q. Yes. And I think you said the greasewood was a native rather than invasive community?

A. Yes, it is.

Q. So you would be destroying a native community with that route to the extent you were getting rid of greasewood?

A. You would be injuring some of that, yes.

Q. Okay. And you also talked about a route that might -- that other vehicles might use track side access?

A. Yes.

Q. Are you aware of people who drive their trucks over railroad tracks?

A. Yes.

Q. A lot?

A. Yes. If you go to the San Rafael Swell and look at the Transcontinental Railroad there, you'll see a lot of that activity going on.

Q. You said that there were different plants in these runoffs -- in the runoff, the natural occurring runoff ditches?

A. Yes.

Q. Okay. What kind of plants?

A. I am not a botanist and I don't specifically know the plants. I went over to look at them, actually to see if I could identify them, and I can't say that I know this many.

Q. So you don't know whether they are native species or invasive species?

A. I know most of the invasive species and they weren't in the ones I recognized.

Q. But you didn't know what they were?

A. I didn't know what they were, no.

Q. You were talking about diverting into a few culverts. Do you know how many culverts there will be?

A. No, I don't.

Q. Do you know how many culverts there would be in the West Valley alternative?

A. No, I don't.

Q. I think you said on redirect, and I may not have his heard, you were talking about riparian areas in the Low corridor. Are there any?

A. No, to my knowledge, there are none.

Q. Okay. And you then identified some facilities which you said were part of the rapid industrialization of this part of the state. And you identified an incinerator. Do you know how long that incinerator has been there?

A. I don't, but it's been there a fair number of years.

Q. Okay. And you mentioned the magnesium plant. Do you know how long the magnesium Corp., magnesium plant has been there?

A. It's been there for several decades.

Q. And you talk about chemical weapons facility. Do you know how long that facility has been there?

A. That's been there a few years, as well.

Q. Okay. A few years meaning several

decades?

A. I'm sorry, I don't -- well, the military storage of it has been there, of course predates World War II. But the chemical incineration of that is more recent.

Q. Okay. And you talked about the proving grounds, the Dugway Proving Grounds, and that's been there for a while, hasn't it?

A. It's been there since the second World War.

Q. So that's the rapid incineration that we're talking about, the stuff that's been there for decades?

A. Well, many of these things have changed in character, and we're seeing changes within them. So they're not the same as what they were in World War II.

Q. Okay. And you talked about -- about changing use of public lands and you'd like to divert activities elsewhere. So you want people to stay away from here and go somewhere else; right?

A. We want to insure that some of the public lands remain in a natural state.

Q. How much of the natural lands?

A. Well, from a biological point of view, that's a very interesting question. But they estimate at least a third to maybe a half of the lands have to be fully functional in order to insure the continued viability.

Q. So it would really be your preference that there be no development in these lands anywhere?

A. No.

MS. WALKER: I'm sorry, just for clarification, these lands, what do you mean?

MR. SILBERG: The lands that are in the five million acres that SUWA and Utah Wilderness Coalition want to include as wilderness.

DR. CATLIN: I believe there should be development on public lands but not on all public lands. And the wilderness proposal did not include all public lands. It's a part of it.

Q. (By Mr. Silberg) Okay. You were having -- you said you were having some difficulty in interpreting some of our charts and maps, including the ones with the pink and green. That's a good way to describe them. I assume you heard the testimony yesterday that those types of charts are common amongst railroad construction experts?

A. Yes.

Q. And you're not a railroad construction expert?

A. That's correct.

Q. Okay.

A. But they're also common on road construction.

Q. You also said that shoulders -- and I think by that, you mean the area in your designated area through which the Low rail spur would go, is most in need of restoration?

A. Yes.

Q. Okay. And you thought that that was caused by the encroachment of invasive species, particularly cheatgrass; is that correct?

A. Biologically speaking, that's the most of it, yes.

Q. And that was probably caused by cow grazing?

A. Yes.

Q. So the first thing we ought to do is get rid of the cow grazing; right?

A. We should change how we graze, yes. But that's not getting rid of it. That's changing.

Q. So we should change how we do cattle grazing?

A. Yes.

Q. In that area?

A. Yes.

Q. And this proceeding has a lot to do with cattle grazing?

A. It may affect it. Because one of the things that happens is when a development goes in an area, it changes how the cattle use the area, because it changes how the rancher distributes feed supplements and water systems. So there may be indirect impacts that come of this, not because of the project itself, but because of how other people use the land that relates to the project.

Q. Well, how is this rail spur going to affect how the cattle ranchers bring feed and water to their herds?

A. Well, there may be a large section -- this is again -- I haven't done this analysis, but there may be a large section in the center of the valley near the rail lines that the rancher didn't drive to today because there's no road there, but now can because they can drive beside the rail line to get there. So they may go out and then use that ease of access that the rail line provides to increase the intensity of grazing use in that area.

Q. First of all, they're going to drive along the road next to the rail spur that doesn't exist; right?

A. They may drive along the cleared section of land beside the rail line that now allows vehicles to pass.

Q. They could also drive along the middle of the valley through the cleared land that exists there today, couldn't they?

A. Not in the case of brushy areas, no. So where the rail line goes through brushy areas, it creates an avenue of vehicle access that wasn't there before.

Q. Okay. And this is in the middle of the valley you're talking about?

A. It could be in the middle of the valley, on the side of the valley, as well.

Q. Okay. But we have the cheatgrass on the side of the valley, so that's not relevant to that concern of yours, is it?

A. Well -- I'm sorry, could you please rephrase that.

Q. You're talking about driving through cleared areas and cattle somehow being impacted by a railroad that has no road next to it, and we're talking about an area that's above a fairly large amount of -- not cheatgrass, I'm sorry, greasewood. My eastern botanist is catching up with me. The idea that cattle grazing in the shoulder area is going to be affected by something that may happen down on the floor of the valley, and that's somehow based on the rail spur, I just don't understand where you come up with the connection.

A. Here's the connection. If you put water out in an area, particularly during the summer or late dry season, you can increase the use of the grazing use of that area. Cattle, particularly when it gets hot, can only go so many miles from water. So the rancher, to encourage cattle to use other areas, will do -- will move them in a sense and manage them by establishing additional water sources. And they can bring in a trough that they carry on a truck and they can fill it with water from a tank. They can establish water facilities that they now can drive to because there's now a new vehicle access to this area. We've often seen where minimal exploration or other developments, including the kind that we're talking about, go in, it produces increased access for development of these facilities and they're used to doing this kind of thing.

Q. Dr. Catlin, you're no rancher, are you?

A. I'm not.

Q. Okay. And you've never raised cattle, have you?

A. I haven't.

Q. And so you don't know how the ranchers in Skull Valley may or may not decide to change their way of doing business because there's a railroad line that comes down that valley that doesn't have an access next to it, do you?

A. I believe I may.

Q. You may what?

A. I may have information on how the area is managed and how their activities may affect the land.

Q. Even though you're not a rancher and you're not a botanist, you're not a railroad person and you think you know how ranchers are going to behave?

A. I may be able to predict, yes --

Q. Okay.

A. -- how they're going to change, and this comes from our experience in analyzing grazing management and property functional condition and range land. We have a project going on now that's looking at using GIS and biological analysis to establish range capacity and range analysis. So I believe this research we're doing with our scientists does relate to the question you just asked, and our ability to look at how the change in stock facilities, what I call range furniture, water facilities, affects ecosystem health, yes, I believe I do have some knowledge in that area.

Q. Okay. Well, I think we'll let your crystal ball speak for itself. I have no further questions.

JUDGE FARRAR: Mr. Weisman.

RECROSS EXAMINATION

BY MR. WEISMAN:

Q. I would just like to follow up on one answer you gave to Mr. Silberg. You indicated that you had seen people driving on railroad tracks, the Transcontinental Railroad in the San Rafael Swell?

A. Uh-huh.

Q. Are you referring to the Transcontinental Railroad that linked the two coasts in the late 19th century?

A. No, it's currently active.

Q. Okay.

A. It's the railroad that goes between Salt Lake City and Denver.

Q. Okay. So right, the old Transcontinental Railroad, that's to the north of the San Rafael Swell?

A. Right, the one that was built in the 1860s, yeah, that's further to the north.

MR. WEISMAN: Okay, thank you.

JUDGE FARRAR: Ms. Walker, has any of what's transpired recently lead you to any redirect?

MS. WALKER: Yeah, just a couple of questions.

REDIRECT EXAMINATION

BY MS. WALKER:

Q. Do you think they drive on the tracks themselves or next to them?

A. They'll drive next to them, they'll drive across them. They'll rarely drive on them themselves on the tracks, but they will drive on the embankment and the cleared area that the tracks provide. So you see ATV routes along these, you see jeep trails occasionally.

JUDGE FARRAR: But you don't see vehicles traveling along the tracks themselves?

DR. CATLIN: No, but they will actually -- actually, these vehicles are capable of going up to the tracks and crossing them and going down the other side.

JUDGE FARRAR: I think we -- many of us may have misunderstood a previous answer where it sounded like you said these people drive along the tracks.

DR. CATLIN: They don't drive on the tracks, but they drive beside them or across them.

JUDGE FARRAR: Okay.

Q. (By Ms. Walker) How many acres of BLM land approximately are there in the state?

A. 22 million.

Q. And what percentage are in America's Red Rock Wilderness Bill -- or not percentage, just -- well, do you know the percentage?

A. It's about 9.3 million acres, so if you divide 9.3 by 22, you can come up with a percentage.

Q. Okay.

MS. WALKER: That's it.

MR. SILBERG: Can I ask one follow-up

mathematical question. And what percent of the that 800 acres that's covered by the portion SUWA B that would be affected in our current proceeding?

DR. CATLIN: It's a small percent.

MR. SILBERG: Very small percent?

DR. CATLIN: Very small percent.

MS. WALKER: But then I have a follow-up. And what percentage of those BLM lands are under threats of developments similar to the proposed project?

MR. SILBERG: That goes well beyond my question.

JUDGE FARRAR: We'll allow it. Go ahead.

DR. CATLIN: There are a large number of them. And it's absolutely astounding the number of threats that we deal with all the time. I can't tell you in absolute numbers, but they're a lot of threats.

MS. WALKER: Thanks.

JUDGE FARRAR: Does that wrap it up? All right. It's now five after one.

MR. SILBERG: We have two questions that we want to ask on rebuttal.

JUDGE FARRAR: Oh, rebuttal by your

witnesses?

MR. SILBERG: Yes.

JUDGE FARRAR: Go ahead.

MR. SILBERG: Can we do that now?

MS. WALKER: Wait, what's rebuttal? I thought you said was all we had was redirect.

MR. SILBERG: That's all you have.

JUDGE FARRAR: That's all you have on your -- with your witness. In other words, we've had the proponent's witnesses, we've had the opponent's witness and now the proponents have a chance for rebuttal.

MR. WEISMAN: The Staff's witnesses.

JUDGE FARRAR: In other words, we're now -- you've had your last chance with your witness unless on rebuttal or something that leads you to do surrebuttal.

MS. WALKER: Okay.

JUDGE FARRAR: Maybe the hungrier everyone is, the more important it is to press forward and we'll do it faster.

MR. SILBERG: It should take us about two minutes.

JUDGE FARRAR: And these would be who?

MR. SILBERG: Well, I'd ask that

Mr. Hayes and Ms. Davis take the stand. They remain under oath.

JUDGE FARRAR: That's correct. Dr. Catlin, thank you for your testimony with us.

DR. CATLIN: You're welcome.

JUDGE FARRAR: We think you're finished but --

DR. CATLIN: I'll stick around.

MR. SILBERG: It depends on how hungry you are.

JUDGE FARRAR: All right. You are still under oath. Go ahead, Mr. Silberg.

REBUTTAL EXAMINATION

BY MR. BARNETT:

Q. Ms. Davis, you recall a discussion earlier about critical habitats and the impacts that the Low rail corridor might or might not have upon them. In evaluating the environmental impacts of the Low rail corridor, did PFS consider critical habitats?

MS. DAVIS: Yes, we did.

Q. And how did you do that?

MS. DAVIS: I consulted with the BLM, the Division of Wildlife Services and the U.S. Fish and Game and -- Fish and Wildlife Service, I'm sorry, and none of them identified any critical habitat among the Low corridor?

Q. Is that for plant and animal species?

MS. DAVIS: Yes, it is.

MS. WALKER: May I ask a question for clarification. So when you're talking about critical habitat here, you're talking about ESA critical habitat?

MS. DAVIS: I believe that is the BLM's definition of critical habitat.

MS. WALKER: So the one that's in the exhibit that the Staff passed out?

MR. WEISMAN: Yes, that's the Staff Exhibit Y, I believe.

MS. WALKER: Yeah, okay.

Q. (By Mr. Barnett) What definition of critical habitat did you use when you did your analysis?

MS. DAVIS: I believe each of those agencies would have their own definition of critical habitat, and would answer appropriately. BLM and U.S. Fish and Wildlife Service would use the same definition, I believe. Utah Division of Wildlife Resources extends their definition of critical habitat. They do it for a large number of species, not just those that are listed in the Endangered Species Act.

Q. Do you recall a discussion earlier, I believe a statement by Mr. Catlin, regarding the impact of the runoff or drainage around the Low corridor railroad on the vegetation that would be around the corridor, and the same question with respect to the runoff around the West Valley alternative and the impact on the greasewood vegetation? Could you, Mr. Hayes, could you say how PFS is handling the question of drainage around the Low rail corridor as it's currently planned?

MR. HAYES: On the Low rail corridor, any drain that was larger than about six inches deep that had a continuing path, in other words, did not come back to or join with a larger drain through the right-of-way, 200 foot right-of-way, now has a culvert. The culverts are -- minimum size, they are 24 inch and go as large as 48 inch.

Q. And, Ms. Davis, given the culverts that are used on the -- plan to be used on the Low rail corridor, what impact would the runoff with the culverts have given the railroad embankment that would be present at the various locations, what affect will that have on the vegetation on either side of the rail?

MS. DAVIS: I would not expect there would be any.

Q. And could you explain that.

MS. DAVIS: The engineering that's been done has been done to appropriately handle the flow so that it would maintain generally the natural flow conditions on both sides of the railroad. Therefore, would not affect the vegetation.

Q. Now, hypothetically, if you were to build a railroad in the greasewood vegetation that's at somewhat of a lower elevation that was observed on the field trip on Monday, what impact would -- do you see that the Low rail corridor as it's currently planned would have a greater impact on vegetation in its area or would railroad built in the greasewood have greater impact on vegetation there?

MS. DAVIS: With what type of engineering on the west --

Q. Assuming both railroads took into account the existing flow, the runoff of the channels that Mr. Hayes discussed?

MS. DAVIS: If the West Valley

alternative was engineered in such a way as to account for the flow that exists in that location, I wouldn't expect there to be any effect on the vegetation in that location, either.

Q. So relatively speaking, you would say both railroads would have very little impact on vegetation because of runoff?

MS. DAVIS: That's correct.

MR. BARNETT: That's all I have, Your Honor.

JUDGE FARRAR: Does the Staff have anything of these witnesses?

MR. WEISMAN: I don't have anything for these witnesses. Thank you.

JUDGE FARRAR: Mr. Hayes, could you do a better alternative if you had access to state lands?

MR. HAYES: I'm sorry.

JUDGE FARRAR: Could you do a better rail line environmentally if you had access to the State lands?

MR. HAYES: I'm not sure what benefit you would get by pushing the rail line any further east in crossing the state line.

JUDGE FARRAR: State lands.

MR. HAYES: That's correct.

JUDGE FARRAR: The boundary of the State lands?

MR. HAYES: Right.

JUDGE FARRAR: Because I thought somewhere in your report or the Staff FEIS, you had felt constrained by the State lands which led me to think you at one point would have liked to have used those if you had access to them.

MR. HAYES: No, we probably never would have used the land. We might have encroached some on it, but we would never have gone across it.

JUDGE FARRAR: Never gone across it because it wasn't yours?

MR. HAYES: We would have never gone across the State land and into further east of the West Valley --

JUDGE FARRAR: Forget -- maybe I didn't make my question clear. Forget that the State owned them. Just visualize in these lands, could you have done a better line -- rail line using those lands?

MR. HAYES: I don't think so.

JUDGE FARRAR: Thank you. Any cross of these witnesses?

SURREBUTTAL EXAMINATION

BY MS. WALKER:

Q. Ms. Davis, when the FEIS says critical habitat on that little map -- do you remember the little map?

MS. DAVIS: Yes, I do.

Q. So whose definition of critical?

MS. DAVIS: That would be the Utah Division of Wildlife Resources.

Q. Okay, great, thank you. That's it.

JUDGE FARRAR: All right. Then --

MR. SILBERG: Ask the witnesses be excused with a thanks of the Board and the parties.

JUDGE FARRAR: They have the thanks of the Board and they are probably thankful themselves.

MR. SILBERG: I'll extend that offer to the witnesses for SUWA and the Staff, if you want.

JUDGE FARRAR: Does the Staff have any rebuttal?

MR. WEISMAN: The Staff has no rebuttal, no.

JUDGE FARRAR: Ms. Walker, does this presentation by the Applicant trigger a need in you to put your witness back on the stand to respond to anything they've said?

MS. WALKER: I hate to do it, but only one question.

JUDGE FARRAR: That's fair. Dr. Catlin.

MS. WALKER: I'm just worried about all this critical habitat stuff.

FURTHER REDIRECT EXAMINATION

BY MS. WALKER:

Q. Dr. Catlin, I believe you talked about GAP analysis and discussion of various species, and I think you might have used the term -- did you use the term critical habitat?

A. Yes.

Q. Okay. Whose definition were you using?

A. This critical habitat was defined by the Utah State University and the Fish and Wildlife Service in analyzing habitat for different kinds of animals and plants.

Q. But are they listed pursuant to the ESA, those kind of animals and plants?

A. No. Nor is deer listed for the ESA. Critical is necessary to support the population to insure that it continues in that area. It's critical for that area, for that herd, for that species or that population.

Q. So you didn't mean critical habitat as in designated by the Utah Fish and Wildlife Service?

A. No.

Q. Yeah, okay. Great, thank you. That's all.

JUDGE FARRAR: Mr. Silberg, may we have lunch now?

MR. SILBERG: Yes, you may. As may I.

JUDGE FARRAR: Thank you. Thank you again, Dr. Catlin. Ms. Walker, we will not be seeing you again, so we thank you for your participation.

MS. WALKER: It was fun.

JUDGE FARRAR: Not many people say that. Mr. Weisman, we'll be seeing you again?

MR. WEISMAN: Only for our oral argument on Thursday.

JUDGE FARRAR: Mr. Silberg, you'll be doing hydrology?

MR. SILBERG: Yes, sir.

JUDGE FARRAR: Okay. Then, again, thank you, Ms. Walker, and your witness and Mr. Weisman.

MR. WEISMAN: Thank you.

JUDGE FARRAR: Let's take a full hour. Given that we've been going on for a long time, we could use it. So we'll be back here at 2:15.

(Noon Recess.)

JUDGE FARRAR: Good afternoon. We are here on a new issue, the State's Contention O involving hydrology. We've got a partial new set of lawyers. Same old Board. If you will introduce yourselves.

MR. NELSON: My name is Fred Nelson representing the state of Utah on Contention O. With me is Mr. Don Ostler, who will be the State's witness. Also with us is Jean Braxton, paralegal.

JUDGE FARRAR: Mr. Silberg?

MR. SILBERG: Good afternoon, again, Mr. Chairman. I'm Jay Silberg, as you know, from Shaw Pittman, representing Applicants, PFS. With me today on this issue is Mr. Douglas Rosinski of Shaw Pittman. We have handed out a copy of his Notice of Appearance and ask that he be welcomed to this august group.

JUDGE FARRAR: We are glad to have you with us and hope the feeling is mutual. Ms. Marco?

MS. MARCO: Good afternoon. My name is Catherine Marco and I represent the Staff of the

Nuclear Regulatory Commission, and with me are two members of the Staff. I have Chester Poslusny, who is our environmental project manager for this project, and also Mr. Mark Delligatto is here. He is the general project manager who has been with this project since the beginning.

JUDGE FARRAR: Thank you. And welcome all of you. Are there any preliminaries?

MS. MARCO: Yes, your Honor. The Staff has a preliminary matter they would like to address at this time, if we may.

