Q. Will rain on the -- rain on the equipment, vehicles, trains will wash off probably small amounts of contaminants, won't it?

MR. LEWIS: What type of contaminants?

Q. Soils, small amounts of oil, whatever accumulates on that kind of equipment.

MR. LEWIS: You're assuming that the diesel fuel would have been spilled on the side in order for the rain to come off there.

Q. If you have equipment or vehicles -- your car. Rain on a car washes --

MR. LEWIS: It is possible.

Q. -- buildup.

MR. LEWIS: It is possible that the rain could dislodge some of those contaminants.

Q. Thank you. Laboratory wastes are generated at this facility?

MR. LEWIS: The laboratory wastes that we have are dry swipes, and they're solids that we would package into a container that's designed for packing radiologically Low-level waste.

Q. Is there isn't any nonradiologic testing, chemicals that are going to be in the lab?

MR. LEWIS: Not at this particular point.

Q. Is there going to be an asphalt plant on this facility?

MR. LEWIS: No.

Q. There's going to be a cement batch plant, isn't there?

MR. LEWIS: There will be a cement batch plant.

Q. And the cement batch plant is located on this figure approximately here just north of the canister transfer building. Is that correct?

MR. LEWIS: The initial batch plant would be located there for purposes of constructing the canister transfer building.

Q. A batch plant for concrete uses quite a bit of lime, doesn't it?

MR. LEWIS: Yes, it does.

Q. And just the physical workings of a batch plant involve oils and industrial fluids?

MR. LEWIS: It involves some oils.

Q. There are going to be paint wastes at the site?

MR. LEWIS: Paint wastes?

Q. Paint wastes.

MR. LEWIS: Would you define what you mean by wastes?

Q. Well, let me refer to page -- page 27, prefiled testimony. Answer to question A61, part way down the paragraph it says, "Small amounts of other substances, such as cleaning solvents, painting products, pesticides and herbicides may also be on site from time to time." So you have painting products, there may be some paint wastes, leftover paints, rags, that kind of thing. Is that correct?

MR. LEWIS: Yeah, you could have paint left over on rags and paint brushes.

Q. You've got pesticides and herbicides on the site?

MR. LEWIS: Yes, we do. May have.

Q. You have some cleaning solvents that are potentially going to be there?

MR. LEWIS: Correct.

Q. Any solvents or cleaning equipment?

MR. LEWIS: There would probably be some solvents for working on equipment in the operations and maintenance building.

Q. That's a part of an operation and maintenance process is to have cleaning solvents there?

MR. LEWIS: Right.

Q. It indicates here in this section on prefiled testimony that "the only substances that will be used," again reading from the answer 61, "that are identified as hazardous to the environment will be lubricating oils and diesel fuels." Isn't it true that waste solvents, paint wastes, waste pesticides and herbicides are also categorized as hazardous wastes by the Environmental Protection Agency?

MR. LEWIS: It depends on what type of paint you would have. If you're using latex paint, not necessarily. If you're using enamel paints, possibly.

Q. Solvents are potentially --

MR. LEWIS: Well, for latex paints the solvent is water, and I don't believe that's a hazardous waste.

Q. Solvents that would be used, petroleum solvents that would be used on engines would be a hazardous waste for the waste product, wouldn't it?

MR. LEWIS: It could be, depending on the type of solvent that you're using.

Q. Is it fair to say that generally you will have chemicals that are common to an industrial type facility on the site?

MR. LEWIS: Well, there's lots of different industrial types of facilities, but we will have solvents that we would need in particular for working on, you know, at our particular site working on the equipment, but that may not be characteristic of every industrial site.

Q. You indicated you're going to clean up any major leak. That's if you know about it, right?

MR. LEWIS: Well, if there's a major leak, I would think we would know about it. But yeah, we will have procedures in place so that if there is a leak, the personnel are instructed on how to prevent the leak from spreading further and then on how to clean that leak up.

Q. There will be, though, won't there, a number, some, perhaps not a lot, but some amount of small leaks throughout that site, whether it be from vehicles, from concrete batch plants, from locomotives, from paint wastes, from pesticides and herbicides that may be applied, there will be small amounts that will not be cleaned up in the way that the large spills are cleaned up. Isn't that right?

MR. LEWIS: It is possible that you could have some minute amounts of lube oils.