JUDGE FARRAR: Okay.

MS. MARCO: It has come to the attention of the Staff that there is an error or perhaps there are two types of errors in our FEIS, our Final Environmental Impact Statement, and we would like to discharge our obligation to give the Board notification of these matters and felt that the appropriate way to do it would be to put our environmental project manager, swear him in so he can address those changes. And at this point I realize that the witness box is occupied, so if he can do it from --

JUDGE FARRAR: He can stay right where he is. Would you stand, sir, raise your right hand.

Chester Poslusny,

called as a witness, for and on behalf of the NRC Staff, being first duly sworn, was examined and testified as follows:

EXAMINATION

BY MS. MARCO:

Q. Your Honor and parties, I have distributed before you Mr. Poslusny's statement of professional qualifications. And what I'd like to do is introduce this as an exhibit.

Mr. Poslusny, I have put before you a document. Do you recognize it?

A. Yes, I do.

Q. And please describe what it is.

A. It's a description of basically my experience with the NRC.

Q. And is it true and accurate to the best of your knowledge and information?

A. Yes, it is.

Q. It is marked as Exhibit BB and I believe I have given the court reporter three copies and the Board, as well, and I would move that it be introduced into evidence.

JUDGE FARRAR: Okay. That's already been marked.

(EXHIBIT-BB WAS MARKED.)

JUDGE FARRAR: Any objection?

MR. SILBERG: No.

JUDGE FARRAR: It will be admitted.

(EXHIBIT-FBB WAS ADMITTED.)

Q. (By Ms. Marco) Mr. Poslusny, are you aware of any inaccuracies in the Staff's Final Environmental Impact Statement?

A. Yes, I am.

Q. Could you please describe what the first one is?

A. Yes. Let me point you to page XLVII of the executive summary of the FEIS. In particular --

JUDGE FARRAR: Wait. It's 47 in Roman?

THE WITNESS: I have forgotten my translation today.

JUDGE FARRAR: XLVII?

THE WITNESS: That will work. On that page is Environmental Condition No. 5, entitled Water Resources. Particularly 5 (c). I would like to --

JUDGE FARRAR: Wait. I don't find that.

THE WITNESS: It's in the middle of the page.

JUDGE FARRAR: Okay.

A. I would like to focus, I will read it very quickly. "PFS shall be responsible for cleanup of any spills or accidents at the proposed PFSF as well as at the rail siding and along the rights of way for the rail line. In the event of any such spills or accidents, all cleanup activities shall conform with the cleanup standards set forth in 10 CFR Part 20, 40 CFR 112.7, and applicable state of Utah or EPA requirements."

We reviewed this item and realized that the reference to 112.7 in the EPA regulations do not apply to cleanup standards, but they apply to preventative measures to prevent spills. So it was an inaccurate reference. We would propose to remove that reference and believe that's a valid change because the last part of the sentence still states, "Applicable EPA requirements."

Q. And so the Staff's proposed environmental condition in this regard would not contain that reference? Is that correct?

A. Correct. We would remove 40 CFR 112.7 from the sentence.

Q. Do you have another matter you'd --

MR. NELSON: Excuse me. For clarification, you are leaving in, then, 10 CFR Part 20?

THE WITNESS: Yes, we are.

JUDGE FARRAR: Okay. Any objection, any problem with that? No? Okay.

Q. (By Ms. Marco) Would you please inform the Board if you have another change?

A. Let me direct the Board to Page 1-27 in Section 1.6.2.1 under Federal Permits and Approvals. About halfway down under the U.S. Environmental Protection Agency. There is a -- the second part of the paragraph I'd like to focus on briefly. Relative to the requirement for a National Pollutant Discharge Elimination System, or NPDES, and also referred to as a UPDES in the text later on, I want to point out the fact that PFS has been interacting with the Environmental Protection Agency to try to come up with a position on whether or not they would require such a permit. That is still under consideration by the EPA, as far as I understand. And what we determined in later portions of the text, we had assumed that they would be applicable. There are a couple of inconsistencies there but really the important fact is 1.6.2.1 prevails in our observation of what is going on between PFS and the EPA.

Q. And in particular can you state what that sentence is that says that?

A. Okay. Let me state it. "However, PFS has provided information to EPA Region 8 indicating that no jurisdictional wetlands or other types of waters of the United States are located at the proposed site for the PFSF or along the proposed railroad alignment, nor do ephemeral drainages in these areas reach any jurisdictional waters. Based on this information PFS has stated that it does not intend to apply for an NPDES permit."

JUDGE FARRAR: And that would remain unchanged --

THE WITNESS: That remains unchanged. However, additional discussions were not consistent with this. I can give you one example, if you'd like.

JUDGE FARRAR: No, I'm -- in other words, here it says that they have stated they don't intend to apply for a permit, and now you are saying that they are talking to EPA about maybe applying.

THE WITNESS: No. PFS is talking with EPA to get a concurrence from them that their permit is not required.

JUDGE FARRAR: Okay.

Q. (By Ms. Marco) And does that conclude what you would like to tell the Board?

A. Yes.

JUDGE FARRAR: All right. Thank you. Any other preliminary matters?

MR. SILBERG: Yes, Mr. Chairman. As I indicated earlier, and I so informated the parties, at this time I would like to ask the Board to reconsider its ruling dated April 18 denying our motion to strike certain portions of the testimony of the State's witness concerning radiological matters.

In the Board's order of April 18, it is stated that the mention of matters dealing with radiological pollution is intended only to provide context or background for the nonradiological matters. And I would ask for reconsideration because I think a fair reading of the statements in the testimony to be offered by Mr. Ostler would indicate that these are not statements that are merely offered for context or background. For instance, if I call the Board's attention, if you have Mr. Ostler's testimony in front of you, on the top of Page 5, first full paragraph, it says, "NRC is relying on 10 CFR Part 20 standards for cleanup standards." I don't see that as a context or background.

JUDGE FARRAR: Where on Page 5?

MR. SILBERG: The first full paragraph, second sentence.

MR. NELSON: If I may --

JUDGE FARRAR: Wait. We may have brought with us the version, the electronic version rather than the hard copy. So give me a question and answer.

MR. SILBERG: I see.

MR. NELSON: I can maybe short-circuit this and simplify it by saying we will agree and stipulate that what the Board has represented in its order is correct, and that was not our intent to --

JUDGE FARRAR: Okay. I hear what you are saying. Let me find the place first.

MR. SILBERG: It's in Answer 4, the third paragraph of text, and the second sentence.

JUDGE FARRAR: Okay. And while I have

your attention on this, if today as we are questioning the witnesses, if you could give us not only page references but question and answer references to take care of the --

MR. SILBERG: And I don't know if I'm reading from an electronic or nonelectronic version.

JUDGE FARRAR: All right. As long as you are informed. So we have that sentence. All right. And we --

MR. SILBERG: Similarly in Answer 14, in the first paragraph, which on my version at the top of Page 13, the testimony says, "If this is not done," meaning the sampling or observation to insure nonradiological contaminants are not present, "or if radiological sampling is ignored or done improperly, contaminants will be released on site." It seems to me the statement about radiological sampling if ignored or done improperly, is not background or context for nonradiological matters.

Similarly, in Footnote 4, which is in Answer 4, the testimony deals with the lack of background radiological levels, lack of monitoring for background radiological levels in ground water.

Again, I think this is testimony which is not mere context or background. And I can go through the other references, as well.

It really seems to me, since this contention has been properly limited to the discussion of nonradiological contamination, that the testimony would be cleaner if we limited it to the scope of the contention.

JUDGE FARRAR: Thank you, Mr. Silberg. As I remember when we wrote this, we took the State's written brief as, in effect, representing that this was only to context. And I think I just heard Mr. Nelson say that.

I take it, Mr. Nelson, that regardless of how you might read this independently of that representation, you are saying this is only for context of the issue, the nonradiological issue as it's been defined?

MR. NELSON: It is, Judge Farrar. And we are going to have this problem I think regularly in the testimony today because many times in the text that we are going to be looking at in the EIS, in the prefiled testimony not only of Mr. Ostler but also the prefiled testimony of the witnesses, we are going to have that issue. And we agree that ruling has been made. We are not dealing with radiologics. We are dealing with nonradiologics.

JUDGE FARRAR: We, not being a jury, we don't have any concern about us getting confused on that point. The issue has been limited to nonradiological. Ms. Marco, does the Staff have anything?

MS. MARCO: The Staff is interested primarily in clarity to make sure that there is no -- that you are not going to be able to go back and find something in the record at a later date and be confused as to what the intent of having it in there was. It is clearly, if it is crossed out, X'd out of testimony, I don't see why, if there are so few passages, it couldn't be done.

JUDGE FARRAR: I understand what you are saying. But if it is offered and understood as context, then that adds something that I would not want to lose.

MS. MARCO: It does.

JUDGE FARRAR: You have no danger. We have written an opinion, whether the State liked it or not, that said radiological is not an issue. We all understand that. We are not a jury so I think on that basis, Mr. Silberg, we will deny your motion for reconsideration and proceed on this understanding.

MR. SILBERG: Thank you, Mr. Chairman. At this time I would ask that Applicant's witnesses on Contention Utah O, Dr. George Liang and Mr. Donald Wayne Lewis rise and be sworn in.

JUDGE FARRAR: Stand and raise your right hand, if you would.

DR. GEORGE H. C. LIANG AND

DONALD WAYNE LEWIS,

called as witnesses for and on behalf of the Applicant, being first duly sworn, were examined and testified as follows:

MR. SILBERG: The prefiled testimony of Dr. Liang and Mr. Lewis has been previously distributed to everyone. And the parties have agreed that we can merely stipulate this into evidence at this point as if read. I'm handing the reporter a copy of a document entitled Testimony of George H. C. Liang and Donald Wayne Lewis on Contention Utah O, hydrology, which includes both the testimony and their statement of professional qualifications. I'd ask that it be incorporated in the transcript at this point as if read as the testimony of these witnesses.

JUDGE FARRAR: And this is the same as the testimony we have previously been given?

MR. SILBERG: It is.

JUDGE FARRAR: Any objection?

MS. MARCO: No objection.

MR. NELSON: No objection. Our understanding is that that is going to carry for all the prefiled testimony. We stipulated to that.

JUDGE FARRAR: Rather than having them testify, it is just bound in the record. Saves time and we move forward from there. And it will be admitted and bound in the record at this point, as if read.

(PREFILED TESTIMONY OF GEORGE H. C. LIANG AND DONALD WAYNE LEWIS FOLLOWS.)

MR. SILBERG: Thank you. That testimony also included one exhibit, PFS Exhibit AA. I'm handing the reporter three copies of that exhibit. It is a site and access road location plan which may look quite similar to the picture on the easel over there. And I'm giving the reporter three copies of the documents and ask that it be --

JUDGE FARRAR: Put it on her place there because she can't type and receive it at the same time.

MR. SILBERG: I ask that it be identified as Applicant's Exhibit AA and admit it into evidence at this point.

(EXHIBIT-AA WAS MARKED.)

JUDGE FARRAR: Any objections?

MS. MARCO: No objection.

MR. NELSON: No objection.

JUDGE FARRAR: All right. It will be admitted.

(EXHIBIT-AA WAS ADMITTED.)

MR. SILBERG: And with that, the witnesses are available for cross-examination.

JUDGE FARRAR: All right. Ms. Marco?

CROSS EXAMINATION

BY MS. MARCO:

Q. I'm Catherine Marco with the NRC Staff and I have a few questions concerning your testimony. Could you please clarify whether the Applicant intends to design the fuel tanks to have a double containment?

MR. LEWIS: Yes, they will.

Q. Would you describe what the double containment will be?

MR. LEWIS: This is in regards to the diesel storage tanks. We will have two diesel storage tanks. And they have an inner tank that's made out of steel and then they have an outer tank made out of concrete. The outer tank is designed to meet the code criteria for being able to withhold all of the contents of the inner tank, should the inner tank fail.

There will also be double containment on the diesel storage tanks that would be for the fire protection pump engine and also for the diesel generator engine. Those tanks are designed underneath the engines within the frame and those are also double walled, both of them being steel in this particular case.

MR. SILBERG: Just for clarification, those tanks are all above-ground tanks?

MR. LEWIS: Yes, they are.

Q. (By Ms. Marco) Does PFS intend that the water in the detention pond would percolate into the soil and evaporate?

MR. LEWIS: Yes. It could do both.

Q. So PFS is not using or not designing the detention pond to be a confining layer? Is that correct?

MR. LEWIS: That is correct.

Q. What percolation tests are going to be performed in the future at the PFS facility?

MR. LEWIS: The only percolation tests that would be performed would be for the purposes of designing the leach fields. There will be two leach fields and there would be two percolation tests performed in those two locations to verify that they meet the required percolation rates.

Q. That is all the questions I have.

JUDGE FARRAR: Mr. Nelson, your witnesses.

MR. NELSON: If I may, I'd like to do two things. I would represent that this chart over here is from Figure 2.2 of the Environmental Impact

Statement, and for purposes of just making sure that we are talking about the same areas of the facility, I would like to bring that and place it maybe right here so that the witnesses and the panel could see it. Is that acceptable?

MR. SILBERG: Sure.

JUDGE FARRAR: Or if you want to, during the course of your examination you can move it right over. If you want to stand there with the witnesses, you can do that, also. Either way.

MR. NELSON: I believe this should work here.

JUDGE FARRAR: And this was Figure 2.2 on what page?

MR. LEWIS: 2-4.

MR. NELSON: In the interest of trying to move this along, what I would like to do is we have ten exhibits that we will be using for cross-examination. And if I could just get all of those marked and distribute the ten, some of them are excerpts from the EIS, excerpts from the SAR, to facilitate looking at them.

JUDGE FARRAR: Fine. And those, I see, have tabs on them with their --

MR. NELSON: With their numbers.

JUDGE FARRAR: With their numbers.

MR. NELSON: This would be Exhibits 158 through 167.

JUDGE FARRAR: Let's go off the record a moment to deal with the procedural matters.

(Discussion off the record and EXHIBITS-158 THROUGH 167 WERE MARKED.)

JUDGE FARRAR: All right. Then we will consider those documents marked for identification.

MR. SILBERG: Do you have copies for our witness? I hope so. And if you have another copy for us? The blue tags represent places where the --

MR. NELSON: Let me describe what I just handed out. It begins with Exhibit 158, which is a page from a NUREG, 1567.

Exhibit 159 is the deposition of Dr. Liang.

Exhibit 160 is the deposition of Dr. Lewis.

Exhibit 61 is excerpts from the FEIS that we will be referring to. And the blue tabs are simply to facilitate the finding of those sections as we look at the testimony.

JUDGE FARRAR: I think you said 61. You

March 18, 2002

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

Before the Atomic Safety and Licensing Board

In the Matter of	)	
	)	
PRIVATE FUEL STORAGE, L.L.C.	)	Docket No. 72-22
	)	
(Private Fuel Storage Facility)	)	ASLBP No. 97-732-02-ISFSI

TESTIMONY OF GEORGE H. C. LIANG AND DONALD WAYNE LEWIS ON CONTENTION UTAH O -- HYDROLOGY

March 18, 2002

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NUCLEAR REGULATORY COMMISSION

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TESTIMONY OF GEORGE H. C. LIANG AND DONALD WAYNE LEWIS ON CONTENTION UTAH O -- HYDROLOGY

I. BACKGROUND -- WITNESSES

A. George H. C. Liang

Q1. Please state your full name.

A1. George H. C. Liang.

Q2. By whom are you employed and what is your position?

A2. I am a Senior Principal Environmental Engineer for Stone & Webster, Inc. ("S&W"), a Shaw Group Company.

Q3. Please summarize your educational and professional qualifications.

A3. My professional and educational experience is summarized in the curriculum vitae attached to this testimony. I was awarded a Ph.D. in Civil Engineering from the University of Connecticut in 1972 and am a registered Professional Engineer in the State of Connecticut. I have extensive experience in the analysis of hydrologic processes, including over 15 years experience in the calculation and evaluation of groundwater dispersion. I have attended university-level continuing education courses on hydrology and groundwater hydrology. Through my involvement in various groundwater dispersion evaluations of nuclear facilities performed by S&W during this period, I am intimately familiar with applicable Nuclear Regulatory Commission ("NRC") requirements and standard industry practice for evaluating groundwater dispersion. I have visited and observed the proposed Private Fuel Storage, L.L.C. ("PFS") project site and surrounding area. I am knowledgeable of the location of the proposed PFS Facility ("PFSF"), the hydrologic and meteorological conditions of that area, and the area's topography, surface water and groundwater.

Q4. What has been your role in the PFSF project relevant to Contention Utah O?

A4. I have been working on the proposed PFSF project since January 1999 in hydrology and groundwater related areas. Analyses that I either participated in or reviewed are the basis of the hydrology sections in the PFSF Safety Analysis Report[1] (SAR) and Environmental Report[2] (ER). In addition, I prepared responses to NRC's Request for Additional Information ("RAI") regarding the ER and SAR related to hydrology issues.

Q5. What is the purpose of your testimony?

A5. The purpose of my testimony is to respond to the remaining allegations in Contention Utah O that PFS has failed to adequately assess the PFSF site hydrology and the environmental effects from the construction, operation, and decommissioning of the PFSF regarding non-radiological contaminant sources, pathways, and impacts.

Q6. To what will you testify?

A6. I am providing this testimony to show: 1) that the PFSF Environmental Report ("ER") and Final Environmental Impact Statement ("FEIS")[3] accurately describe the non-radiological environmental impacts on surface water and groundwater that will result from the construction, operation, and decommissioning of the

[1] PFS, "Private Fuel Storage Facility Safety Analysis Report," Rev. 22 (2001).

[2] PFS, "Environmental Report for the Private Fuel Storage Facility" (1997).

[3] NUREG-1714, "Final Environmental Impact Statement for the Construction and Operation of an Independent Spent Fuel Storage Installation on the Reservation of the Skull Valley Band of Goshute Indians and the Related Transportation Facility on Tooele County, Utah" (Dec. 2001).

PFSF and 2) that the construction, operation, and decommissioning of the PFSF will have no significant non-radiological impacts on surface water and groundwater. My specific role in this testimony is to provide the scientific basis for PFS' position regarding potential non-radiological impacts to local hydrological resources from the construction, operation and decommissioning of the PFSF.

B. <u>Donald Wayne Lewis</u>

Q7. Please state your full name.

A7. Donald Wayne Lewis

Q8. By whom are you employed and what is your position?

A8. I am currently employed by Stone & Webster, Inc., a Shaw Group Company, as the Lead Mechanical Engineer for the PFSF project. I have held this position since 1996.

Q9. Please summarize your educational and professional qualifications.

A9. My professional and educational experience is summarized in the curriculum vitae attached to this testimony. I received my undergraduate engineering degree from Montana State University, where I majored in Civil/Structural Engineering. I have 19 years of experience in the nuclear power industry, including 10 years of experience with the design, licensing, construction, and operation of independent spent fuel storage installations ("ISFSIs"). I am currently a registered professional engineer in the states of New York, Colorado, Utah, Iowa, and Maine. My technical contribution focuses on the mechanical aspects of ISFSI work, including cask handling and transportation equipment and operations, building services (HVAC, plumbing, etc.), and fire protection. For the PFSF project, I am also responsible for the preparation of the principal design criteria, design installation, and operating systems portions of the PFSF Safety Analysis Report. I have previously testified in this license application proceeding on the subject of fire protection.

Q10. What has been your role in the PFSF project relevant to Contention Utah O?

A10. As Lead Mechanical Engineer, it is my responsibility to establish the design basis and review all design activities of the mechanical systems at the PFSF, including the sanitary waste system. Specifically, I prepared the sanitary waste system flow diagrams, determined the approximate location of the two drain fields, and determined which buildings would drain to each drain field. The flow diagrams, system physical arrangement drawings, and construction specifications were prepared under my direction, which I reviewed for completeness and accuracy. In addition, during licensing of the PFSF, I established many of the detention basin design criteria. Specifically, I helped determine some of the detention basin design features and calculated the duration of evaporation and percolation of the standing water following a 100-year storm.

Q11. What is the purpose of your testimony?

A11. The purpose of my testimony is to respond to the remaining allegations in Contention Utah O that PFS has failed to adequately assess the PFSF site hydrology and the environmental effects from the construction, operation, and decommissioning of the PFSF regarding non-radiological contaminant sources, pathways, and impacts.

Q12. To what will you testify?

A12. I am providing this testimony to show: 1) that the ER and FEIS for the PFSF adequately and accurately describe the potential impacts on the surface water and groundwater in the vicinity of the PFSF site from non-radiological contaminant sources and pathways resulting from the construction, operation, and decommissioning of the PFSF, and 2) that the construction, operation, and decommissioning of the PFSF do not have the potential for significant non-radiological surface water and groundwater impacts or downgradient hydrological resource impacts. My role in this testimony is to describe the specific PFSF design features to minimize the potential for non-radiological contamination of surface waters and groundwater. I will also describe the potential non-radiological contaminants that will likely be present at the PFSF and discuss the likelihood of non-radiological contamination of surface and ground water occurring during facility construction, operation and decommissioning. I will also generally describe the procedures that will be in place to preclude such contamination.

II. OVERVIEW

A. PFSF General Description

Q13. Please describe the proposed PFSF.

A13. (Lewis) The proposed PFSF is an independent spent fuel storage facility to be located in Skull Valley, Utah. When completed, the Owner-Controlled Area will cover 820 acres. Spent nuclear fuel will be stored inside welded, stainless steel canisters contained in concrete and steel cylindrical storage casks on concrete storage pads within a secure Restricted Area. The general layout of this area is illustrated in ER Figure 2.1–2 (sheet 1 of 2) (PFS Exhibit AA). The area around the storage pads will be surfaced with compacted crushed rock with a gentle slope toward the north to facilitate runoff of surface water from the storage pads to a detention basin.

1. Site Facilities

Q14. Please describe the buildings that will be present at the site.

A14. (Lewis) In addition to the spent fuel cask storage pads, four buildings will be constructed as part of the PFSF. These include the Administration Building, the Operations and Maintenance Building, the Security and Health Physics Building, and the Canister Transfer Building. PFS Exhibit AA shows the relationship of these buildings to other site features.

The Administration Building is located outside of the Restricted Area at the entrance to the 820-acre Owner-Controlled Area. It is a single-story steel-frame building, approximately 80 feet wide, 150 feet long, and 22 feet tall, that will house the full-time administrative, engineering, licensing, and Quality Assurance personnel. It will be located approximately 1,850 feet from the storage pads. A break room, men's and women's restrooms, and janitor's closet will have sinks and/or toilets that drain into the sanitary waste system.

The Operations and Maintenance Building is located close to the Administration Building, approximately 1100 feet from the Restricted Area. This building is a single-story steel-frame building, approximately 80 feet wide, 200 feet long, and 36 feet tall, that will house maintenance shops and spare parts and equipment storage areas to service the vehicles and equipment used at the facility. A break room, men's and women's restrooms and locker rooms, and a janitor's closet will have sinks, toilets, and/or showers that drain into the same sanitary waste system that services the Administration Building. Because of their distance from the other two buildings on site, the Administration Building and the Operations and Maintenance Building will have a common sanitary waste system independent from a second system servicing the Security and Health Physics Building and the Canister Transfer Building.

The Security and Health Physics Building is located at the entrance to the Restricted Area and is a single-story concrete-masonry building, approximately 80 feet wide, 120 feet long and 23 feet tall. The building will control access to the Restricted Area and will house the health physics and security personnel. A staff day room, men's and women's restrooms and locker rooms, first-aid treatment room, and a janitor's closet will have sinks, toilets, and/or showers that drain into a second sanitary waste system that will service the Security and Health Physics Building and the Canister Transfer Building.

The Canister Transfer Building is located within the Restricted Area and is a reinforced-concrete high-bay structure approximately 205 feet wide, 270 feet long, and 92 feet tall. The building will house personnel temporarily during canister receipt and transfer to storage cask activities. Men's and women's restrooms and a janitor's closet will have sinks and/or toilets that will drain to a sanitary waste system, the same system that services the Security and Health Physics Building.

2. Sewer/Wastewater Systems

Q15. Please describe the PFSF sanitary waste systems.

A15. (Lewis) During PFSF construction and decommissioning, all sewage and wastewater will be handled using portable sanitary systems and subsequently trucked offsite. Sewer and wastewater requirements during PFSF operation will be handled by two separate sanitary waste systems. One of these systems will service the Administration Building and the Operations and Maintenance Building and a second system will service the Canister Transfer Building and the Security and Health Physics Building. The distance between these two buildings made the use of a single system and leach field impractical.

Both sanitary wastewater systems will be designed and installed according to the Uniform Plumbing Code ("UPC"). Major system components will include fixtures (sinks, toilets, and showers), piping, septic tanks, and the leach fields. The Canister Transfer Building sanitary waste system may include a lift station to pump waste to the septic tank, if necessary. Current plans call for use of standard materials, such as cast iron and PVC, as piping.

Q16. What is the Uniform Plumbing Code?

A16. (Lewis) The Uniform Plumbing Code, or UPC, prepared by the International Association of Plumbing and Mechanical Officials, is a widely used and accepted standard for material selection, design, construction, and installation of plumbing systems including sanitary drainage systems. Compliance with this code will ensure that the PFSF sanitary waste systems are adequate to accommodate anticipated usage. The 1997 edition of the UPC was the adopted plumbing code for Tooele County when detailed design began on the PFSF in 2000. Typically, the appropriate code edition to apply to a project is the one in effect when detailed design begins.

The UPC was used to design the domestic water and sanitary waste systems of the Canister Transfer Building and the Security and Health Physics Building and to determine the preliminary size of the leach field areas. The code will also be required by PFS to be used by the construction contractor that will design and install the domestic water and sanitary waste systems in the Administration Building and Operations & Maintenance Building.

Q17. How did you determine the size of the PFSF sanitary waste systems?

A17. (Lewis) The UPC specifically mandates the sanitary waste system design requirements. The sanitary waste pipes were sized based on the number and type of fixtures in each building. The minimum number of fixtures was determined in accordance with Uniform Building Code requirements and based on the number of occupants (addressed in ER Section 4.2). The septic tanks were sized for a capacity of 3,500-gallons each. The piping for each sanitary waste system will be installed underground and sloped to facilitate drainage. Based on the number of fixtures and typical soil types encountered onsite, each sanitary waste leach field has been preliminarily sized at 1,400 square feet. The construction contractor will determine the final leach field sizing after percolation tests have been performed.

Q18. Describe the location and design of the sanitary waste system leach fields?

A18. (Lewis) The PFSF leach field serving the Canister Transfer Building and Security and Health Physics Building will be located approximately 125 feet north-northwest of the Security and Health Physics Building. The leach field serving the Administration Building and the Operations & Maintenance Building will be located approximately 275 feet northwest of the Administration Building and approximately 250 feet east of the Operations & Maintenance Building. These locations were chosen because they are downhill from the buildings, which is required for good drainage, and are away from the site water supply well. Each leach field was conservatively designed to process the anticipated wastewater loading discussed in the previous question. Each leach field is anticipated to contain a distribution box and perforated piping to disperse the wastewater evenly over the entire leach field area. These locations and designs meet the clearance distances and capacities in accordance with the UPC. The construction contractor may, however, change the final location of the leach fields based on soil percolation test results.

Q19. What bearing did the soil types have on the size of the PFS sanitary waste system components and leach field?

A19. (Lewis) The PFSF site soil characteristics determine the size leach field needed for absorption of the generated wastewater into the soil. The UPC provides the design criteria for the leach field size based on soil types.

Q20. How did you determine the soil characteristics at the PFS site for the purpose of sizing the sanitary waste systems?

A20. (Lewis) The soil characteristics used in sizing the PFSF sanitary waste leach fields were determined from the site borings that were taken in late 1996 nearest the proposed leach field areas.[4] The boring near the leach field servicing the Canister Transfer Building and Security and Health Physics Building sanitary waste system (boring E-3) determined that the soil consisted mainly of silt extending to a depth of 5 feet below grade and interlayered clay and silty clay 5 to 10 feet below grade. The boring near the leach field servicing the Administration Building and the Operations & Maintenance Building sanitary waste system (boring AR-1) determined that the soil consisted mainly of clayey silt extending to a depth of 5 feet below grade and sand 5 to 10 feet below grade.

Q21. Is there any technical reason a sanitary waste leach field would not work as intended (i.e., properly process waste without pooling or contaminating groundwater) in the soils expected at the PFSF site?

A21. (Lewis) No. As stated before, leach fields have been designed for many, many years and are well understood. Established codes and standards mandate certain requirements for leach field placement. We have no reason to believe that the soils in the vicinity of the PFSF will not comply with these requirements and every reason to believe that the planned wastewater system will perform as designed, as have thousands, if not millions, of similar systems.

3. Detention Basin

Q22. Please describe the PFSF detention basin.

A22. (Lewis) A storm-water detention basin will be constructed at the northern end of the Restricted Area, as shown in PFS Exhibit AA. The purpose of the basin is to detain precipitation runoff from severe storms and prevent possible soil erosion from runoff channeled by the storage pads. The detention basin will be approximately 800 feet long by 200 feet wide by 7 feet deep, which S&W calculated will hold the waters from a single 100-year storm event. The basin serves as a collection point for runoff, allowing the water to collect and then slowly dissipate through evaporation and percolation into the subsoils. The detention basin is designed with a concrete inlet from the cask storage area that precludes erosion of the area surrounding the cask storage area. The basin will be constructed with mechanically compacted soil sideslopes and floor and will cover approximately 8 acres with 10:1 embankments.

Q23. What will prevent damage to the detention basin structure in the unlikely event of runoff volume in excess of design?

A23. (Lewis) A spillway is located on the northern side of the detention basin. Its purpose is to allow overflow that may occur in the very unlikely event of precipitation in excess of the 100-year storm event or a precipitation event that occurs before the water from a previous precipitation event has dissipated. Though it is unlikely that this would occur, the emergency spillway provides relief protection for the detention basin walls by preventing water in the basin from exceeding a maximum depth of 6 feet. The spillway is designed so that if such overflow occurs there will be no damage to the detention basin structure or the spillway and no erosion of the soil around the PFSF.

Footnote continued from previous page

[4] See. SAR Chapter 2, Appendix 2A, Borings E-3 and AR-1.

Q24. What evaporation rate have you assumed for your detention basin analysis and what was the source of this information?

A24. (Lewis) Originally, I assumed an evaporation rate of 0.32 inches per day. I have revised that assumption and now assume an evaporation rate of 0.13 inches per day based on information from Figure 16.1 in Houghton, Handbook of Applied Meteorology, 1985.

Q25. What is the impact of assuming this evaporation rate?

A25. (Lewis) Using an evaporation rate of 0.13 inches per day results in a longer period of standing water in the detention basin following a precipitation event (assuming no pumping as described in Answer 70). Even for this evaporation rate , however, no significant percolation of retained water would occur because of the extremely low percolation (0.09 inches per day) of the detention basin floor. Therefore, assuming a 0.13 inches per day evaporation rate, the water from the 100-year precipitation event (4.77feet) would take approximately 260 days (to dissipate through evaporation and percolation), rather than 140 days with an evaporation rate of 0.32 inches per day.[5] The additional 120 days equates to approximately two feet of additional percolation depth from the earlier calculation. This is clearly insignificant in relation to a groundwater depth of 125 feet.

B. Surface Water and Groundwater Near the PFS Site

Q26. Please describe the surface waters in the vicinity of the PFSF site.

A26. (Liang) The location proposed for the PFSF is an area of western Utah with a semi-arid climate, receiving average annual precipitation of 7 to 12 inches.[6] There are no perennial watercourses, such as lakes, ponds, drinking water storage areas or streams, within 5 miles of the PFSF. No intermittent or perennial streams cross any portion of the PFSF site boundary. No identifiable stream channels exist at any point on the PFSF site. The nearest channel identifiable as an intermit-

[5] Accounting for water loss through the basin floor of 0.09 inches per day.

[6] Hood, J. W. and Waddell, K. M., "Hydrologic Reconnaissance of Skull Valley, Tooele County, UT: Technical Publication No. 18" (1968); See also, ER Table 2.4-3 (recent data confirming historical information).

tent stream is located approximately 1,500 feet northeast of the site. According to information provided by the State of Utah, the nearest perennial stream is the Lower South Lost Creek Spring, located approximately 5 miles northeast of the proposed PFSF site.[7] The nearest perennial surface water body, the Great Salt Lake, is located about 28 miles north of the proposed PFSF site boundary.

Q27. Please describe the groundwater in the vicinity of the PFSF site.

A27. (Liang) The groundwater table beneath the PFSF site in the proposed vicinity of the Canister Transfer Building (elevation 4,350 feet) was encountered in the monitoring well CTB-5 (OW) at a depth of 124.5 feet during an investigation at the PFSF site administered by S&W. Based on this information, the depth to groundwater at the PFS site is approximately 125 feet. Differences in surface elevations across the proposed PFSF site could cause the depth to groundwater to vary somewhat over the site, but only by a few feet.

Q28. Are any wells located in the vicinity of the PFS site?

A28. Yes. There are 9 water wells in use within 5 miles of the site. Based on well data obtained from the State of Utah, Division of Water Rights, and Hood and Waddell, 1968, the depth from the ground surface to groundwater in these wells ranges from 78 feet to 520 feet. The depth of 125 feet observed at the CTB-5 well is entirely consistent with this data.

Q29. What is the quality of the groundwater in the vicinity of the PFSF site?

A29. (Liang) In general, groundwater in Skull Valley in the vicinity of the PFSF site is suitable for irrigation or stock watering without treatment. The main dissolved ions are sodium and chloride (Hood and Waddell, 1968). Total dissolved solids in the central and northern parts of Skull Valley, the location of the PFSF, range from 1,600 to 7,900 mg per liter. In comparison, total dissolved solids in potable water are normally less than 500 mg per liter. Most sources of water in the valley

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[7] "State of Utah Contentions on the Construction and Operating License Application by Private Fuel Storage, LLC for an Independent Spent Fuel Storage Facility" (Nov. 27, 1997).

are high in calcium (i.e., would be classified as very "hard") and would need treatment to be suitable for human consumption.

Q30. Please explain how the precipitation in the Stansbury and Cedar Mountains provides groundwater for the PFSF site in Skull Valley.

A30. (Liang) Soils at higher elevations around the Stansbury and Cedar Mountains tend to be highly permeable. Skull Valley typically receives 7 to 12 inches of precipitation per year, while the surrounding mountains generally receive more precipitation, up to 40 inches in Stanbury Mountains and 16 to 20 inches in the lower Cedar Mountains. Because of the semi-arid climate and geologic conditions in and around the mountains, most of the runoff from the mountains either evaporates or infiltrates into alluvial materials near the margins of Skull Valley. Infiltration of runoff from the mountains recharges aquifers in the alluvial fans that extend beneath Skull Valley and is the source of groundwater beneath the PFSF site. Precipitation that falls in the valley does not reach the groundwater because of the depth of the water table, the low permeability of the soil and low amount of precipitation. Each of these characteristics is discussed in further detail below.

Q31. Please explain what happens to the precipitation that falls directly in Skull Valley in the vicinity of the PFSF site.

A31. (Liang) Precipitation events in Skull Valley are normally small and the water remains on or very near the surface where it is evaporated or transpired by vegetation. Larger amounts of precipitation may permeate slightly into the soil. Ultimately, all precipitation returns to the atmosphere either by evaporation or plant uptake and subsequent transpiration. Precipitation falling in Skull Valley does not reach groundwater because of the relatively small amount, low soil permeability, and depth to the water table.

C. Soils Near the PFSF Site

Q32. Please describe the soils in Skull Valley.

A32. (Liang) Soils in the Skull Valley floor are mainly comprised of interlayered silt, silty clay, and clayey silt down to between 25 to 35 feet below existing grade.

Q33. Please describe the borings and laboratory test data you used to determine that the soil at the PFSF site, down to between 25 and 35 feet below existing grade, is mainly comprised of interlayered silt, silty clay, and clayey silt.

A33. (Liang) Geotechnical tests were performed on samples obtained from the borings at the PFSF site. The tests were conducted at the S&W Geotechnical Laboratory in Boston, Massachusetts on 20 boxed split spoon jar samples and 9 undisturbed tube samples from the Skull Valley site. The testing program performed analyses to determine water content, Atterberg limits, percent fines, specific gravity, consolidation, and unconsolidated - undrained triaxial compression. They were conducted in accordance with applicable American Society for Testing and Materials ("ASTM") standards, including the C-136 Test Method for Sieve Analysis of Fine and Coarse Aggregates and D-1140 Test Method for Amount of Material in Soils Finer Than the No. 200 Sieve, and others.

All laboratory equipment and materials used to conduct the testing were calibrated and maintained in accordance with the S&W Standard Nuclear Quality Assurance Program. The results of testing are presented in SAR Appendix 2A, Attachment 2.

Q34. What is the permeability of the soils in the general vicinity of the PFSF site?

A34. (Liang) The silty soils in the vicinity of the PFSF site have relatively a low permeability of 0.071 inches per hour. This value is based on a field pumping test at monitoring well CTB-5, which is located in the planned location of the Canister Transfer Building. The calculated value of 0.071 inches per hour is consistent with the 0.2 inches to 0.6 inches per hour reported in the FEIS.

Q35. Please describe how you determined the permeability of the soil beneath the PFSF site.

A35. (Liang) We performed a field pumping test at monitoring well CTB-5 in 1998. During the field pumping test, the water level within the well was maintained at a fixed height above the equilibrium groundwater level (i.e., top of casing) by injecting water under pressure through a flexible hose. The amount of water injected into the well was monitored over time by means of an in-line flowmeter. The test data acquired were subsequently incorporated into a standard analytic equation for estimating aquifer permeability.[8] Using the field pumping test data, we calculated the permeability to be 0.142 feet per day, or 0.071 inches per hour. The calculated permeability based on the field pumping test data is consistent with the general values of 0.2 to 0.6 inches per hour noted in the FEIS as reported in the literature.[9]

Q36. Why was site specific permeability data, in addition to that from well CTB-5, not collected?

A36. (Liang) Additional site specific permeability data was not necessary. Previous work provided ample information with which to evaluate the site and potential environmental impacts of the proposed facility. The CTB-5 data (0.071 inches per hour) provided great confidence that the generally applicable permeability values reported in the FEIS (0.2 to 0.6 inches per hour) conservatively characterized the site. Of course, activities such as leach field preparation will require verification of actual soil permeability to ensure compliance with the UPC and adequate system function.

Q37. Are you aware of any technical basis supporting a conclusion that the permeability of the silty clays and sands vary by many orders of magnitude over the PFSF site?

A37. (Liang) No. PFSF site borings and laboratory test data identified a sub-surface profile consisting of three layers: silt, silty clay, and clayey silt. No sand was identified to a depth of between 25 and 35 feet below existing grade. As discussed above, a permeability value of 0.071 inches per hour was established at monitoring well CTB-5. Undermining the State's assertion, this value is within a

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[8] See Canada Centre for Mineral and Energy Technology (CANMET), Pit Slope Manual: Chapter 4 - Groundwater; Mining Research Laboratories (1977); *Energy, Mines and Resources Canada*, CANMET Report 77-13 (1977).

[9] See, e.g., U.S.G.S. Professional Paper 1370-G , "Studies of Geology and Hydrology in the Basin and Range Province, Southwestern United States, for Isolation of High-Level Radioactive Waste: Characterization of the Bonneville Region, Utah and Nevada."

single order of magnitude of the general area permeability value of 0.2 to 0.6 inches per hour. We know of no information supporting a conclusion that the permeability of the PFSF site soils vary by many orders of magnitude.

Q38. Would the presence of interfingered lenses and zones in the vicinity of the PFSF site increase the speed of contaminant downward migration toward the groundwater beyond that indicated by permeability information?

A38. (Liang) No. I am aware that the State's expert has concluded that interfingered lenses and zones must result in higher downward migration than that indicated by the permeability of uniform soils. The presence of interfingered lenses and zones, however, does not mandate this result. Such a conclusion is simply a generalization of one potential result of interfingered lenses and zones. A sequence of soils with varying permeabilities (i.e., interfingered lenses and zones) are as likely to retard downward migration as increase it. A generalization of increased migration at the PFSF site is not supported by existing information.

Q39. What is the difference between "permeability" and "percolation rate"?