Although lube oils, I recently looked into the MSDS from the products for the lube oils that we're using, and none of them are considered hazardous substances, as I originally thought. But those could drip to the ground. But we would try to ensure through maintenance that we -- that our equipment was in good order to prevent as many of those as possible.

Q. If you had lube oils in your water, you wouldn't want to drink it, would you?

MR. LEWIS: No, I didn't say that it would be something I'd want to drink. I'm just saying that it is not classified by OSHA as a hazardous substance.

Q. Isn't it true that there is the potential for a cumulative effect over 20 and perhaps 40 years for an industrial facility operating in that manner, a cumulative effect of a lot of those small leaks of creating something that potentially should be considered in your evaluation of protecting groundwater?

MR. LEWIS: I suppose it could be possible, although I'm not recalling where we would have such accumulations as you imply.

Q. If I could refer to Exhibit 161 again,

page 4-5. Right before the bottom of the page there's a sentence right before the bold term "Site Access Road." It says, "Pursuant to 40 CFR 122.26(b)(14), PFS would be required to obtain an NPDES permit to protect surface waters from pollutants that could be conveyed in construction-related stormwater runoff and would be required to prepare a Stormwater Pollution Prevention Plan."

MS. MARCO: Objection, your Honor.

MR. NELSON: I haven't asked the question yet.

MS. MARCO: Well, I believe that this is getting into the permitting issue that we had raised earlier.

MR. NELSON: That's what my question was.

MS. MARCO: Correct.

Q. (By Mr. Nelson) Is this the section that was related to the changes to the EIS that were described earlier?

MR. LEWIS: You mean that they --

MR. SILBERG: I'm sorry. Is that a question for the Staff or for the witnesses?

MR. NELSON: For Mr. Lewis.

MR. LEWIS: Described earlier, you mean by the NRC?

Q. (By Mr. Nelson) Right, in changes to the Environmental Impact Statement.

MR. LEWIS: I believe it is.

Q. In your professional opinion, isn't it possible that there could be construction-related stormwater runoff that may necessitate taking into consideration that there would be contamination in that runoff?

MR. LEWIS:

MR. SILBERG: I'm sorry. Could I have that question read back?

(The record was read as follows: "In your professional opinion, isn't it possible that there could be construction-related stormwater runoff that may necessitate taking into consideration that there would be contamination in that runoff?")

MS. MARCO: I object again, because I don't see how this relates to the quote that we had just read from the FEIS. Is there a relationship there, or are you dropping that part of the question?

MR. NELSON: I am trying to ask

Mr. Lewis whether or not construction-related stormwater has the potential to have contaminants in it, and that would be a potential source of pollution at the site.

MR. LEWIS: Although PFS isn't required to have an NPDES permit, they have committed to creating a document called the Erosion Control Plan which is equivalent to the NPDES which would contain all of the best management practices and things that a regular NPDES would have in order to capture, contain, and prevent contamination from any stormwater runoff during construction.

Q. Does the tribe have any inspection -- inspectors, to your knowledge, that would be inspecting the facility for cleanup of spills or for proper working of the drainfields? Do you know if the tribe has any inspection capabilities in that regard?

MR. LEWIS: I wouldn't know that.

Q. Do you know if EPA has any oversight responsibility for the operation of facilities?

MR. LEWIS: In terms of spills, typically the E.P.A. requires that the operator control and clean up spills. They don't necessarily have inspectors that come out there and

check.

Q. Mr. Liang, could I have you look at section 161 -- or Exhibit 161 again, page 4-9, potential impacts to groundwater. Right in the middle of that paragraph, right in the middle of the page there's a sentence that reads, and I'm going to ask you whether you agree with this or not, "A large fuel spill would be required to adversely impact groundwater quality at the site, because the groundwater table is approximately 125 feet below the ground surface and soil retention would hold up the liquid."

DR. LIANG: Would you refer to the section number?

Q. I'm sorry. It's page 4-9 --

DR. LIANG: Yeah, 4.9, yeah.

Q. -- of the Environmental Impact Statement.

DR. LIANG: Okay.

Q. It's in the sentence -- it's the sentence in the paragraph, third paragraph down.

DR. LIANG: Uh-huh.

Q. "Potential impacts to groundwater quality."

DR. LIANG: Yeah.