A39. (Liang) The coefficient of percolation refers to the average actual velocity of water flowing through the actual pore area of the soil whereas the coefficient of permeability refers to the velocity of flow through the total area of solids plus pore spaces. Since, as a rule, the total area is more conveniently determined in gravitational flow problems, the permeability coefficient is used more often than the percolation coefficient. The area of the pore spaces in a typical cross-section of soil is equal to the total area multiplied the porosity. It follows that the coefficient of permeability of the soil is equal to the coefficient of percolation multiplied by the porosity.[10]

Q40. What does the permeability of the soils near the PFSF site indicate regarding percolation into the groundwater from the valley surface?

[10] See M.G. Spangler, Soil Engineering, 2nd Ed. (1960).

A40. (Liang) Percolation from the surface to the groundwater is very unlikely. As described above, borings and laboratory test data show that the upper layers of soil at the PFSF site, extending to depths of between 25 and 35 feet below existing grade, is mainly comprised of interlayered silt, silty clay, and clayey silt. As reported in the FEIS, the permeability of a silty soil in Skull Valley ranges from 0.2 to 0.6 inches per hour. The result of the field pumping test at monitoring well CTB-5 of 0.071 inches per hour indicates an even lower permeability in the soil at the PFSF site than the 0.2 to 0.6 inches per hour range.

The small amount of precipitation that does fall in Skull Valley near the PFSF site is held near the surface by the low permeability of the soils in the valley floor. Because this water cannot quickly permeate much below the surface, it is discharged to the atmosphere either by evaporation or plant uptake and subsequent transpiration.[11] Consequently, percolation into the groundwater from the surface near the PFSF site is effectively nonexistent.

D. Lack of Hydrological Connection

Q41. Is there a hydrological connection or link between the ground surface in the vicinity of the PFSF site and the aquifer beneath Skull Valley.

A41. (Liang) There is no hydrological connection between the valley surface in the vicinity of the PFSF site and the aquifer beneath Skull Valley. Hydrological connection between the surface and groundwater depends on permeability of the soils at the surface, the depth to groundwater, and the amount of precipitation or other source of water. Because Skull Valley floor soils and the soils in the PFSF site area have a low permeability, a measured depth to groundwater of 125 feet, and very low precipitation in Skull Valley, surface water evaporates or is transpired before it can reach the groundwater. There is simply no credible mechanism for overcoming these natural physical characteristics and creating a pathway between the surface and groundwater in the vicinity of the PFSF site.

[11] Dames & Moore, "Superconducting Super Collider, Cedar Mountain Siting Proposal," Proposal Appendix A, Geotechnical Report, Vol. 2, "Geohydrology" (Sep. 1987) at 8 ("Dames & Moore").

Q42. Does PFS intend to construct or rely on a "confining layer" as defined in EPA Guidance?

A42. (Liang) No. The State's expert has cited two EPA documents relevant to hazardous waste landfill and waste containment facilities in support of his analysis of the proposed PFSF design.[12] These documents discuss constructing clay confining layers to minimize infiltration from such facilities and are inapplicable to the PFSF. A "confining layer" is not needed to assure that potential non-radiological contamination from the PFSF detention basin will not reach groundwater. PFS will rely on the lack of any link between the surface and groundwater in the vicinity of the PFSF site as one of several barriers to contamination reaching the groundwater. The low permeability of the soils in the vicinity of the PFSF provide this natural barrier. Other barriers to groundwater contamination include strict procedural controls on storage and use of potential contaminants, maintaining limited quantities of contaminants on site, and spill response processes to cleanup and remove contaminated materials in the unlikely event of a spill, as discussed below.

Q43. Why is PFS not planning to conduct groundwater monitoring at the PFSF site?

A43. (Liang) Groundwater monitoring at the PFSF site is not necessary and would not provide any indication of contamination from the PFSF in any event. Obviously, groundwater monitoring is only useful when the monitored groundwater could possibly be contaminated by materials released from the proposed facility. Here, as described earlier, the groundwater below the PFSF is not hydrologically connected to the surface. Without such a connection, even in the highly unlikely event that a sufficient amount of a contaminant is spilled, is not cleaned up, and reaches the surface soils, contamination cannot permeate to the groundwater 125 feet below because of soil characteristics. Monitoring the groundwater, therefore, would not provide any useful information.

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[12] Requirements for Hazardous Waste Landfill Design, Construction and Closure, EPA/625/4-89/022; Quality Assurance and Quality Control for Waste Container Facilities, EPA/600/R-93/183.

III. RESPONSE TO CONTENTION UTAH O

Q44. What are the State's general claims in Contention Utah O?

A44. (Liang/Lewis) In the remaining portions of Contention Utah O, the State asserts that PFS has failed to adequately assess the environmental effects from the construction, operation, and decommissioning of the PFSF regarding non-radiological contaminant sources, pathways, and impacts, specifically:

1. Potential non-radiological contaminant pathways from the PFSF sewer/wastewater system;
2. Potential non-radiological contaminant pathways from the PFSF detention basin including:
   a) the potential for overflow, and
   b) whether the PFSF FEIS and ER contains appropriate information regarding effluent characteristics and environmental impacts associated with seepage from the detention basin; and
3. Potential for non-radiological groundwater and surface contamination; and
4. Potential impacts on downgradient hydrological resources from non-radiological groundwater contamination.

Q45. Please describe the construction activities that will take place at the PFSF site and how PFS has addressed the potential for non-radiological contamination of ground and surface water during construction.

A45. (Lewis) Construction activities at the PFSF will consist be typical of most industrial construction sites and will consist of site preparation, earth-moving associated with construction of facility features such as the detention basin and flood berm, construction of an access road, four buildings and the concrete pads on which the storage casks will be placed. PFS has committed to the preparation and implementation of best management practices to minimize any potential for precipitation-related erosion during construction. Measures will include erosion and sediment controls, soil stabilization practices, structural controls, and other controls as needed to effectively manage construction-related storm water runoff. PFS will also develop maintenance, inspection, and other practices for the effective management of storm water. A spill response procedure, in accordance with implemented best management practices, will be followed to appropriately respond to an inadvertent spill of oil or fuel from construction machinery. The same measures will be used during subsequent construction of additional PSFS phases. These procedures, in combination with the lack of surface water at the PFSF site, depth (approximately 125 feet) to groundwater beneath the site, low permeability of the soils above the groundwater aquifer, and typically low precipitation, will ensure that construction activities will not lead to contamination of the groundwater beneath the site.

Q46. Please describe the routine facility operations that will take place at the PFS site and how PFS has addressed the potential for contamination during operation.

A46. (Lewis) Routine facility operations will include receipt, inspection and placement of storage casks and maintenance of related vehicles and equipment. All non-radiological substances that could be hazardous to the environment used during these operations, including laboratory chemicals and cleaning supplies, will be marked and stored in designated locations in sealed containers and controlled in accordance with facility procedures as required by regulations to prevent non-radiological contamination. The only substances clearly identified to date that will be used or stored at the PFSF that are listed as hazardous materials under 40 C.F.R. § 355, Appendix A (EPA), 49 C.F.R. § 172, Subpart B (DOT), or 29 C.F.R. § 1910, Subpart H (OSHA) are lubricating oil and diesel fuel. In addition, PFS will maintain and update the plans and procedures implemented during facility construction (see discussion above) during PFSF operations. Additional best management practices will be implemented to meet or exceed applicable requirements as necessary to prevent non-radiological contaminants from entering the environment throughout the PFSF operational life.

Q47. Please describe the decommissioning activities that will take place at the PFS site and how PFS has addressed the potential for non-radiological contamination during decommissioning.

A47. (Lewis) Decommissioning activities will include removal or disposition of the storage pads and the buildings and other improvements. The exact nature of decommissioning has not been established at this time. The types of impacts to surface water and groundwater from decommissioning activities are, however, expected to be similar to those from PFSF construction. PFS will rely on similar best management practices and procedural controls to prevent non-radiological contaminants from entering the environment.

Q48. Could you please describe the tanks that will be used at the PFSF and how PFS has addresses the possibility that liquid stored in a tank could cause contamination at the site?

A48. (Lewis) There will be no below grade or buried tanks at the PFSF. All liquids stored on site (e.g., fuel and water) will be stored in aboveground tanks. The PFSF will have two tanks that will store low-grade sulfur No. 2-D diesel fuel. One tank will be located approximately 200 feet northeast of the Canister Transfer Building and the other tank will be located approximately 225 feet northeast of the Operations & Maintenance Building. Each tank will have a capacity of 1000 gallons. The tanks consist of a primary tank enclosed within a secondary tank to provide double containment. The primary tank will be constructed of steel in accordance with UL-142, "Above Ground Tanks for Flammable and Combustible Liquids." The secondary tank will be a concrete encasement that is designed to provide secondary spill containment in accordance with NFPA 30, "Flammable and Combustible Liquids Code," and meets the requirements of UL-2085, "Insulated Secondary Containment of Aboveground Storage Tanks." This code requires that the tank meet two-hour liquid-pool furnace fire tests, vehicle impact, and projectile resistance criteria.

The PFSF will also have a diesel fuel storage tank for the diesel operated fire pump and a diesel fuel storage tank for the diesel generator. The precise capacity of these tanks has not been determined, but will be approximately 200 gallons each. The tanks are mounted in a sub-base under the engines and have secondary containment in accordance with NFPA 30, "Flammable and Combustible Liquids Code." The tanks will be constructed of steel and meet the requirements of UL-80, "Safety Steel Tanks for Oil-Burner Fuel."

All of the tanks that will store diesel fuel at the PFSF are designed with a monitoring device to detect any leakage into the secondary tank. Should a leak in the primary tank occur, it will be drained. The secondary tank will contain any leaking diesel fuel and protect the surrounding soil until the primary tank is drained. Leaking tanks will be repaired or replaced in accordance with applicable codes and standards.

The PFSF will have four tanks that will store liquid propane for the Canister Transfer Building heating system. The tanks will be located approximately 1,800 feet south of the Canister Transfer Building and approximately 1,000 feet west-southwest of the Operations & Maintenance Building. Each tank will have a capacity of 5,000 gallons. The tanks and attached components will meet the requirements of NFPA 58, "Liquefied Petroleum Gas Code." The tanks will be constructed of steel for a pressure rating of 250 psig and designed, constructed, tested, and stamped in accordance with the stringent requirements of ASME Section VIII, Division 1, "Rules for Construction of Pressure Vessels." The outlet piping of each of the tanks will have excess flow valves to shutoff flow in the event of a pipe rupture. In the highly unlikely event that the propane tanks leak, the propane will vaporize when it is depressurized and not create any ground contamination.

Q49. Could you describe how the lubricating oils would be used and stored at the PFSF?

A49. (Lewis) Lubricating oils will be used at PFSF in, and to maintain, facility equipment such as cask transporters and construction vehicles. Other equipment, such as air compressors, may also require specialized oils for operation. Such lubricants will either be in use in facility equipment or limited quantities sufficient for routine equipment servicing (estimated at approximately 500 gallons) kept sealed in metal drums in designated storage areas within the Operating and Maintenance Building. There will be no floor drains in any of these storage locations.

Q50. Please describe how potential contamination from vehicles used on the PFSF site will be precluded.

A50. (Lewis) During diesel fueling operations, absorbent materials will be placed under the refueling nozzles and hoses to minimize contamination of the soil from a spill of diesel fuel. Diesel fuel will either be contained in facility vehicle tanks or in double-containment, aboveground storage tanks at the fuel dispensing stations. Spills from vehicle fuel tank leaks during operation will be isolated and cleaned up as directed by PFSF operating procedures.

Q51. What would happen if any soil at the PFSF were to become contaminated with spilled diesel fuel or other hazardous materials?

A51. (Lewis) PFSF personnel will follow the actions specified in the Best Management Practices Plan and applicable implementing procedures. As a minimum, soil contaminated with diesel fuel or other hazardous substances will be quickly removed and hauled to an appropriate commercial facility for treatment or disposal preventing contamination from reaching the groundwater.

Q52. Are any other hazardous substances likely to be located at the PFSF?

A52. (Lewis) Other possible hazardous substances include substances such as laboratory chemicals, cleaning solvents, painting products, pesticides and herbicides, and other chemicals common to any industrial facility of this size. These materials will be present only in limited quantities (e.g., small bottles, aerosol cans, and half-, one- and five-gallon containers) and only if needed. Each will be confined to designated areas and stored in labeled containers. Procedures will be in place to ensure that all applicable rules and regulations concerning use and storage of hazardous substances are properly implemented and adhered to. PFSF will also use common janitorial cleaners, which are not classified as hazardous materials. These cleaners will be stored in marked, sealed containers in designated janitor closets in quantities typical of a facility of this size (i.e., aerosol cans, and half-, one- and five-gallon containers).

Q53. If a spill of non-radiological hazardous material were to occur at the PFSF site, would the characteristics of the soil affect the time that PFSF personnel would have to respond to the spill and prevent contamination of the groundwater?

A53. (Liang) Yes. The low permeability of the soil at the PFSF facility will provide adequate time for PFSF personnel to respond and prevent groundwater contamination. Even at the highest permeability assumed (0.6 inches per hour), it would take more than 4 days without any mitigating action for a liquid contaminant to reach a depth of 5 feet, which is easily within reach of remediation equipment (but still over 100 feet above the groundwater). Using the actual measured permeability of 0.07 inches per hour, it would take over 7 days for a liquid contaminant to reach a depth of 1 foot. In either case, PFSF personnel would have ample time to respond and remove the material before it traveled within 100 feet of the groundwater under the site.

Q54. Could you please describe in greater detail how the Erosion Control Plan will direct precipitation runoff to the detention basin and prevent offsite precipitation from running into the basin?

A54. (Lewis) The PFSF Erosion Control Plan (ER at 9.1-5) will identify actions to minimize the potential for precipitation-related erosion. These actions include directing precipitation in the Restricted Area to the stormwater detention basin located north of the storage area. Drainage ditches and diversion channels will be used to divert water to the basin. Earthen berms, designed for the probable maximum flood (PMF), will prevent stormwater from running onto the PFSF site and entering the detention basin.

Q55. Could you describe the types of procedures that the PFSF will use to ensure that all rules and regulations concerning use and storage of hazardous substances are followed?

A55. (Lewis) PFS will implement pollution prevention and waste minimization procedures that incorporate Resource Conservation and Recovery Act (RCRA) pollution prevention goals as identified in 40 CFR 261, and Occupational Safety and Health Act (OSHA) requirements associated with hazardous materials, in accordance with 29 CFR Parts 1910 and 1926. Equipment maintenance and repair will be procedurally controlled to prevent the discharge of oils, grease, hydraulic fluids, etc. As required by OSHA regulations, Material Safety Data Sheets (MSDS) will be filed onsite for all hazardous materials used at the PFSF, along with information on safe handling, storage, and disposal practices. PFSF procedures will assure hazardous materials are placed only in appropriately constructed, properly labeled, containers and stored only in authorized storage locations. Procedures for conducting inventories, inspections for unauthorized materials, and surveillances of procedural compliance will also be developed and implemented. PFSF workers using hazardous materials will be trained in the proper use of the spill response kits in accordance with OSHA requirements.

Q56. What kind of training or instruction will PFSF employees and the construction and decommissioning contractors receive to ensure that they comply with all applicable procedures?

A56. (Lewis) Every PFSF employee will receive initial training, which will consist of general employee training (GET) and job-specific training to provide individuals with the skill and knowledge required to perform their particular duties and responsibilities. GET will include training on procedural compliance, emergency procedures, and environmental protection policies and procedures. Training on environmental protection will include proper handling of hazardous materials on site. PFSF employees assigned tasks involving hazardous materials will receive job- and material-specific training in pre-job briefings prior to performing the tasks. Training of personnel working for construction and decommissioning contractors will comply with applicable laws and regulations governing the hazardous materials required to perform the contracted work.

A. Potential Non-radiological Contaminant Pathways from the PFSF Sanitary Waste Systems

Q57. Please describe the State's claims with respect to the potential for contamination from the sanitary waste systems.

A57. (Liang/Lewis) Basis 1 of the contention asserts that environmental effects associated with non-radiological contaminant sources and pathways from the sanitary waste systems have not been adequately assessed. As we discuss below, however, PFS has appropriately addressed the potential environmental affects from non-radiological contamination.

Q58. Please describe the possible entry points for contaminants into the PFSF sanitary waste systems.

A58. (Lewis) As discussed above, the sewage systems at the PFSF will consist of two independent sanitary waste systems for the sinks, toilets, and showers onsite. Each sanitary waste system will drain sewage to a separate septic tank and leach field. One system will service the Canister Transfer Building and the Security and Health Physics Building and the second will service the Administration Building and the Operating and Maintenance Building. There will be no access to these systems except through the sinks (approximately 25), toilets and urinals (approximately 20), showers (approximately 4), and water fountains (approximately 7). In addition, there will be several "cleanouts" throughout the systems to provide access for maintenance, all of which will be closed during routine system operation. Floor drains will not be used in the buildings.

Q59. How has PFS addressed the potential for contamination from the sanitary waste systems?

A59. (Lewis) Normal janitorial cleaners, common to any industrial facility of this size, will be used at the PFSF. Such cleaning compounds are typically biodegradable and are not classified as materials hazardous to the environment. They will be introduced into the sanitary waste systems, as a part of normal cleaning of sinks and toilets, where they will be decomposed by natural mechanisms. As I described earlier, the septic tanks and leach fields will be designed in accordance with the Uniform Plumbing Code to utilize natural filtering processes to purify disposed sewage, including janitorial cleaning compounds.

Q60. Could you describe how the filtering process in the soil would work to purify the disposed sewage and cleaning compounds?

A60. (Lewis) Use of a septic tank with a leach field is one of the oldest and most widespread methods of sewage treatment in the United States, and the process by which they function is documented in several sources. Wastewater passes through the septic tank where most of the solids settle to the bottom of the tank and undergo decay by anaerobic digestion. Sewage contents typically include nitrogen compounds, suspended solids, organic and inorganic materials, and bacteria. These are removed from the wastewater in the soil by microorganisms, which provide natural wastewater treatment. Clarified effluent flows out the septic tank and is distributed into the soil through perforated pipe. Because of the semi-arid location of the PFSF and the great depth to the groundwater, a significant amount (perhaps all) of the PFSF effluent will be used by plants or evaporate from the soil surface. The remaining effluent, if any, would percolate outward or downward to a depth determined by the soil characteristics.[13] The 125 feet to groundwater at the PFSF site will ensure that any effluent that may reach the groundwater will be thoroughly filtered of any contaminants.

Q61. How has PFS addressed the potential for contamination from the sanitary waste system by materials other than sewage and janitorial cleaners and the potential for hazardous materials to enter the environment through the sanitary waste system?

A61. (Lewis) As discussed above, the only substances that will be used at the PFSF that are identified by applicable federal regulation as hazardous to the environment will be lubricating oils and diesel fuel. Small amounts of other substances, such as cleaning solvents, painting products, pesticides and herbicides, may also be on site from time to time. All such substances will be stored or contained within sealed and properly labeled containers and will be located in designated areas away from building areas with openings to the sanitary waste system. Lubricating oils will only be stored in the Oil Storage Room in the Operations & Maintenance Building or two Canister Transfer Building store rooms, and only if in a NFPA 30 approved flammable and combustible liquid storage cabinet. Painting supplies, pesticides, and herbicides (if onsite) will be stored only in the Operations & Maintenance Building warehouse. Cleaning supply storage will be limited to the janitor's closets in each building.

Laboratory areas will be provided with appropriate receptacles for disposal of laboratory chemicals and similar materials. Proper procedures will be developed and implemented to ensure that workers comply with all applicable rules and

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[13] See EPA 932-F-99-075, "Decentralized Systems Technology Fact Sheet, Septic Tank – Soil Absorption Systems" Sep. 1999).

regulations regarding the handling and storage of hazardous substance. The combination of the small quantities of substances on site and procedures in place for the proper storage and handling of these substances will make non-radiological contamination highly unlikely. PFS will also implement procedures to ensure that, if inadvertent contamination should occur, rapid and effective actions to prevent or minimize release to the environment are performed in accordance with applicable PFSF operating procedures.

Q62. Could hazardous materials inadvertently get into the sinks or drains in the Operations and Maintenance Building?

A62. (Lewis) It is highly unlikely. The Operations and Maintenance Building will be used to perform routine maintenance on equipment, such as cask transporters, used at the facility. There are no floor drains in the Operations and Maintenance Building that would route hazardous liquids, such as spilled diesel fuel or lubricating oil, to the sanitary waste system. The sanitary waste system in this building will only be used to dispose of sewage generated in the sinks, toilets, or showers located in the lunch room, men's and women's restrooms and locker rooms, and janitor's closets. Any material spilled inside the building will be cleaned and disposed of in accordance with PFSF procedures.

Q63. Are there any connections between the sanitary waste system and the detention basin?

A63. (Lewis) No.

Q64. Do the sanitary waste systems handle precipitation runoff from any source on the PFSF site?

A64. (Lewis) No.

Q65. Are there any drains connected to the sanitary waste systems in the storage pad area or in the diesel or lubricating oil storage areas?

A65. (Lewis) No.

Q66. In your opinion, is there any credible pathway for non-radiological contaminants to have a significant environmental impact during construction, operation, or decommissioning of the PFSF?

A66. (Lewis) No. During construction and decommissioning, the sanitary waste systems will not yet be in service or will be removed from service. The lack of physical connection to areas where hazardous materials could be spilled, the non-hazardous nature and limited amounts of other materials, and strict procedural controls assure that hazardous materials will not be introduced into the sanitary waste systems during routine operations. In the highly unlikely event that small amounts of contaminants did enter a sanitary waste system, the natural filtering action of the soils would prevent them from entering the groundwater.

B. The PFSF Detention Basin

Q67. What are the State's claims with respect to the PFSF detention basin?

A67. (Liang/Lewis) Basis 2 of the Contention asserts that the non-radiological environmental impacts of the detention basin have not been adequately considered in two specific respects. First, the State claims that the potential for overflow from the detention basin has not been addressed. Second, the State asserts that potential non-radiological contamination is not addressed because there is no information on either the characteristics of any overflow or seepage from the detention basin.

Q68. How does PFS address the State's claims?

A68. (Lewis) The detention basin is not expected to have freestanding water, except possibly following a severe precipitation event. Most of the relatively small volume of water impacting the cask storage area during a typical rainstorm will be absorbed into the 8-inch thick compacted gravel surface surrounding the storage pads and will not drain to the detention basin. Only during a substantial rain event is water expected to drain from the cask storage area to the detention basin. As discussed below, the detention basin is sized to hold the amount of water that would be generated within the cask storage area following a 100-year storm event.

As discussed previously, the absence of large quantities of chemicals precludes chemical contamination at the PFSF, including the detention basin. In the unlikely event of an accidental spill of petroleum product or other potential contaminant, which I also discussed above, engineered containment features and PFSF operating procedures will preclude their introduction into the detention basin as well. Therefore, since there are no credible scenarios for any type of contamination being introduced into the detention basin, there is no need for an effluent monitoring system. Diesel fuel spilled from leaking or ruptured locomotive fuel tanks would drain into the swale located on the north side of the railroad tracks. The swale is designed to contain a total loss of diesel fuel from a locomotive coincident with a 100 year design rainfall. Cleanup of the contamination in the swale will be performed in accordance with PFSF operating procedures and will prevent contamination from such spills from reaching the groundwater.

Q69. Specifically, how does PFS address the potential for the overflow of the detention basin?

A69. (Lewis) As noted earlier, the detention basin is sized to contain the runoff of the storage site from a 100-year storm event. The depth of water in the detention basin following a 100-year storm event is calculated to be a maximum of 4.8 feet. Water that collects in the detention basin will dissipate by evaporation and percolation into the subsoils. In the unlikely event of a 100-year storm event, the time for the water that has collected in the basin to be removed via evaporation and ground percolation is conservatively estimated to be approximately 260 days, based on assumptions of an evaporation rate of 0.13 inches per day[14] and a percolation rate of 0.09 inches per day.[15] The percolation rate for the detention basin was based on soils found in the borings nearest the detention basin (boring B-1 and C-1). This percolation rate is not based on the permeability determined from the field pumping test at monitoring well CTB-5 because at depth of 125 feet the permeability data was obtained in silty sand, which has a higher permeability. The site borings show that the upper layers of soil consist of clayey silt extending all the way down to a depth of 25 feet below current grade. Clayey silt has a

[14] David D. Houghton, Handbook of Applied Meteorology (1985).

[15] William T. Lamb & Robert V. Whitman, Soil Mechanics (1969).

much lower permeability than silty sand and will tend to slow the percolation of the water into the soil. If significant standing water occurs in the detention basin, temporary pumps will be used to drain the detention basin via the spillway to eliminate long-term freestanding water. This action will minimize the already unlikely possibility of overflowing the detention basin, as well as precluding the growth of significant vegetation and attracting wildlife.

Q70. What would happen if there were a storm more severe than the 100-year storm or the basin was already nearly full at the time of a 100-year storm?

A70. (Lewis) Though it is highly unlikely that either of these events would occur, the emergency spillway would provide relief protection for the detention basin walls by releasing water from the basin. The water released through the spillway would mix with the other waters flowing through the valley as a result of the 100 year rain. To the extent that any amount of contaminant was in the detention basin water, this mixing would further dilute the contaminant making any potential environmental harm even more unlikely.

Q71. How does PFS address the potential for contamination from basin overflow and seepage?

A71. (Lewis) As discussed above, introduction of contaminants into the detention basin is highly unlikely. The absence of large quantities of chemicals and PFSF operating procedures for using the small quantities of chemicals stored at the PFSF will prevent any substantive quantities of contaminants from entering the basin in the first place. Further, because of the lack of significant precipitation and low permeability of the basin floor and the underlying soils, the potential for significant contaminant seepage out of the detention basin is not credible. Only during a substantial rain event would water be expected to accumulate in the detention basin. Two significant rain events within a short time (e.g., less than the 140-days needed to completely empty the basin after a 100-year rain event, assuming no pumping) is extremely unlikely, if not incredible. Finally, even if there were contaminants in the detention basin and even if contaminated water overflowed from the detention basin, the low permeability of the surface soils would provide ample time for PFSF to perform cleanup and removal of the contamination before it reached any significant depth.

Q72. How do you address the possibility that contaminants from locations other than the spent fuel cask storage area might be washed onto the site and into the detention basin during a rainstorm?

A72. (Lewis) The PFSF will have engineered containment features (e.g., the drainage ditches that run along the north and south sides of the railroad tracks at the PFSF) that will contain potential non-radiological contaminants, such as diesel fuel that could be spilled from a transportation vehicle. The south drainage ditch is connected to the north drainage ditch via a culvert located at the west end of the drainage ditches. While these drainage ditches eventually drain into the detention basin, the drainage system design includes weirs that can be shut in the event of a contamination event (i.e., a spill of diesel fuel). A weir is located just north of the culvert discharge into the north drainage ditch. The weir consists of gates that can be closed to prevent any potentially non-radiological contaminants from draining to the detention basin during cleanup of a spill. Contaminated material will be removed and properly disposed of in accordance with applicable requirements.

Q73. How would the soil in the vicinity of the PFSF affect the potential for groundwater contamination resulting from detention basin overflow or seepage?

A73. (Liang) As discussed earlier, based on borings and laboratory test data, the upper layers of soil, extending to depths of between 25 and 35 feet below existing grade, mainly are comprised of interlayered silt, silty clay, and clayey silt. With this type of soil acting as a natural barrier below the bottom of the basin, water seepage will be very slow, allowing for appropriate actions to be taken before any water reached the groundwater.

As also discussed earlier, the source of groundwater flow at the PFSF is mainly derived from precipitation that falls at the higher elevations of the Stansbury and Cedar Mountains. The lack of direct hydrological link between the surface and groundwater at the site results in surface water from precipitation at the site migrating horizontally northward and eventually dissipating from evaporation, transpiration and capillary action. Therefore, even if hazardous chemical contaminants were deposited on the surface at the PFSF, the lack of a direct hydrological link would effectively prevent them from ever reaching the groundwater below. The contaminants will either remain suspended in the soil, be adsorbed, or (if volatile) ultimately evaporate into the atmosphere.

Q74. When you say that the soil will act as a "natural barrier" to the movement of contaminants downward in the direction of the groundwater, what do you mean?

A74. (Liang) The low permeability of the soil will retard contaminants from moving downward into the soil. Indeed, the low amount of precipitation and complete lack of surface water will provide little, if any, driving force for any contaminants to reach depths below that at which they are released. Ultimately, particulate contaminants will remain deposited in the soil, while volatile contaminants may slowly rise to the surface and evaporate. While the permeability of the soil at the surface of the PFSF site may or may not be as low as the permeability of a man-made barrier (e.g., liners that might be used at a hazardous waste disposal facility), because of the depth to the groundwater at the PFSF site, lack of surface water, and the low rate of precipitation, it will nevertheless prevent any spilled contaminants from reaching the groundwater.

Q75. Could holes that PFS has drilled during the evaluation of the site or that PFS will drill during construction provide a pathway for contaminants to seep from the detention basin into the groundwater?

A75. (Liang) No. Borings and cone penetration tests (locations shown in SAR Figure 2.6-2 and 2.6-19) were not performed within the location proposed for the detention basin; therefore, there are no potential pathways for water in the basin to drain through to underlying soils.

Q76. Would holes drilled elsewhere on the PFSF site provide a path for contamination to reach the groundwater?

A76. (Liang) No. All boreholes in the proposed Canister Transfer Building area at the PFSF site were grouted with cement. Some other boreholes were backfilled with soil, but they were generally less than 50 feet in depth and did not intercept the ground water. Further, no boreholes were drilled in the area of the detention basin, which is the most likely location for the standing water necessary for improperly sealed boreholes to act as conduits.

C. The Potential for Non-Radiological Surface Water and Groundwater Contamination

Q77. What are the State's claims with respect to the potential for non-radiological surface water and groundwater contamination?

A77. (Liang/Lewis) Basis 3 of the contention asserts that the environmental impact discussion is incomplete because the discussion of the potential for non-radiological surface water and groundwater contamination is inadequate.

Q78. How do you respond to the State's claims?

A78. (Liang/Lewis) As discussed above, we have clearly demonstrated that there is no credible pathway for either surface water or groundwater contamination of any kind to occur from construction, routine operations, or decommissioning of the PFSF. Non-radiological contamination is precluded by the absence of any significant contaminant sources, strict adherence to procedures, and the use of best management practices that minimize the potential for contaminant releases to occur and quickly contain and clean up any contaminant releases that might occur. The lack of contaminant sources and pathways and absence of nearby surface water preclude the possibility of surface water contamination from the PFSF. The low permeability of the near-surface soils and the general lack of precipitation in this semi-arid environment also ensure that there is no opportunity for any inadvertent contamination to spread to the groundwater.

Q79. How do you respond specifically to the State's claim with respect to runoff from the PFSF site or the PFSF detention basin?

A79. (Liang) Operation of the detention basin will have only a very local, sporadic effect on the subsurface hydrology. The design of the PFSF and the PFSF Erosion Control Plan will significantly minimize or prevent surface changes due to sporadic runoff. As discussed above, the water from the detention basin will not affect the groundwater because there is no direct hydrological link between surface water and the groundwater at the proposed PFSF site.

Q80. How do you respond to the State's claim of non-radiological surface water and groundwater contamination from the PFSF wastewater system?

A80. (Lewis/Liang) The design and operation of septic systems is a mature technology and the PFSF system contains nothing novel or untried. Applicable design and construction codes and standards will ensure that discharged wastewater does not pool at the surface or reach the groundwater during the life of the PFSF. As described earlier, the leach fields will be conservatively designed for the expected amount of wastewater to allow natural filtration to remove biological and other materials from the wastewater. The water portion of the sewage will be transpired by vegetation or evaporate similar to runoff from the detention basin. The remaining material, including whatever small amounts of contaminants present will either decompose, be adsorbed, or (if volatile) evaporate at the surface. There will be no impact on either surface or ground water from the PFSF sanitary waste system.

D. Impact on Downgradient Hydrological Resources

Q81. What are the State's claims with respect to the PFSF impact on downgradient hydrological resources?

A81. (Liang/Lewis) The State asserts that the environmental effects of the potential impact of non-radiological groundwater contamination on downgradient hydrological resources has not been addressed.

Q82. How do you respond to the State?

A82. (Liang/Lewis) As discussed above, PFSF construction, operation, and decommissioning will not have a significant impact on the water resources on or near the site. Diesel fuel and lubricants will be stored in approved containers and designated locations, used only in strict compliance with procedure, with leaks and spills quickly contained and cleaned up. The PFSF will maintain only small amounts of other potentially hazardous materials, which will be closely controlled and carefully stored. The concentration and quantities of chemicals onsite will be so low as to eliminate the possibility of an uncontrolled release of a substantive amount of contaminants. No hazardous material will be introduced into the sewage system. Contamination from vehicles used onsite will be precluded using normal industrial practices, and any unexpected contamination will be immediately removed from the site. Further, soil characteristics, lack of surface water, and depth to groundwater will prevent contaminants from spreading downgradient, even in the highly unlikely event contamination somehow spread offsite. As there is no credible pathway for non-radiological contamination to reach the groundwater, the PFSF will have no significant impact on downgradient hydrological resources.

IV. CONCLUSION

Q83. What are your conclusions regarding the remaining assertions in Contention Utah O?

A83. (Lewis/Liang) We conclude that PFS has adequately assessed the physical characteristics of water and soil in Skull Valley, engineering barriers, and procedural controls regarding potential environmental affects on surface water and groundwater from non-radiological contamination as a result of the construction, operation, and decommissioning of the PFSF. In our opinion, based on all of the available information, non-radiological contamination from construction, operation and decommissioning of the PFSF will have no significant impact on the surface water and groundwater of Skull Valley or downgradient hydrological resources. We further conclude, therefore, that there is no technical basis for any of the remaining assertions in Contention Utah O.

DONALD WAYNE LEWIS

LEAD ENGINEER
MECHANICAL DIVISION

EDUCATION

Montana State University - Bachelor of Science, Civil Engineering - 1980
Daniel International Corp. - Course in ASME Section III - 1982
Daniel International Corp. - Course in Welding - 1983

REGISTRATIONS

Professional Engineer - New York (1988)
Colorado (1997)
Maine (1999)
Utah (2001)
Iowa (2002)

EXPERIENCE SUMMARY

Mr. Lewis has 20 years of engineering experience in the power generation industry, and has participated in all phases of power plant engineering from design through construction, pre-operational testing to on-line modifications.

Mr. Lewis has experience on several nuclear facilities. Assignments include the design of spent nuclear fuel storage facilities, plant systems design modifications, and on-site engineering of mechanical systems installation. Spent fuel storage facility design involved preparation of the design of mechanical aspects and related licensing of the facilities, including an on-site assignment as project engineer for the client for construction of one of the facilities. Plant systems modification assignments involved resolving system design problems, preparing design changes and supporting analyses, revising drawings and preparing specifications. On-site engineering of mechanical systems installation involved resolving pipe and equipment installation conflicts, reviewing and revising design drawings, ensuring code compliance, procuring system components, and developing start-up procedures.

Mr. Lewis has experience on four coal-fired boiler plants. Assignments included the design of mechanical systems on a flue gas scrubber project, development of system descriptions and operating instructions; and the evaluation of a coal to natural gas conversion design. Work involved design of piping systems, component selection and sizing, preparing calculations and specifications, reviewing proposal submittals, initiating process flow and layout drawings; writing plant operation instructions; and preparing cost analyses.

Mr. Lewis is currently assigned to two spent fuel storage projects: the Duane Arnold Energy Center and Private Fuel Storage Facility where he is Lead Mechanical Engineer, responsible for mechanical design and licensing of the facilities.

DETAILED EXPERIENCE RECORD
LEWIS, DONALD WAYNE

STONE & WEBSTER ENGINEERING CORPORATION, DENVER, COLORADO
(Apr 1988 - Present)
Appointments:
Lead Engineer, Mechanical Division - Jan 1998
Senior Mechanical Engineer, Mechanical Division - Nov 1990
Mechanical Engineer, Mechanical Division - Jan 1989

Duane Arnold Energy Center, Cedar Rapids, Iowa – Nuclear Management Company
(July 2000 - Present)
LEAD MECHANICAL ENGINEER

Indian Point 1, Buchanan, New York – Entergy Nuclear Northeast
(April 2001 – January 2002)
PROJECT ENGINEER

Indian Point 2 Nuclear Plant, Buchanan, NY – Consolidated Edison
(January 1999 - January 2000)
PROJECT ENGINEER

Maine Yankee Atomic Plant, Wiscasset, ME – Maine Yankee Power Company
(November 1998 – October 2001)
LEAD MECHANICAL ENGINEER

Yucca Mountain Project, Las Vegas, NV - U.S. Department of Energy
(June 1998 - August 1998)
SYSTEMS ENGINEER

Rocky Flats Environ. Tech. Site, Golden, CO - Rocky Flats Engineers & Contractors, L.L.C.
(May 1998 - Sept 1998)
RADIOLOGICAL CONSULTANT

Prairie Island Generating Plant, Red Wing, MN - Northern States Power Company
(Oct 1997 - Present)
PROJECT ENGINEER

National Wind Technology Center, Golden, CO - National Renewable Energy Laboratory
(Oct 1997 - Apr 1998)
SENIOR MECHANICAL ENGINEER

Rocky Flats Environmental Technology Site, Golden, CO - BNFL
(July 1997 - Oct1997)

SENIOR MECHANICAL ENGINEER

Private Fuel Storage Facility, Goshute Indian Res., UT - Private Fuel Storage
(Oct 1996 - Present)
LEAD MECHANICAL ENGINEER

Goodhue County ISFSI, Frontenac, MN - Northern States Power Company
(Aug 1995 - Sept 1996)
PROJECT ENGINEER

Navajo Generating Station, Page AZ - Salt River Project
(Sept 1993 - Nov 1995)
SENIOR MECHANICAL ENGINEER

Prairie Island Generating Plant, Red Wing, MN - Northern States Power Company
(Jan 1992 - Aug 1993)
SENIOR MECHANICAL ENGINEER

Neil Simpson Station, Gillette, WY - Black Hills Power Company
(Sept 1991 - Dec 1991)
SENIOR MECHANICAL ENGINEER

North Omaha Station, Omaha, NE - Omaha Public Power District
(July 1991 - Aug 1991)
SENIOR MECHANICAL ENGINEER

Fort Calhoun Power Station, Ft Calhoun, NE - Omaha Public Power District
(Apr 1988 - June 1990) (Nov 1990 - Aug 1991)
SENIOR MECHANICAL ENGINEER

Prairie Island Generating Plant-Unit 2, Red Wing, MN - Northern States Power Company
(July 1990 - Oct 1990)
LEAD MECHANICAL ENGINEER

EG&G Rocky Flats Inc., Golden, CO - U. S. Department of Energy
(July 1990)
MECHANICAL ENGINEER

U. S. Department of Energy, Hanford, WA
(June 1990)
MECHANICAL ENGINEER

STONE & WEBSTER ENGINEERING CORP., CHERRY HILL, NEW JERSEY
(Sept 1983 - Mar 1988)
Appointments:

Engineer, Mechanical Division - Aug 1987
Construction Engineer - Oct 1985
Senior Field Engineer - Oct 1984
Field Engineer - Sept 1983

Nine Mile Point Nuclear Station, Unit 2, Lycoming, NY - Niagara Mohawk Power Corporation
(Sept 1983 - Mar 1988)
ENGINEER, Mechanical Division (Aug 1987 - Mar 1988)
ENGINEER, Construction Division (Sept 1983 - July 1987)

Oswego Steam Station Units 5 & 6, Oswego, NY - Niagara Mohawk Power Corporation
(Dec 1986)
CONSTRUCTION ENGINEER

DANIEL INTERNATIONAL CORPORATION, GREENVILLE, SOUTH CAROLINA
(June 1982 - Aug 1983)

Wolf Creek Nuclear Plant, New Strawn, KS - Kansas Gas & Electric
CONSTRUCTION ENGINEER II

J.A. JONES CONSTRUCTION COMPANY, CHARLOTTE, NORTH CAROLINA
(Oct 1981 - Apr 1982)

Washington Nuclear Plant No. 1, Handford, WA - Washington Public Power Supply System
FIELD ENGINEER

WRIGHT SCHUCHART HARBOR-BOECON-GERI, RICHLAND, WASHINGTON
(Mar 1981 - Oct 1981)

Washington Nuclear Plant No. 2, Handford, WA - Washington Public Power Supply System
ASSOCIATE STRUCTURAL ENGINEER

MONTANA STATE HIGHWAY DEPARTMENT, HELENA, MONTANA
(July 1979 - Sept 1979, July 1980 - Mar 1981)
CIVIL ENGINEER I (Traffic Division, Jan 1981 - Mar 1981)
ENGINEER AIDE (July 1979 - Sept 1979)

Experience Summary

Dr. Liang is a Senior Principal Environmental Engineer in the Environmental Sciences & Engineering Department. He has over 26 years of experience in siting, environmental assessment, developing and managing environmental protection programs, and licensing of power plants and industrial facilities. He also has extensive experience in mathematical modeling, numerical analysis, and computer applications in environmental engineering/design related problems. He is currently a Program Manager and has previously been a Lead Environmental Engineer on major projects in nuclear/fossil power plants and industrial projects, which involved environmental impact studies, federal/state/local permitting applications, managing engineering/design, procurement and installation of water and wastewater treatment systems, conceptual design of the heat dissipation/chemical discharge system, studies of alternative cooling systems, groundwater dispersion, hydrological analysis of power plant sites and thermal/water quality impact analysis of power plant discharge.