Q. It says, "A large fuel spill would be required to adversely impact groundwater quality." Do you agree that a large fuel spill could impact groundwater quality?

DR. LIANG: If no immediate remediation action taken, I agree this statement.

Q. So if there's no remediation taken and there's a large spill, it could affect groundwater quality. Is that right?

DR. LIANG: No, because we have to evaluate if that large spill did not remediate -- immediate emergent remediation action, have any potential change reached the groundwater. If after evaluation it does not reach the groundwater, there will be no impact. If it does reach the groundwater, that will have impact on the groundwater quality.

Q. So if a large spill was not cleaned up and it reached -- it could reach the groundwater and could have an impact?

DR. LIANG: After evaluation, yes.

Q. Mr. Liang, have you ever been involved in a groundwater cleanup?

DR. LIANG: No.

Q. Have you ever worked on sites where

there was groundwater contamination and did any modeling or cleanup work for those sites?

DR. LIANG: No.

Q. I believe, Mr. Lewis, you referred to some solid waste swipes, and that was radioactive. And you recognize that's not a subject of this hearing?

MR. LEWIS: (Nods head up and down.)

Q. Is it possible that with the kinds of materials that you're working with on this industrial site, that clothes, hands can have on them pesticides, herbicides, and that that kind of contamination on those materials could go into the area where the septic tank drainfield entry is, and by washing and showering there would be, isn't it true, small amounts of contaminants that could enter the septic tank drainfield?

MR. LEWIS: Typically whenever employees are handling hazardous materials they're supposed to be wearing protective clothing that would prevent it from getting on their hands. If they're handling herbicides and pesticides, they should be wearing plastic gloves, something to that nature, that in that particular case they would not get it on their hands and wouldn't be washing it down the

sinks.

Q. So your testimony is that under -- there just isn't going to be any kind of minute amounts of chemical going down the septic tank or drainfields?

MR. LEWIS: It's possible that you could get minute amounts, but it's not likely.

Q. It's probably more likely for this facility than if it were a residential home, isn't it?

MR. SILBERG: I'm sorry. What is more likely?

Q. (By Mr. Nelson) It is more likely that you would have some of those kinds of contaminants going into the drainfield than if it were a residential home that was hooked up to a septic tank drainfield?

MR. LEWIS: Actually I disagree with that, because a site of this nature has procedures, precautions, the protective clothing and things that a typical homeowner would not have, and a homeowner would be more likely to use those chemicals without protective clothing and wash them down than we would at a site like this.

Q. Have you ever been aware of

circumstances where septic tank drainfields because of either intentional or accidental acts have had materials improperly put into the septic tank drainfield?

MR. LEWIS: I've read cases in the E.P.A. documents that imply that yes, there have been things inadvertently or intentionally poured down that damaged the septic systems.

Q. There are collection sumps, I believe it's described, there are collection sumps in this canister transfer building. Is that correct?

MR. LEWIS: Yes. In the load-unload bays there are two large sumps between the railroad tracks.

Q. If -- and that area involves equipment and operating vehicles?

MR. LEWIS: That area primarily involves just the railroad cars coming into the building.

Q. Those collection sumps may accumulate some water. That's why they're there. Isn't that correct?

MR. LEWIS: They're expressly designed -- they're there because of the fire protection codes which require that for foam type systems, which is what we are using to put out a

fire. If there was a diesel fuel fire in there, you have to be able to capture the foam. And so those sumps were in place to capture all that water in the foam.

Q. If a locomotive comes into that building and it's been snowing on top of the locomotive, when it comes in and the water drains off that locomotive, isn't there water in that sump?

MR. LEWIS: Well, actually we don't allow locomotives inside the canister transfer building.

Q. I'm sorry. I misunderstood. What's inside there?

MR. LEWIS: Railroad cars.

Q. If a railroad car has been snowed on and comes in and the water melts, doesn't that go into the sump?

MR. LEWIS: Yes, it would.

Q. What happens to that water?

MR. LEWIS: Most likely the amount of water that would come off of a railroad car if it was snowing or if there was ice on, it would most likely evaporate. However, if there is standing water, we've committed to testing it to ensure that there would be no radiological contamination on

that.

Q. You're not testing it for nonradiologics, though?

MR. LEWIS: No. But the sump is not connected to anything that -- I mean, if there were some sort of contaminants, it would just stay in the sump.

Q. So you would just leave that water in the sump, it's not going to be disposed of anywhere; you're just going to have a standing amount of water in that sump?

MR. LEWIS: Well, you're implying that there would be quite a bit of water in the sump. If there were snow or ice on the vehicles, there would be some water, but it would be extremely minimal and it would probably evaporate in a day or two.

Q. In the middle of the winter when the snow is there and you're inside a building, and you're suggesting that a rail car that may have snow on it that's melted, and that's going to evaporate in a day or two?

MR. LEWIS: I'm suggesting that there would not be -- I mean, the sumps are seven feet wide and several feet long. There's not going to

be gallons and gallons of water off those railroad cars. There's going to be some water that's going to collect in there, but not much.

Q. If you decide to wash the vehicle, that water would collect in there if that's where you washed it?

MR. SILBERG: I'm sorry. Which vehicle are we talking about?

MR. NELSON: The railroad cars. Excuse me.

MR. LEWIS: We wouldn't wash the railroad cards inside -- actually, we wouldn't wash railroad cars anywhere on site. Typically railroad cars, they make wash stations, and I believe there's a wash station not too far from the site where we would use that.

JUDGE FARRAR: Mr. Nelson, may I ask a question?

MR. NELSON: Yes.

JUDGE FARRAR: I don't think you ever answered Mr. Nelson's question about what would happen to the water in the sump if there were enough water that you had to do something with it.

MR. LEWIS: What we've said is that we will test the water to ensure that there's no

radiological contamination in it, and then from there we could dispose of it.

JUDGE FARRAR: Dispose of it where?

MR. LEWIS: Well, we would be required to look at it, like, you know, he's talking about oils that could possibly come off of it. The E.P.A. requires that if you have enough oil to create a sheen on top of the water, then you have to dispose of it in a facility that's designed for oil remediation, or provide oil separators in order to do that. Once we determine that, if you did not have a sheen on the water that constituted a reportable amount of hydrocarbons, we could dispose of it anywhere. It would be no different, though. I mean --

JUDGE FARRAR: Go ahead.

MR. LEWIS: In a sense, I mean, if you have rainwater or snow that's melting off of the car, it would be no different than if that car was located somewhere along the tracks along I-80 and it turned out to be a sunny day, it all melted off.

JUDGE FARRAR: Let me make my question simpler. The water is in the sump; where does it -- where does it go? How do you get it out of there and where do you put it?

MR. LEWIS: If we determined it was not contaminated, then we could just pump it out onto the ground around the site.

JUDGE FARRAR: And if it was contaminated?

MR. LEWIS: If it's contaminated, then we have to dispose of it.

JUDGE FARRAR: Would you pump it into 55-gallon drums, or what?

MR. LEWIS: We would probably have a service come in that would pump it into a tank truck that would take it down and dispose of it at a proper facility.

Q. (By Mr. Nelson) You haven't proposed -- nothing in anything that I have read indicates you're going to sample that water other than for radioactives, though, right? Radiologic.

MR. LEWIS: Yeah, that's correct. In the Safety Analysis Report we had committed to sampling it for contamination.

Q. You're not sampling it for oils, you're not sampling it for solvents?

MR. LEWIS: We didn't address sampling it for other things other than radiological contaminants, because in the Safety Analysis Report

we are concerned about radiological items rather than other items.

Q. You wouldn't know whether it were contaminated with the solvent, would you, if the solvent was not colored?

MR. LEWIS: You mean if it didn't leave a sheen or something on top of the water?

Q. Didn't leave a sheen. It's possible to have oils in water without a sheen, isn't it?

MR. LEWIS: If you don't have a sheen, then it is not considered enough to be a reportable amount.

JUDGE FARRAR: If there were no sheen on the water so it's not reportable and so you decide to pump it out on the ground, as I think you told me you would do, could there nonetheless be contaminants in there that would affect the operation of the septic system?

MR. LEWIS: Well, we wouldn't put those down inside of the septic system. You know, there --

JUDGE FARRAR: Would they be in the leach field?

MR. LEWIS: No, it wouldn't be in the leach field at all. It would be just in the

grounds around the building. But you're talking about extremely, I mean, if you drop an eyedropper worth of oil onto the water, it creates a very visible sheen. So in order to not have sheen means that you've got extremely minute amounts of any hydrocarbons in that fluid. It would be -- it would not be considered a pollutable amount, according to the E.P.A., at that point.