As Supervisor of Water Quality and Hydrology, Dr. Liang has supervised many water quality and hydrology related tasks for power plant projects. He established the technical guideline for flood analysis at power plant sites. He managed the environmental impact assessment of a fluidized bed power plant site and prepared its permit application. He established the exclusion criteria for siting a Low-Level Radioactive Waste disposal facility in Maine, to assure compliance with federal and state requirements. He evaluated existing permit requirements to determine the potential environmental impacts of rerating a nuclear power plant. Dr. Liang completed the conceptual design of a surface run-off detention pond for a proposed NPR site in Idaho, a cooling pond for a proposed power plant site in Florida, a multiport diffuser for a cogen plant in New York and a combined cycle power plant in England, U.K. He has developed the water quality monitoring program and conducted the hydrothermal/water quality modeling for numerous power plant projects.

Dr. Liang has been a lead environmental engineer on major projects in nuclear, fossil, and industrial plants.

Dr. Liang has been an expert in mathematical modeling of surface water, groundwater, water quality, hydrological and hydrothermal analysis.

Dr. Liang has been intimately familiar with EPA's National Pollution Discharge Elimination System (NPDES) permit application regulations and the requirements of section 401 of the Water Quality Act (WQA), which amended Clear Water Act (CWA) section 402(1)(2). He has assisted many major utility clients as well as independent power producers in obtaining the NPDES permit.

Dr. Liang has participated in numerous siting studies for various type of power generation projects and Low Level Radioactive Waste disposal facilities. He has designed and supervised many environmental monitoring programs for siting studies, and prepared permit applications and supporting documentations.

As a member of ICE team, Dr. Liang has participated in evaluating DOE's Environmental Restoration and Waste Management Five-Year plan. He has assisted DOE in environmental cleanup activities at Handford site, and managed environmental studies for the U.S. AMTL research reactor decommissioning project.

Dr. Liang developed a comprehensive environmental protection program at a nuclear power plant construction site. He monitored project construction activities for regulatory compliance in air and water quality, noise, wetlands and wildlife refuge protection, and solid waste disposal. Dr. Liang integrated the environmental protection program with the quality assurance and safety/health programs to measure program performance. He provided the impetus to implement similar programs at other nuclear power plant sites.

Dr. Liang has performed a technical review of the existing environmental operating limit permits and supporting documentation (316a and 316b demonstrations) and assessed the impact of the power uprate on the plant's ultimate heat sink.

In 1994, Dr. Liang managed a consulting services project for improving the technical ability of 22 senior engineers from East China Electric Power Design Institute, dealing with the requirements for a Conventional Island design associated with a nuclear power plant.

Since 1995, Dr. Liang has been working as Lenders' engineer for several fossil power plant projects in China. Working as an Independent Technical Consultant (ITC), he has been responsible for the due diligence effort which includes technical review of engineering/design of the major plant systems, review and evaluation of fuel sources and cost, project performance parameters and guarantees, environmental parameters for compliance with PRC's regulations and World Bank guidelines; construction progress monitoring for funding drawdown certification, start-up/test procedure review, and witnessing the 72-hour and 24-hour test runs, and certification of completion of several fossil power plant projects in China.

Recently Dr. Liang has been in charge of developing EPC cost data base for fossil power plant in China.

Education

Ph.D., Civil Engineering - University of Connecticut, Storrs, Connecticut - 1972
M.S., Civil Engineering - University of Connecticut, Storrs, Connecticut - 1967
National Taiwan University, Taipei, Taiwan, Republic of China

Training

China Forum - since 1995, a lunch-time seminar series, meeting once every other month, covered the topics of information, challenges, strategies, recent development, and successful projects in marketing in China, sponsored by the Office of International Trade & Investment, the Commonwealth of Massachusetts, Foley, Hoag & Eliot LLP, and others.
The Princeton Course/Groundwater Pollution and Hydrology - 1993
Hazardous Materials Management, American Management Association - 1991
Site Selection and Design of Sediment and Detention Basins, Southern New England Environmental Regulation Course, Executive Enterprise, Inc. - 1987
MIT Video Course on Finite Element Methods, Massachusetts Institute of Technology - 1984
Water Resources Lecture Series - Rainfall/Run-off Modeling using HEC-1, Stone & Webster Engineering Corporation - 1982
Sediment Transport in Rivers and Estuaries, University of Southern California - 1974

Licenses, Registrations, and Certifications

Professional Engineer - Connecticut, 09789 - 1975 Active

Professional Affiliations

American Geophysical Union, Member
The Society of the Sigma Xi, Member

Publications

Liang, G.H.C.. "New Technologies in Sulfur Removal in the Refining Process in a Refinery." National Conference for Environmental Managers of Petrochemical Plants, May 1995

Liang, G.H.C., "Use of Groundwater Analytical/Numerical Models for Evaluating Pollution Control Measures at Hazardous Waste Disposal Facilities." New England/Republic of China Technical Exchange Symposium, May 1990.

Liang, G.H.C.. "Summary of Hydrographic and Hydrothermal Studies at Millstone Nuclear Power Station, 1969-1985." Millstone Ecological Advisory Committee Meeting, Waterford, Connecticut. 1986.

Liang, G.H.C.; Lee, V.M.; and Torbin, R.; "A Data Acquisition and Analysis Technique for a Sediment Transport Field Study Program." COASTAL ZONE 78, San Francisco, California, 1978.

Liang, G.H.C. and Lin, J.D., "Effect of Pressure Gradient on Wind-waves in a Laboratory Channel." 2nd U.S.National Conference in Wind Engineering Research, Colorado State University, Fort Collins, Colorado, 1975.

Liang, G.H.C., "Wind-generated Waves With and Without Pressure Gradients." University of Connecticut, Storrs, Connecticut, 1972.

Liang, G.H.C. and Lin, J.D., "Laboratory Win-waves Generated With and Without Pressure Gradients." American Geophysical Union Fall Annual Meeting, San Francisco, California, 1972.

Liang, G.H.C., "Numerical Calculation of the Source Term for a Vertical Line Source Under Linearized Free Surface." University of Connecticut, Storrs, Connecticut, 1967.

meant 161?

MR. NELSON: I'm sorry. 161.

162 is a copy of the state Utah drinking water standards, a copy of a state rule.

Exhibit 163 is a Uniform Plumbing Code Illustrated Training Manual, 1997 edition.

Exhibit 164 is an excerpt from the Safety Analysis Report, two of the boring logs from that report in Appendix 2A.

Exhibit 165 is also from the Safety Evaluation Report. Excuse me. Safety Analysis Report. And it is a page excerpt from Attachment 2 on some moisture content Atterberg limits.

Exhibit 165 -- excuse me 166 is again from the Safety Analysis Report, Volume 1, two pages dealing with locations of bore holes and other test investigations.

And then Exhibit 167 is a table that I will be asking the witnesses about concerning rates of percolation.

MR. SILBERG: And that is a table prepared by the State?

MR. NELSON: That is a table prepared by the State.

JUDGE FARRAR: I don't see -- I have no

last page but I will borrow from my neighbors here.

MR. NELSON: Let's get --

JUDGE FARRAR: Don't worry about it. When we get to that, I'll look at --

MR. NELSON: We have several extras.

JUDGE FARRAR: Thank you.

MR. SILBERG: Off the record.

(Discussion off the record.)

CROSS EXAMINATION

MR. NELSON:

Q. If I may begin with a couple of questions for the panel concerning the locations of the waste water and storm water facilities. This represents the detention basin, does it not? And I'll address this question to Mr. Lewis. This represents the detention basin that is spoken of and that potentially could receive water from the fuel storage pad area. Is that correct?

MR. LEWIS: Before we start, could I get you to move it just a little bit towards the board so it is under the light? There you go. Perfect. That's better. Much better.

Okay. Ask your question again, please?

Q. There are two main areas of discussion in the prefiled testimony dealing with the detention basin and water that flows into that, and then the second major area is the septic tank drain fields. In looking at this map here, this site plan, this is the detention basin here just above the fuel storage pad area. Is that correct?

MR. LEWIS: That is correct.

Q. And it is the fuel storage pad area that potentially could drain to that detention basin?

MR. LEWIS: That is correct.

Q. The two septic tank drain fields, the first is located in an area near the operation and maintenance building and the administration building in this position here just north of the administration building. Is that correct?

MR. LEWIS: It is actually a little bit further west than you have depicted on the drawing, but it is somewhat between the two buildings.

MR. NELSON: I didn't depict it on the drawing. It's from the EIS. So is the EIS incorrect, then, as to the location of that drain field?

MR. LEWIS: It will be somewhere in that location, yes.

Q. That drain field services the

administration building and the operation and maintenance building; is that right?

MR. LEWIS: That is correct.

Q. The second drain field is located near the security and health buildings, just to the north, and it services the canister transfer building and the security and health physics building.

MR. LEWIS: That is correct.

MR. SILBERG: Excuse me. Just for clarification, I can't see that far, which way is north on that map?

MR. NELSON: North on this map is depicted up.

MR. SILBERG: Okay.

Q. (By Mr. Nelson) Mr. Liang, and I guess really I address this question first to you and then to Mr. Lewis, you have had considerable expertise in nuclear facilities, have you not?

DR. LIANG: In the area of hydraulic surveys, hydrology, and ground water hydrology, yes.

Q. With respect to nuclear facilities that's been your primary interest and focus in your profession?

DR. LIANG: Yes.

Q. And that's true of you, too, isn't it, Mr. Lewis?

MR. LEWIS: In different areas, but yes, on nuclear facilities.

Q. Would you agree that with respect to these two major systems that I have just described, that they are not unique to nuclear facilities? They are typical of industrial facilities in the design of a detention basin or the design of a septic tank drain field is not unique to a nuclear facility?

MR. LEWIS: Septic systems are typically not used at nuclear facilities unless there is, you know -- typically there is sewage systems that they would utilize, if they could.

Q. Expertise with respect to nuclear facilities doesn't help you with respect to the design of the drain field. You need independent expertise to deal with that, similar to any other facility which was designing a septic tank and drain field.

MR. LEWIS: Yes. They could be used at any type of industrial facility, yes.

Q. Mr. Lewis, you are licensed in Utah as a professional engineer.

MR. LEWIS: Yes, I am.

Q. Have you ever worked with a client who applied for a state permit in Utah to install a septic tank drain field?

A. No, I have not.

Q. Have you worked with a client in any of the western states to get a permit for a septic tank drain field?

MR. LEWIS: In Colorado.

Q. Would you indicate what the circumstance was there?

MR. LEWIS: Just had to prepare an application for a septic system to the tri-county board of Colorado, which would be in the Denver area.

Q. For what facility?

MR. LEWIS: I cannot remember that, off the top of my head.

Q. You don't remember the client?

MR. LEWIS: No. It's been a few years ago.

Q. Have you aided any other clients in the preparation of a design for a septic tank drain field?

MR. LEWIS: Yes, I have.

Q. Can you tell me who and where?

MR. LEWIS: That one, which we did about three years ago, was in the state of Maine. And that was at the Maine -- let's see. Maine Atomic Power Plant, and that would be for the same company.

Q. And that was a septic tank drain field for disposal of waste at the power plant?

A. That was for a septic system that was going to be used for the spent fuel storage facility at the power plant, yes.

Q. Mr. Liang, have you ever designed or helped a client work on a septic tank drain field?

DR. LIANG: No, I have not.

Q. Have either one of you had occasion to review the ground water protection rules for the state of Utah?

MR. LEWIS: I have only briefly.

DR. LIANG: I have not.

Q. Which rules did you look at, Mr. Lewis?

MR. LEWIS: The rules on septic system design.

Q. That would be Part 4 of the Utah rules?

MR. LEWIS: At the time that we were

preparing the design for the spent fuel storage system, that would have been I believe it was 501 or part five. Now it is part four.

Q. Did you ever look at Section 6 of the rules dealing with ground water protection?

MR. LEWIS: I do not remember if I did or not.

Q. Are you familiar, Mr. Liang, with the Uniform Plumbing Code?

DR. LIANG: No, I'm not familiar with that.

Q. Mr. Lewis, are you familiar with the Uniform Plumbing Code?

DR. LIANG: Yes, I am.

Q. Have you looked at the specific requirements for a septic tank drain field with that code?

MR. LEWIS: Yes, I have.

Q. Mr. Lewis, have you ever designed a lagoon or storm water retention pond for a client in the state of Utah?

MR. LEWIS: No, I have not.

Q. Have you done that for any clients in the western United States?

MR. LEWIS: No, I have not.

Q. Have you ever designed a retention pond or storm water retention pond other than this one?

MR. LEWIS: No, I have not.

Q. Mr. Lewis, have you seen a septic tank drain field being constructed?

MR. LEWIS: Yes, I have.

Q. Was that the occasion of the facility in Maine?

MR. LEWIS: That was -- no. That was the facility in Colorado.

Q. Did you observe the one in Maine?

MR. LEWIS: No, I did not.

Q. Have you observed any other septic tank drain fields being constructed other than the one in Colorado?

MR. LEWIS: Only in private applications. But yes.

Q. How many times?

MR. LEWIS: Three or four times.

Q. Mr. Liang, I assume that your expertise is not in the septic tank drain field area. But do you have any firsthand information on viewing septic tank drain fields being constructed?

DR. LIANG: No, I have not.

Q. Mr. Lewis, have you physically conducted a percolation test?

MR. LEWIS: No, I have not.

Q. Have you seen one conducted?

MR. LEWIS: Yes, I have.

Q. How do you do that for a septic tank drain field?

MR. LEWIS: Typically they bring in a backhoe and they dig down four or five feet to the layer where the drain field is going to occur. They drill a hole in the ground, typically about 12 inches in diameter. They fill that hole up with water and then you watch it and see how long it takes for the water to percolate down one inch, and record that time.

Q. It's not a difficult or costly process, is it?

MR. LEWIS: It's not a costly process. It does involve a little bit of work since the backhoe has to be brought in on site and it tears up a little bit of soil in the process of doing it.

Q. Home owners do it all the time, don't they?

MR. LEWIS: They have it done, yes.

Q. Have either one of you -- my assumption is that since you have not designed or had constructed a detention pond previously, that neither one of you have designed or constructed either a lined or unlined pond.

DR. LIANG: No, I have not.

MR. LEWIS: No, I have not, either.

Q. Mr. Liang, if I could ask you to refer to Exhibit 159. 159 is the deposition that you gave and I would like to have you take a look at Page 6. At the bottom of Page 6 there is a question. Do you see what I'm referring to there where it says, "So you are involved in site monitoring wells and production wells, things like that?" Do you see that question there at the bottom of Page 6?

DR. LIANG: Yes.

Q. And you answer, "Not really, but at one point we -- Stone & Webster is a very diverse company. Not only in the power plant, we also have environmental cleanup. Sometimes because of so many projects going on, they want some personal resource. I was asked a number of times to look into this so-called monitoring well. Ground well -- at the groundwater well there was monitoring, and then give some technical input to the specification and so on."

DR. LIANG: Yes.

Q. Do you consider yourself to be a monitoring expert?

DR. LIANG: No, I'm not.

Q. You have indicated in your resume that you have been involved in conducting water quality monitoring. What were you referring to?

DR. LIANG: That is we, the group I was associated with, the company's environmental science and engineering division, we had some small project in Massachusetts. When they had the install monitoring wells and they needed some technical input about prepare a specification, then I would provide some input to that, to the way how to install technical input to the monitoring well. So-called spec, specification preparation.

Q. But you haven't been involved in designing or implementing monitoring systems for ground water?

DR. LIANG: No, I have not.

Q. Are you a soils expert?

DR. LIANG: I'm not a soil expert.

Q. Are you an expert in geologic formations?

DR. LIANG: No, I'm not an expert in

that area.

Q. Are you a hydrologist?

DR. LIANG: Yes, I am.

Q. Do you consider yourself an expert in hydrology?

DR. LIANG: Yes.

Q. If I could refer you in that same exhibit, Number 159, your deposition, to Page 23. Page 23, there's a question at the top of the page. It says, "So this is a heterogeneity in the aquifers? The permeability in the three dimensions differs?" Do you see that question?

DR. LIANG: "So this is a heterogeneity in the aquifers? The permeability in the three dimensions differs?"

Q. Do you see that question?

DR. LIANG: Yes.

Q. The answer is, "No. The permeability is vertical, the transmitability horizontal, coefficient. An aquifer is -- how much water you can do is not only permeability. You have other coefficient also affect the production of the well is the transmitability coefficient.

Question: Are you saying the permeability of the surface soils --

Answer: Uh-huh.

Question: -- does not determine the ability of it to transmit water?

Answer: I didn't say that.

Question: Well, let me ask this question, then. What is the difference between permeability and hydraulic conductivity.

Answer: I don't know that.

Question: Are you familiar with the term "hydraulic conductivity?

Answer: I would say no."

Isn't a hydrologist familiar with the term "hydraulic conductivity".

DR. LIANG: At the time I was confusing these so-called conductivity and transmissibility or permeability.

Q. Do you know what the term "hydraulic conductivity" means?

DR. LIANG: Yes.

Q. If I could refer you to -- no. I believe on Page 42 and 43, I was going to ask you about that but you have confirmed that you are not an expert in waste water disposal systems.

DR. LIANG: No, I'm not.

Q. Are you a ground water modeling expert?

DR. LIANG: Yes, I am.

Q. If I could refer to Page 9 and 10 of the deposition. Excuse me. Bottom of Page 10.

DR. LIANG: Deposition, is that -- Excuse me. Is that in your --

Q. I'm sorry. The deposition is Exhibit 159.

DR. LIANG: Oh, I'm sorry.

Q. And I'm asking you questions within that. So if you stay on that for the moment, that's where they will be.

DR. LIANG: All right.

Q. On Page 10. Right in the middle of Page 10.

"Question: You are an expert in ground water modeling?

Answer: Yes."

Do you see where I'm reading there?

DR. LIANG: Yes. "You are an expert in ground water modeling?"

Q. "Answer: Yes. As a matter of fact, I wrote an article on that and presented it in a symposium. That is in my resume on the publication. On the groundwater model to use remediation of hazardous waste site, compare different model.

Question: What about areas of environmental impact as far as degradation of surface or groundwater quality?

Answer: What do you mean by that, degredation?

Question: Adversely affecting the water quality of groundwater or surface water."

And this is the answer I need to ask you about.

"Answer: Yeah. As a matter of fact, this is one of the -- when we prepare a project report, no matter if it is nuclear or fossil, within Stone & Webster's scope of work, usually after modeling the ultimate goal is to evaluate what the impact is in the environment, because this is always required by federal regulation or NRC guidelines to rep ER. so modeling is the first step to prepare, but the evaluation impact is the ultimate objective."

Has there been any modeling done in this particular project?

DR. LIANG: No.

Q. Isn't the first step not modeling, but it is characterizing the site?

DR. LIANG: Would you repeat the question?

Q. You have indicated in your answer that modeling is the first step to prepare. I'm trying to understand what you mean by that. And my question is if you were going to evaluate the impact on the environment, isn't the first step to characterize the site and then do the modeling?

DR. LIANG: I don't understand what you mean by characterizing of the site.