Q. (By Mr. Nelson) You're saying -- is it your testimony that you can have quantities of oils in water, and so long as it doesn't show a sheen that that can be discharged into waters of the United States?

MR. LEWIS: The E.P.A. has certain acceptable levels of hydrocarbons in water that can occur. If there is a ship who has a discharge of diesel fuel, there are acceptable levels that they can allow into the water before it becomes reportable.

Q. There are discharge limits, aren't there, for oil and grease I believe is the category; isn't that correct?

MR. LEWIS: Uh-huh.

Q. And those oil and grease categories don't necessarily relate to whether there's a sheen

or not. Isn't that right?

MR. LEWIS: That would be correct. The test for determining if you have enough that's polluting the water is whether it has a sheen or if it creates a sludge.

Q. With respect to the drainfield, Mr. Lewis, the drainfield consists of two parts -- I'm sorry. The septic tank drainfield consists of two parts. There's a tank that the wastewater comes into, and then solids drop out, and then the liquids go out into a series of one or more pipes and disburse into the soil. Is that a fair description of a septic tank drainfield?

MR. LEWIS: Pretty close. The septic tank actually has solids and foam, and so the septic tank is designed to prevent the solids from going out and the foam on the surface from going out into the drainfield.

Q. And your design on the tank is it will hold 3,500 gallons. Is that correct?

MR. LEWIS: That is correct.

Q. And so you've designed the drainfield -- well, the drainfield is listed in the Environmental Impact Statement at 1,400 feet squared. That drainfield will consist of a series of four-foot

pipes, won't it?

MR. LEWIS: Four-foot pipes?

Q. Four-inch. Excuse me. Four-inch pipes.

MR. LEWIS: Yes, perforated pipes.

Q. Perforated pipes. And the perforations are along the bottom edge so when the water comes into the four-inch pipe, it drains into the soil. Is that correct?

MR. LEWIS: Actually, I believe the perforations are located horizontal in the drainfield, and there's perforations on either side of the pipe.

Q. The constituents, normal constituents in a septic tank drainfield include bacteria and viruses, don't they?

MR. LEWIS: Yes, they do.

Q. And it includes nitrates?

MR. LEWIS: Correct.

Q. And nitrates can be considered to be a contaminant?

MR. LEWIS: They are part of the waste.

Q. Is a drainfield designed to treat anything other than domestic waste?

MR. LEWIS: No, it is not designed except for domestic waste. However, there are what

the E.P.A. terms "planned releases" I guess is what they call it, of other things besides that.

Q. If you had some chemical waste, you wouldn't use the septic tank drainfield to dispose of them?

MR. LEWIS: No, we would not.

Q. And if had you a metals waste or a hazardous waste, you wouldn't use a septic tank drainfield for disposal?

MR. LEWIS: No, we would not.

Q. It's designed for domestic waste?

MR. LEWIS: Yes, it is.

Q. How deep is the drain line, the four-inch drain line?

MR. LEWIS: Typically the four-inch drain lines are located about four and a half feet under the ground.

Q. Four and a half feet. Are you familiar with the Uniform Plumbing Code?

MR. LEWIS: Yes, I am.

Q. If I could refer you to Exhibit 163. Now, this isn't the Uniform Plumbing Code, but it is entitled the Uniform Plumbing Code Illustrated Training Manual, 1997 Edition, published by the International Association of Plumbing and

Mechanical Officials. Have you ever seen this document before?

MR. LEWIS: I've seen it, although I'm not that familiar with it.

Q. It is published by the same group that publishes the Uniform Plumbing Code, does it not?

MR. LEWIS: That is correct.

Q. And PFS used the 1997 edition of the Uniform Plumbing Code in their initial design work, didn't they?

MR. LEWIS: Yes, we did.

Q. If you'll turn to page 482 is the page number in the training manual. Does that look to you like a cross-section for a drain line?

MR. SILBERG: Excuse me.

MR. NELSON: I'm sorry. Maybe we're not on the right page.

MR. LEWIS: No, I'm there. Just a moment.

MR. SILBERG: I'd just ask that the witness be given time to look at this and what it relates to.

MR. LEWIS: It appears to be.