Q. What do you need to have? What information do you need to have to model?

DR. LIANG: It is true, yes, the first step is you have to do that.

Q. You have to get information about the site before you can run a model.

DR. LIANG: Yes.

Q. And there was no modeling done with respect to this particular facility.

DR. LIANG: Yes.

JUDGE FARRAR: Excuse me. Was that yes, there was no modeling; or yes, we did modeling?

DR. LIANG: Yes, we did not do the modeling on this project.

MR. NELSON: Thank you.

Q. (By Mr. Nelson) Was there any testing to determine the direction of groundwater flow underneath the site?

MR. SILBERG: I'm sorry. You said was there any testing to determine?

Q. Testing. Was there any testing done to determine the groundwater flow direction under the site?

DR. LIANG: No.

Q. Mr. Lewis, are you a soils expert?

MR. LEWIS: I have worked with soils. I have a degree in civil engineering so I am aware of a lot of soil conditions, but I would not necessarily characterize myself as an expert.

Q. If I can refer you to Exhibit 160, Mr. Lewis, it's your deposition. And referring you to Page 14, beginning approximately -- well, Line 8. Beginning Line 8 with the question that starts, "Evaporation, transpiration." Do you see where I am there?

A. Yes.

Q. "Evaporation, transpiration. Somehow it's leaving the system back to the surface. Are there any other options besides those three?

Answer: Water -- it typically is going

to follow the slope of the ground, and it's going to flow in layers along a path that goes down. And that might reach, you know, I don't know. You know, it's going to follow the same path as all the rainwater that travels through there and gets absorbed into the ground.

Question: Will it end up in the groundwater?

Answer: I don't know. You know, the groundwater is very deep, so I don't know if it is going to end up in the groundwater eventually or not. I don't know what types of -- I don't even know if the soil allows rainwater to eventually percolate into the groundwater. I guess I can't quite answer. You know, I do not know. My expertise does not cover soil conditions enough to where I can answer your specific question."

Is that answer reflective of what you have just indicated to me with respect to your expertise in soils?

MR. LEWIS: Yes, it is.

Q. If I could refer you to Page 6 of the deposition. Beginning on Line 10.

"Question: Do you know if the pond is going to be using native soils? Is there any synthetic liner that is going to be placed in the pond?

Answer: There will not be any synthetic liners in the pond. I believe it is using native soils, but if they are supplementing those with structural fill, I wouldn't know.

Question: Do you know if they're going to be doing anything to the native soils that would change their percolation characteristics?

Answer: I'm not aware of any, no.

Question: That's possible that they will be doing something like that?

Answer: That's actually out of my expertise."

So with respect to native soils and percolation, that specifically is not within your expertise?

MR. LEWIS: No. That's not what I was referring to in this answer.

Q. Would you explain, please?

MR. LEWIS: What I was referring to in the answer is the design of the detention pond. It would actually be civil engineers that are out of my group that would be designing the detention pond. And so the types of materials that they were going to be using at the detention pond at the Private Fuel Storage facility, I was not aware of at the time.

Q. Thank you. If I may go back and use this facility map and ask some specific questions. The area that is controlled by PFS is approximately 820 acres. Isn't that right?

MR. LEWIS: Is that out of the SAR or the ER?

Q. It is out of your prefiled testimony on Page 5.

MR. LEWIS: Okay. I believe that is correct.

Q. The trains and locomotives that would be coming into the area would be coming in from the west to the canister building south of the fuel storage pads. Is that correct?

MR. LEWIS: That is correct.

Q. What kinds of vehicles are operating in the fuel storage pad area?

MR. LEWIS: Predominantly they would be the locomotives. And then there would be the canister transfer vehicle. And thirdly there would be security vehicles.

Q. Pickup trucks, trucks?

MR. LEWIS: It could be a pickup truck.

Q. Do you know specifically where the two 1000 gallon fuel tanks are located?

MR. LEWIS: Yes, I do.

Q. Where are they located?

MR. LEWIS: The first one is located about 200 feet northeast of the canister transfer building, within the protected area. The second one is located just north of the operation and maintenance building.

Q. So in looking at the map, it is just north of the canister building here and then just north of the operation and maintenance buildings?

MR. LEWIS: Northeast of the canister transfer building, towards the security and health physics building.

Q. Northeast?

MR. LEWIS: Northeast.

Q. In this area?

MR. LEWIS: Correct.

Q. How large is the detention basin?

MR. LEWIS: I think it is 800 feet long and 200 feet wide.

Q. And that is eight acres, isn't it?

MR. LEWIS: Yes, I believe so.

Q. Do you know if that eight acres is computed from the outside?

MR. LEWIS: I do not know that.

Q. How large is this storage area? Do you remember? Is it your recollection it is 99 acres?

MR. LEWIS: Yes, it is 99 acres. I believe it is a little over a 1000 feet in both directions. I could not tell you the exact measurements.

Q. Here is the scale on the map. Could it be 2000 feet in both directions, if this is a 1000 feet?

MR. LEWIS: Yes, it could be.

Q. So you have -- it is about a third of a mile square?.

MR. LEWIS: Half of a mile, third of a mile.

Q. Inside this fuel storage pad area, is there any growth of wheat grass or anything like that?

MR. LEWIS: Not inside of it, no.

Q. That's outside is where the wheat grass is planted?

A. That is correct.

Q. What is inside the 99 acres?

MR. LEWIS: The storage pads and compacted gravel, predominantly.

Q. The compacted gravel is eight inches deep; is that right?

MR. LEWIS: That is correct.

Q. Would you describe what the compacted gravel is like? Is it a clean, crushed rock?

MR. LEWIS: Yes. It would be what we call structural fill, which is crushed gravel that is graded so that it compacts very tightly.

Q. What is the size of the pieces of gravel?

MR. LEWIS: That all depends on what they specify. But it could be from three-quarters of an inch down to fines.

Q. There's not a lot of dirt in there?

MR. SILBERG: What do you mean "in there"? You mean underneath the gravel?

Q. There's not a lot of dirt in the compacted gravel?

MR. LEWIS: It depends what you define as dirt. There are what we call fines, which are small particles that make up -- the objective of structural fill is to insure that there are very few voids. So you have to have what we call gradation, a number of different types of or different sizes of gravel in order to make sure that you've compacted it and filled all those voids. So there would be some voids or some gravels that would be very small.

Q. The purpose is to make it structurally so that you can drive a larger vehicle across it, isn't that right, without sinking into the mud?

MR. LEWIS: That would be correct.

Q. The detention pond is going to be planted with wheat grass inside; is that correct?

MR. LEWIS: I don't remember if it is or not.

Q. Let me ask you to look at Page 11 of your prefiled testimony. On the top of the page there on Page 11 of the prefiled testimony it talks about the basin being constructed with mechanically compacted soil sideslopes and floor and will cover approximately eight acres with a 10 to 1 embankment.

MR. SILBERG: Could you give us a question and answer? We may be dealing with this electronic versus hard copy issue again.

BY MR. NELSON: Question 3. It is under Detention Basin. Question 3 is the best I can do on that.

MR. SILBERG: Our testimony doesn't have a Question 3 under Detention Basin.

MR. NELSON: Q3, A3?

JUDGE FARRAR: That's the bad version that got filed initially where it gave question and then the answer was a different number. We got several of those in as people were racing to meet deadlines. And then everybody substituted.

MR. SILBERG: I don't remember that episode.

JUDGE FARRAR: You weren't on our end of the computer.

MR. SILBERG: Or it may have been in your computer. Can I take a look?

JUDGE FARRAR: Why don't you go ahead and straighten it out.

(Discussion off the record.)

Q. (By Mr. Nelson) Let's look at Page 10, then. Page 10 of the prefiled testimony, Question 22, Answer 22. Last sentence, embankment of 10 to 1. You don't know whether the eight acres described there is inside on the bottom or whether it is an outside dimension taking into account the embankment?

MR. LEWIS: I believe it does take in the embankment, but I am not sure about that.

Q. If I can refer you to Exhibit 161, it's the selections out of the Environmental Impact Statement, on Page 4-12. There's a sentence in the middle of the page on Page 4-12 that says, "If processes such as frost heave or vegetation root penetration causes disruption of the compacted soil layer," do you see that sentence? The vegetation root reference there, is that a reference to wheat grass growing in the bottom of the detention basin?

MR. LEWIS: I believe that it is.

Q. The septic tank drain field for the administration building and the operation and maintenance building is designed at 650 gallons per day. Is that correct?

MR. LEWIS: Can you repeat the question?

Q. The septic tank drain field for the administration building and operation and maintenance building is 650 gallons per day. Is that correct? It's designed for that size.

MR. LEWIS: I think that's the minimum requirements. We actually designed them both to be 875 gallons per day, I think.

Q. 875 gallons per day combined with the two?

MR. LEWIS: No. It was 1750 gallons combined for the two.

Q. If you will look at Exhibit 161, again. Page 4-13. The fourth paragraph from the top. It says, "One of the proposed septic systems," do you see where I'm reading?

MR. LEWIS: Yes.

Q. "Would serve the administration operation and maintenance building (estimated 650 gallons per day) and the other would serve the canister transfer and health physics building (estimated at 400 gallons per day)." So you are testifying that that has now changed; that the size between the two is now 1750 gallons per day?

MR. LEWIS: No. In our license application we do not have these numbers. Our numbers are based on an industrial facility with showers, which is 35 gallons per person per day. And these numbers are based on an industrial facility without showers, which is 25 gallons per person per day.

Q. So these facts in the EIS are about half of the estimated amount that will be going into the septic tank drain field?

MR. LEWIS: Not half. They are about three-quarters.

Q. It's the difference between 1000 and 1750.

MR. LEWIS: Right. Understand that the canister transfer building and the administration building would not have showers. So these numbers are not that far off. But for conservatism, when we were designing the septic systems I assumed worst case, which is to assume that we have showers everywhere, to design a conservative field.

MR. SILBERG: For clarification at this point, can I just understand the statements in the FEIS, do those relate to the design of the system or the usage that was assumed from those two sets of buildings, or do we know that?

MR. NELSON: I guess at this point I need to ask a question. Mr. Silberg has a chance to ask questions on cross-examination. Is he going to cross- examine while I'm doing the testimony?

MR. SILBERG: My purpose is not to cross- examine, but to get a clarification because frankly I don't know what this means and I think it would be good for the record at this point to indicate what this statement means. I'm certainly not cross- examining.

MR. NELSON: Well, let me ask the witness --

JUDGE FARRAR: Mr. Nelson, let me touch on how we tend to do things here. When there's confusion, either we jump in, or somebody jumps in, trying not to interrupt the rhythm of cross-examination, but sometimes if there's confusion we find it is easier on technical matters to ask a question, get a clarification, and save 15 minutes of nobody understanding what is going on. So I think that is what Mr. Silberg is doing. But if you think they --

MR. NELSON: Thank you, Judge. That is acceptable.

JUDGE FARRAR: But if you think he is doing it for a different purpose, then you are free to ask that he or anybody else not do it.

MR. NELSON: Thanks, Mr. Chairman.

MR. SILBERG: Mr. Nelson, I was just trying to clarify the record at this point.

JUDGE FARRAR: That has been the practice.

MR. NELSON: Understanding that, I will try to fit the same mold.

JUDGE FARRAR: But your point is a valid one, and so let's move on.

Q. (By Mr. Nelson) Let me ask the question, then. Those estimates --

JUDGE FARRAR: As long as we have interrupted you, could I ask a question? I have had a clarifying question in my mind for some time, but how do we get eight acres out of 800 by 200? Because I'd like to bring you back to Montgomery County and we will sell those excess four acres for what we get for them, and we can all not participate in the hearing anymore.

MR. LEWIS: Well, the 800 by 200 could be the -- it could be 800 by 200 divided by --

JUDGE FARRAR: 40,000.

MR. LEWIS: 43,516 feet per square acre. But if it includes the embankments, then it could be --

JUDGE FARRAR: Okay. Now the --

MR. LEWIS: I'm not sure that the 800 by 200 includes the embankments. That might just be the base of the detention basin.

JUDGE FARRAR: When you say the embankments, do you mean the embankments that are holding the water or do you mean the embankments outside the pond that are slanting downwards and out- wards?

MR. LEWIS: I do not know how the eight acres was computed.

MR. SILBERG: I can provide that information, if you'd like.

JUDGE FARRAR: As long as we have interrupted Mr. Nelson, why don't you testify, Mr. Silberg.

MR. SILBERG: Or I can put on Mr. Trudeau and he can answer it.

JUDGE FARRAR: We can have him later confirm it.

MR. SILBERG: The 200 by 800 is the bottom. The eight acres represents the entire area from the top of the outward sloping slopes.

JUDGE FARRAR: So the area at the top of the detention basin is considerably larger than the bottom?

MR. SILBERG: Because of the 10 to 1 embankment ratio.

JUDGE FARRAR: If Mr. Trudeau will be good enough later to mention that, we will confirm it. I'm sorry, Mr. Nelson.

MR. NELSON: I don't believe that Mr.

Trudeau is going to testify, but if we want to have a representation on the record, I will agree to that dimension.

MR. SILBERG: We can put him on the record for that purpose, and he may be on later.

MR. NELSON: We will stipulate to that explanation.

JUDGE FARRAR: Thank you, Mr. Nelson. Go ahead.

Q. (By Mr. Nelson) The leach fields that are associated with these two septic tanks are 1400 square feet apiece. Is that correct?

MR. LEWIS: That is the preliminary calculation for those two leach fields, yes.

Q. That is the number that was represented on Page 9 of your prefiled testimony and also in the EIS. Is that correct?

MR. LEWIS: That is correct.

Q. What permeability was used to compute the size of that leach field?

MR. LEWIS: There was no permeability that was used for it. We used the Uniform Plumbing Code, which provides five different soil types. And we tried to match it up with the closest soil type. And then it has a prescribed number of square feet that you would design the leach fields for.

Q. If you had done a percolation test, you could have used the percolation test to design the size of the leach field; couldn't you?

MR. LEWIS: Yes, you could. And eventually we would do that percolation test.

Q. In fact, that is critical you do that, isn't it? To make sure that the drain fields will work right?

MR. LEWIS: Typically it's required, yes.

Q. If I could refer you to Page 12. Well, no. Just a minute. I'll have to get into that mode. I'm sorry.

JUDGE FARRAR: That's all right.

Q. Page 12 of the prefiled testimony, top of the page. Mr. Liang. That's your testimony. Do you see the sentence on the last paragraph, it says, "The nearest perennial surface water body, the Great Salt Lake, is located about 28 miles north of the proposed PFSF site boundary." Is that a correct statement?

DR. LIANG: The last sentence of the first paragraph?

Q. The first partial paragraph. Right at the top of the page. It says, "The nearest perennial surface water body, the Great Salt Lake, is located about 28 miles north of the proposed PFSF site boundary."

DR. LIANG: Yes. That's a correct statement.

Q. If I could refer you to Exhibit 161, Page 3-11. At the top of the page, last sentence in that first partial paragraph, it says, "The nearest perennial surface water flow downstream of the proposed PFSF site is Horseshoe Springs located 10 miles to the north." Doesn't that conflict with your testimony?

DR. LIANG: No, not necessarily. When I say the water body, I assume some kind of reservoir type. No flow in and out. So here it seems to me they have some kind of flowing stream, something like that.

Q. Have you seen Horseshoe Springs?

DR. LIANG: No, I have not.

Q. It is a series of small ponds and lakes, isn't it?

MR. SILBERG: I think he just said he hadn't seen it.

DR. LIANG: I don't know.

JUDGE FARRAR: He can answer if he knows from some other source of information.

DR. LIANG: At the time, I do not have that source of information.

Q. Your definition of the nearest perennial surface water body is a body of water that doesn't have an in-flow, or has an in-flow and no out-flow? Is that what I understood you to say?

DR. LIANG: No. Exactly what I'm saying, water body is a water retained in a boundary. The spring, as a matter of fact, this water body was presented by the state after saying we do not find or did not find any permanent water body or stream within five miles of the PFS site. So this piece of identification of water body was presented by the state of Utah later on, after we presented this so-called permanent water body 28 miles in our environmental report.

Q. I don't want to belabor this point, but the prefiled testimony was filed after the Environmental Impact Statement was issued; wasn't it?

DR. LIANG: True. It is true.

Q. And the prefiled statement is the one that has the representation with respect to the Great Salt Lake. And the EIS has the statement with respect to Horseshoe Springs. So you didn't have the EIS -- I will leave that question.

Mr. Lewis, how is the detention basin constructed? Would you describe how it is constructed?

MR. LEWIS: The detention basin basically is constructed by digging down a few feet and then the spoils from that would be used to create the embankment around the basin itself.

Q. So you excavate out the material, using the excavation to build the sides?

MR. LEWIS: For the most part. We might have to bring in some soil to complete the embankments.

Q. The detention basin is seven feet deep; isn't that right?

MR. LEWIS: That is correct.

Q. And that is measured from the top of the embankment to the floor.

MR. LEWIS: That is correct.

Q. How far below grade -- let me state the question again. How far below the edge of the fuel storage pad would you estimate is the bottom of the detention basin?

MR. LEWIS: I don't remember that.

Q. It would be lower than it, wouldn't it?

MR. LEWIS: Yes, it would be.

Q. Because you have excavated out the detention basin and you've got, then, a place for the water to flow into. There's no pumping into the detention basin.

MR. LEWIS: No, there's not.

Q. Underneath this site, PFS identified groundwater; isn't that correct?

DR. LIANG: Yes.

Q. Excuse me. Mr. Liang. You're the one to answer this. Okay. What was the depth of the groundwater that was discovered?

DR. LIANG: Based on our boring tests at the site, the groundwater depth is to about 125 feet from the surface.

Q. If I could refer you to Exhibit 161 again. Page 3-12. That identifies your boring identified groundwater at 124.5 feet. In the next paragraph down there's a description in the EIS of seismic reflection surveys. Seismic reflection surveys are where you go in and look at -- let me describe it as kind of an X-ray, an attempt to identify where the different soils are and where the groundwater is. Isn't that right? Is that a very poor technical description of what it is?

DR. LIANG: To my understanding, your description is right.

Q. Are you familiar with seismic reflection surveys? Have you done those?

DR. LIANG: No, I have not.

Q. Have you done them, Mr. Lewis?

MR. LEWIS: No, I have not.

Q. Are you familiar, either one of you, with having read that paragraph on the seismic reflection surveys?

MR. LEWIS: I have not.

DR. LIANG: No, I have not.

Q. Mr. Liang, the depth of the groundwater is about 125 feet. If you were to estimate the width of the room from that end to that end, that's probably less than 125 feet; isn't it?

DR. LIANG: I would say so.

Q. Would your guess be that it is maybe 50 to 75 feet, if you were to pace it off?

DR. LIANG: In that range.

Q. So I'm trying to get kind of an understanding of how far the groundwater is from the surface. So if we doubled the length, that would clearly be within the range of where the groundwater is to the surface.

DR. LIANG: I would say so. I believe so.

Q. Do either one of you know what the quality of water is under the site?

MR. LEWIS: I do not.

DR. LIANG: Based on my reading the ER, yes, I do.

Q. What is the quality of the groundwater under the site?

DR. LIANG: Our ER described the water quality of the groundwater based on a reference we use in Hood and Waddell, published in 1968, which is entitled Hydrological Reconnaissance of Skull Valley, Tooele County. Based on that reference, the groundwater in the Skull Valley have some iron, like sodium and chloride.

MR. SILBERG: Did you say iron or ion?

DR. LIANG: Iron. In the central part and northern part of the Skull Valley, the groundwater quality is somehow -- the total dissolved solid is in the range of maybe 760 to 1500 ppm. In comparison to drinking water, total dissolved solid was in the range of 500 ppm. In addition, the groundwater in the aquifer under the Skull Valley had very high calcium. We are using a layman term as "hard", hardness of the groundwater quality. So most of the water used in the Skull Valley, according to their reference, is for irrigation or for the stock, the range use.

Q. So it's your opinion that the water under the site is not drinking water quality?

DR. LIANG: For under the site specific, I cannot say one way or the other because we don't have any specific data in that location.

Q. You haven't checked the quality of the water under the site?

DR. LIANG: Based on my understanding, we have not.

Q. You did drill down to figure out the depth, but you didn't sample the water for quality?

DR. LIANG: That's correct.

Q. If I could refer you to page 3-13 of the Environmental Impact Statement, again at Exhibit 161. Right at the bottom of Page 3-13. It says, "Ground- water in the alluvial apron along the base of the Stansbury Mountains contains the lowest total dissolved solid in the valley, with concentrations from 100 to 800 milligrams per liter." Not parts per million. Were you referring to parts per million?

DR. LIANG: Yes. Same unit.

Q. Same unit?

A. As ppm.

Q. So ppm is the same as milligrams per --

A. Yes.

Q. Groundwater can be obtained from the Salt Lake Formation in some areas near the center of Skull Valley although the TDS content increases towards the center and northern end of the basin. TDS levels between 1000 and 10,000 mg/L have been reported." Is it your testimony that 1000 is above drinking water standards?

DR. LIANG: No. What I just said is on average, drinking water total dissolved solids is in the range of 500 ppm.

Q. Are you familiar with the drinking water standards that are set by the United States and also in the state of Utah?

DR. LIANG: No, I am not familiar with that.

Q. Let me ask you to look at Exhibit 162. And I would refer you to Number 19 under (c), 2.1(c). Do you see the words "total dissolved solids"?

DR. LIANG: Yes.

Q. Do you see the number 2000?

DR. LIANG: Yes.

Q. Have you ever seen this document that includes that 2000 as a primary drinking water standard?

DR. LIANG: I have not seen this number before today.

Q. You don't know, then, the difference between a primary standard and a secondary standard?

DR. LIANG: No.

Q. If you were to come to believe that 2000 was a drinking water standard for drinking water quality, would you conclude that water under the site is potentially a drinking water source?

DR. LIANG: Yes.

Q. So you are not an expert on drinking water quality or drinking water standards?

DR. LIANG: No, I'm not.

Q. Mr. Lewis, do you have any background on drinking water standards?

MR. LEWIS: No, I do not.

Q. If you can refer again to Page 3-13 of the Environmental Impact Statement, the page that we are on. And Mr. Liang, I think based on what you have explained on expertise, I will start with you with this question. In the middle of the third section down there is a statement. "Based on the estimates for hydraulic parameters at the PFS site the apparent groundwater seepage velocity beneath the site would be approximately 1.04 meters per day." I skipped the centimeters per second. Let's use the 1.04 meters per day. It then goes on to say, "If a saturated zone porosity of 0.3 is assumed, the actual seepage velocity would be approximately 3.9 x 10-6 centimeters per second or 3.5 meters per day." That describes the velocity of groundwater flow, doesn't it?

DR. LIANG: Yes.

Q. Why does it say 1.04 meters per day and a range to 3.5 meters per day? Why is there a differentiation there between those two numbers? Do you know?

DR. LIANG: I don't know.

Q. Have you heard the term "flux rate"? You have indicated you are a hydrologist. Do you know what the term flux rate means?

DR. LIANG: That is flux, F-L-U-X?

Q. Yes.

DR. LIANG: No.

Q. If I convert 3.5 meters per day to feet per day, because I'm more used to dealing in feet than I am meters, that ends up being about 11 feet per day. Doesn't it?

DR. LIANG: Yes.

Q. So that would be an estimate of the groundwater velocity underneath the PFS site. Eleven feet per day.

DR. LIANG: Would you repeat the question?

Q. Eleven feet per day is indicated as being the actual seepage velocity. Doesn't that mean the actual seepage of velocity means the rate of flow of the groundwater, the estimate underneath the PFS site?

MR. SILBERG: I'd object to the question as phrased. It says, "If a saturated zone porosity of 0.3 is assumed, the actual seepage velocity would be approximately 3.9 x 10-6 meters per day."

Q. Let me state the question again. If you assume that 0.3 is the saturated zone porosity, would the actual seepage velocity be about 11 feet per day? And is that the travel velocity of groundwater under the site?

DR. LIANG: If I recall, seepage is not necessarily vertical. I give you an example. We build a dam. The water can seep out from the footing of the dam. So sometimes seepage could be referred to horizontal, and then seepage, of course, also referring to vertical.

Q. You think that this number is referring to how fast the groundwater is sinking into the earth as opposed to going horizontal?

DR. LIANG: Seepage can go either direction.

Q. We are talking about groundwater here, aren't we, in the saturated zone?

DR. LIANG: In this particular area, I say yes, it is groundwater seeping into vertically, yes.

Q. So we are talking about a saturated zone and we are talking about a seepage velocity and you are saying that that saturated zone is sinking down?

DR. LIANG: No, I didn't say that.

Q. It is a --

MR. SILBERG: Excuse me. I think the

witness was answering.

Q. Go ahead and finish your answer. You are not talking about it sinking down?

DR. LIANG: Would you please repeat the question?

Q. The saturated zone porosity and the actual seepage velocity. You are in a saturated zone and the actual seepage velocity, is that referring to vertical velocity or horizontal velocity?

DR. LIANG: Vertical.

Q. So the saturated zone is sinking 11 feet into the ground?

MR. SILBERG: You say the saturated zone is sinking 11 feet?

Q. That's what we are in here, aren't we? We are in a saturated zone.

DR. LIANG: I don't think we can interpret a zone in here. It --

Q. Let me back up one sentence. Maybe this will clarify it. "The hydraulic conductivity of the water-bearing zone." What is the water-bearing zone?

DR. LIANG: A saturated zone.

Q. That's the groundwater.

DR. LIANG: Yes.

Q. And the next sentence describes the velocity of seepage. Isn't that describing horizontal velocity?

DR. LIANG: Not horizontal.

Q. How does groundwater behave? When you have a level of groundwater, from the top of that saturated zone, does it sink?

DR. LIANG: No.

Q. It remains pretty much the same and changes a little over time. But it's quite a long time, isn't it?

DR. LIANG: Yes.

Q. That level stays the same. So what sinks? What is going vertically in that zone?

DR. LIANG: I don't know.

Q. So you don't know what that means, the actual seepage velocity?

DR. LIANG: Seepage, like I said earlier, can be moved horizontally or vertically. And in this case, when you are talking about here, we just said the seepage was going downward, vertically.

Q. I'll move on. The rainfall on the site ranges between seven to twelve inches per year. Is that correct?

DR. LIANG: Yes.

Q. In your pre-filed testimony, Page 13.

DR. LIANG: Page 13?

Q. Yes. You indicate in the last sentence of the answer to Question 31, "Precipitation falling in Skull Valley does not reach groundwater because of the relatively small amount, Low soil permeability, and depth of the water table." Is it your testimony, then, that precipitation never reaches groundwater in Skull Valley?

DR. LIANG: Yes.

Q. There's no circumstances that you can think of that precipitation falling in the valley could potentially reach groundwater?

DR. LIANG: Yes.

JUDGE FARRAR: Is that yes, there's no circumstance or --

DR. LIANG: Yes, no circumstance the rainfall will reach the groundwater at the site.

Q. (By Mr. Nelson) PFS is relying on water rights of the Tribe, is it not, perhaps for drilling a well that is going to be located that is shown here on this figure; a well located in this area by the security and health physics building?

MR. LEWIS: Yes. That is correct.

Q. Mr. Lewis, thank you. The well that is proposed there, the expectation is it will be drilled to past 125 feet. Is that right?

MR. LEWIS: Correct.

Q. The water that is underneath the site that is going to be used for that well, who owns that water?

MR. SILBERG: Objection. Calls for a legal conclusion. Not related to the Contention.

JUDGE FARRAR: We will permit the answer if you know it.

MR. LEWIS: I could not tell you.

Q. Can I refer you to 3-14 in the Environmental Impact Statement, Exhibit 161. The paragraph there under the heading 3.2.3 Water Use. It says, "Water rights in Utah have been described as follows: All waters in Utah are public property. A water right is the right to use the water." Do you have any reason to disagree with that statement?

MR. SILBERG: Objection. Same grounds. Calls for --

MR. NELSON: I'm just asking if he has any reason to disagree with the statement.

MR. SILBERG: And I'm objecting because it calls for a legal conclusion, also on a document that is not theirs.

JUDGE FARRAR: We will overrule the objection. You can answer if you know the answer. Or you may answer.

MR. LEWIS: If it is within the state of Utah, I'm not sure that that would be the same as the waters underneath the reservation.

Q. If you were designing a detention basin and septic tank drain fields, isn't it true that you should take into consideration potential impacts that may have on groundwater immediately under the site?

MR. LEWIS: If the water from the drain field would reach the groundwater, that would be the case. But that is not necessarily the case.

Q. What you are saying is you took it into consideration, evaluated that, and you, in your opinion, designed a system that that would not happen?

MR. LEWIS: The design of the system is not necessarily dependent on whether it would happen. It is more the soil conditions and the conditions of the area in which the disposal field is located.

Q. The quality of the water and protecting the water under the site would be a factor, though, in you designing and implementing ways of dealing with stormwater and wastewater.

MR. LEWIS: Can you repeat that again?

(Testimony was read back as follows: "The quality of the water and protecting the water under the site would be a factor, though, in you designing and implementing ways of dealing with stormwater and wastewater.")

MR. LEWIS: Typically it is not a factor when you are designing a disposal field. Typically when we are designing a disposal field, the protection of those waters is maintained by establishing a certain amount of soil layer between the disposal field and the groundwater. The codes or standards or, in your case, Utah codes, have a prescribed soil layer so that it will be automatically protected, if you want to put it that way.

Q. This site and facility has been characterized as an industrial facility, hasn't it?

MR. SILBERG: Characterized by whom?

Q. It has been characterized in the EIS and by your testimony as an industrial facility.

MR. LEWIS: In the Uniform Plumbing Code we characterized it as an industrial facility for the purposes of determining how much waste water we could have per day of the categories listed in the Uniform Plumbing Code. Industrial facility was the closest one that we could choose from.

Q. It is also characterized by EPA, is it not, for purposes of stormwater requirements as an industrial facility?

MR. LEWIS: It could be.

Q. You don't know for sure?

MR. LEWIS: Yes, I believe it would be.

Q. Let's talk for a minute about the sources, potential sources of contamination which were reviewed in your analysis. You will have rail locomotives coming into the site. There is a potential, is there not, for fluids, fuels from those locomotives to be released to the site?

MR. LEWIS: In a rupture of, like, the tanks?

Q. A small drip off of a transmission, an oil pan that leaks a little bit. There is a potential for fluids to be released to the site.

MR. LEWIS: That would be correct.

Q. You indicate in the prefiled testimony on Page 32 --

MR. SILBERG: Is that question or page?

Q. Page 32. Excuse me. Page 32 of your prefiled testimony, Mr. Lewis. It discusses, in the answer to Question 72, a spill of diesel fuel potentially from the tracks and the locomotive area. And it indicates that there are some weirs that are located just north of the culvert discharging into the north drainage ditch. Can you describe, by location, where those weirs are?

MR. LEWIS: Yes, I can. It would be the -- the ditches run both to the north side and the south side of the railroad tracks. In this particular case we are concerned about the north side ditch to the west side of the site just before you get to the protected area fence, if you could put your pen up there.

Q. So in this area here on both sides of the track?

MR. LEWIS: The ditch. There are ditches located on the north side and south side of the tracks running parallel to the tracks.

Q. And the weir is located, again?

MR. LEWIS: The weir would be on the

west side of the site. West. There you go. Just before you get to the protected area fence. But it would be on the north side of the tracks.

Q. Up here?

MR. LEWIS: It would be on the east side of the fence.

Q. Right in here.

MR. LEWIS: Right there. And the ditch actually turns 90 degrees and traverses up to the north and to the detention basin.

Q. So there's a ditch that runs along this edge up to the detention basin?

MR. LEWIS: It runs up north a ways. I'm not sure if it runs all the way to the north, but I know it runs from the railroad tracks north a certain distance.

Q. Is there another comparable ditch on the east side?

MR. LEWIS: No. And the weir is located just as the ditch turns to the north.

Q. Are any of these ditches lined?

MR. LEWIS: Yes, they are. These ditches are all concrete lined.

Q. Concrete lined ditches?

MR. LEWIS: Yes.

Q. The ditch on both sides of the railroad tracks?

MR. LEWIS: Yes.

Q. And once it finishes in this area, you say you are not sure it goes all the way to the detention basin, but it would then go out in the gravel area? Is that correct?

MR. LEWIS: Yes. I do not remember if it goes clear to the detention basin or if it just daylights out into the ground there.

Q. In any event, it would go into the gravel area if it ended.

MR. LEWIS: Correct. The weirs are actually located a number of feet south of where, if it daylighted, I don't remember if it does or not.

Q. So by building that system you anticipate that there may be or there is a potential for spills.

MR. LEWIS: We built the system or we built the ditch so that if there were possibility of a rupture of diesel fuel tank on the locomotives, there would be some means in order to capture that, which is what is required by the EPA for any type of diesel spill. And this just provides ease in insuring that we have a diked area for that diesel fuel spill.

Q. Other sources that you looked at for potential sources of contamination would obviously include the fuel tanks, the 2000 gallon fuel tanks.

MR. LEWIS: Correct.

Q. You would also have equipment operating within the 99 acre area, transporter vehicles. Those would involve fluids, hydraulic fluid, brake fluid, oils, fuels?

MR. LEWIS: Typically they would have -- the transporters have about 30 gallons diesel fuel on board. It would have lube oil, hydraulic fluid, yes.

Q. There are air compressors, generators on site?

MR. LEWIS: There are air compressors in the canister transfer building and the O&M building.

Q. And you would need some oils to run those?

MR. LEWIS: There would be oils in those.

Q. And those are stored in 500 gallons quantity, total?

MR. LEWIS: No. You mean the lube oils?

Q. The lube oils.

MR. LEWIS: Yes. For all the equipment on site would be stored in -- we estimated a maximum of 500 gallons and that would be stored in the O&M building in the oil storage room.

Q. Do you ever wash any vehicles?

MR. LEWIS: Yes.

Q. Where will the vehicles be washed?

MR. LEWIS: On this -- I thought you meant in general do I ever wash.

Q. Excuse me. I was not referring to your personal car.

MR. LEWIS: I don't know. We have not put in, in the design, any provisions for washing the vehicles at this point in time.

Q. So the transport vehicles, any trucks, any of those kinds of equipment, you are not going to wash them ever in twenty years?

MR. LEWIS: I didn't say that. I just said on the site, we have not put in provisions on the site to wash those vehicles at this time.

Q. So in your evaluation of the potential for release of waters, you haven't factored in or considered any vehicle washing?

MR. LEWIS: We could actually drive some of the vehicles off site and wash them in a regular washing facility, like you would your personal car.

Q. Do you know if the Skull Valley Band has a washer for a transport vehicle?

MR. LEWIS: I do not.

JUDGE FARRAR: Mr. Nelson, would you be good enough to let us know the next time you are at a convenient break point?

MR. NELSON: Are we ready to stop for a minute?

JUDGE FARRAR: Yes. And we will switch reporters at the same time. So why don't we take 15 minutes unless you had something you wanted --

MR. NELSON: No. I'm fine.

JUDGE FARRAR: It's almost quarter after. Let's be back at 4:30.

(A break was held.)

JUDGE FARRAR: Mr. Nelson, if you'd resume your cross-examination.

MR. SILBERG: Excuse me. I suggested to Mr. Nelson during the break, I think we had a failure of understanding on the set of questions on horizontal/vertical, and I offered that if he wanted to reopen that now, or we can do it later, it's his choice.

Q (By Mr. Nelson) Let me just quickly ask a question of Mr. Liang. On page 3-13 of the Environmental Impact Statement, there are references -- that is Exhibit 161. 3-13 references to 1.04 meters per day and 3.5 meters per day for seepage velocity. Mr. Liang, I ask you that question. Is that horizontal velocity or is that vertical velocity?

DR. LIANG: As I say earlier, seepage can be horizontal, vertical. After I look at this more closely, it was confusing before, but I see this means horizontally.

Q. So the 3.5 meters that we converted to 11 feet per day, the horizontal seepage velocity on that is the equivalent of 11 feet per day?

DR. LIANG: In the unit conversions, that's correct, yes.

Q. Thank you.

DR. LIANG: However, I want to clarify one thing is the 1.04 meter per day, which represent the average velocity of the movement. When we consider the so-called porosity in here, which means the water will pass through the different voids, the path is actually linked which will pass through the -- so that, in other words, the first velocity present here, 1.04 meter per day, is the average velocity move from 1 point to another. The other 3.5 meter or 11.5 feet per second is actual path that water particles through different voids to that point.

MR. SILBERG: I'm sorry. You said feet per second. Did you mean feet per day?

DR. LIANG: I'm sorry. Feet per day, yes, is what I understand is two number difference.

Q. (By Mr. Nelson) So the difference -- I thought this was going to be easier. So the difference of 11 -- between 3 feet per day and 11 feet per day --

DR. LIANG: Yes.

Q. -- is because you're doing a curved race through the soils and therefore the distance is longer, but the horizontal distance is three feet, but when you do the curve through the soils it adds up to 11 feet?

DR. LIANG: Yes.

Q. And you don't know what the term "flux rate" means?

DR. LIANG: No, I don't.

Q. Mr. Liang, I omitted asking you one

question about your prefiled testimony under the quality of the water in the area. If I could have you look at the bottom of page 12 and the top of page 13 of your prefiled testimony. We've discussed the drinking water TDS, and I showed you an exhibit that had the number 2,000 in it, and I want to start with the sentence at the bottom of the page that says, "Most sources of water in the valley," going to the next page, "are high in calcium and would need treatment to be suitable for human consumption." Mr. Liang, is there a drinking water standard for calcium?

DR. LIANG: I don't know. I have to look into it if I like to know the drinking water quality standard. Specific for calcium I don't know. If there is a number in that water quality standard or drinking water standard, I don't know.

MR. NELSON: There isn't a drinking water quality standard for calcium, is there? Because I can go down to the local supermarket and buy calcium tablets and take them to supplement my calcium.

DR. LIANG: Yeah, you can do that. But my understanding, personal understanding, when you have it hard will make the water taste bad, or you're washing something or not so clean on your clothes.

Q. But having calcium in water doesn't make it violate a drinking water standard, does it? Otherwise milk would violate drinking water standards.

MR. SILBERG: I object. I don't think there's any basis for saying that this witness has said that calcium levels in the water violate drinking water standards.

Q. (By Mr. Nelson) Mr. Liang, let me ask you the question again, then. "Most sources of water in the valley are high in calcium and would need to be treated to be suitable for human consumption." Are you referring to the calcium that would need to be treated?

DR. LIANG: Yes.

Q. With respect to the fuel tanks, Mr. Lewis, getting back to sources of contamination, isn't it true that external piping and spills from pumping fuel from fuel tanks is really more of a likelihood potential problem than the tank itself?

MR. SILBERG: I'm sorry. Could I have that question read back, please? Or can you restate it?

(The record was read as follows: "With respect to the fuel tanks, Mr. Lewis, getting back to sources of contamination, isn't it true that external piping and spills from pumping fuel from fuel tanks is really more of a likelihood potential problem than the tank itself?")

MR. LEWIS: It may or may not be depending on the quality of the piping and the tank. However, in our particular case there is no external piping on our two diesel fuel storage tanks.

Q. (By Mr. Nelson) So a likelihood of a spill would probably be with respect to spills and transfers of fuels?

MR. LEWIS: There could possibly be small drips, if you will, whenever you are filling a vehicle, to which we have committed to using absorbent type pads underneath when we are doing filling operations to ensure that we don't pollute the environment.

Q. I remember reading that. Isn't it true that you in your experience in working with industrial facilities have from time to time heard of circumstances where somebody turns on the spigot to fill and then they leave and don't realize it's spilling? It happens at gas stations all the time, doesn't it?

MR. LEWIS: Well, only in those particular -- well, no, it doesn't. You know, gas station nozzles are designed so that whenever your tank is full it shuts off, and if you deliberately turned it on, I suppose you could deliberately create a spill.

Q. Have you ever been to a gas station that when you looked on the ground you didn't see little spots of oil and fuel spills and stains, maybe not big ones, but just a number of little stains around the area of the fuel tank? Fuel dispensers, excuse me.

MR. LEWIS: Where people continually tried to top off their tanks?

Q. Yes.

MR. LEWIS: Until it actually did spill.

Q. You've seen that, haven't you?

MR. LEWIS: I have seen that. But again, you know, the use of these absorbent pads will help ensure that any spillage that we could get out of the tank is captured rather than released to the environment.