Q. (By Mr. Nelson) It doesn't list a distance from the top of the surface down to the

drain line, but it does list a two-inch distance above the drain line, a four-inch perforated line, and then a 12-inch depth below that line. Do you see what I'm referring to there on the diagram?

MR. LEWIS: Yes.

Q. Now, if you'll turn back to the previous page, 481. It says in the table at the bottom of the page, do you see the language that says "Depth of earth cover of lines"?

MR. LEWIS: Uh-huh.

Q. And that's 12 inches minimum?

MR. LEWIS: 12 inches minimum, right.

Q. And preferred is 18 inches; is that correct?

MR. LEWIS: Right.

MR. SILBERG: Excuse me. For clarification, is that a preferred minimum or preferred maximum, or --

Q. (By Mr. Nelson) What would your interpretation be? A preferred -- it would be likely between the minimum and maximum as being preferred; isn't that correct?

MR. LEWIS: It's a preferred minimum. And usually a local jurisdiction would prefer a little bit more than that because septic systems,

the proper operation is dependent upon ensuring that the soil doesn't get too compacted. So a little bit more soil on top of the lines is preferred.

Q. So when you referred to the drain line being four and a half feet down, that would be your recommendation as being preferred to put it farther down into the ground?

MR. LEWIS: Yeah, I would like to see it be placed further down into the ground.

MR. SILBERG: I'm sorry. Further than four and a half feet?

MR. LEWIS: No, no, no, further than what they're saying here.

MR. NELSON: Further than 18 inches?

MR. LEWIS: Further than 12 to 18 inches.

MR. SILBERG: I'm sorry.

MR. NELSON: Thank you. I appreciate that clarification.

Q. (By Mr. Nelson) If I could refer you now to your prefiled testimony. Sorry that it takes me a minute to make a conversion here. Okay, question No. 80, A80. "The design and operation of septic systems," and it looks like both Mr. Lewis

and Mr. Liang are testifying to this, "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."

The reason that you put it quite a ways in the ground is so you make sure that water that has got the bacteria and viruses in doesn't come up to the top. Isn't that right?

MR. LEWIS: Well, the water shouldn't -- you mean pool at the top of the ground?

Q. Right.

MR. LEWIS: It shouldn't pool at the top of the ground if you've properly designed it so that you have enough drainfield. And if you have pooling, that means that it's inadequately small.

Q. And if you refer to that diagram that we just looked at, that's why you've got an amount of gravel -- I guess, what is it described as? It's filter material under the drain line, to make sure that you've got a little filter material under the drain line so that it doesn't come back to the

surface.

MR. SILBERG: I'm sorry. Could just give me the page number of that exhibit again?

MR. NELSON: It's page 482 of Exhibit No. 163.

MR. LEWIS: Well, actually what you're trying to create there is what they term a biomass, which is just a region where you have microorganisms that would help break down all of the contaminants in the water.

Q. And you don't want that water coming back to the surface, because that would pose a health hazard?

MR. LEWIS: Not in a liquid form to where it's, you know, if it evaporates to the surface, that's different than if it pools at the surface.

Q. And you have 12 inches of filler material below the drain line to ensure that it's going down and not building back up so you actually have pooling on the surface. Isn't that right?

MR. LEWIS: Well, you have 12 inches of material underneath there, because the water is going to tend to, because of gravity, flow down from -- you know, these pipes are not full.

You know, they only have some water in them. So what's going to happen is water is going to come out of the pipes and drain down into this filter material.

Q. And so that's what it says; it says, "The applicable design will ensure that the discharged wastewater does not pool at the surface or reach the groundwater during the life of the PFSF facility." Isn't it true that a septic tank drainfield is not designed for the purpose of making sure that the water doesn't get to the groundwater?

MR. LEWIS: Well, the drainfield, like I say, is designed to create this area where microorganisms can work on it. Depending on what your soil conditions would depend on whether the water made it to groundwater or not. In our particular case, because of the arid conditions and because your groundwater is excessively deep, you most likely are not going to get any of this water going to groundwater. It's either going to evaporate because the soil around it is thirsty and it's going to wick it up, or it could be grabbed by -- the plants have deep roots, and so it's going to be absorbed into the plants and transpired off

to the atmosphere.

Q. What you're telling me is that there are other conditions that may affect whether or not that water gets to groundwater, but you don't design the system to keep it from getting to groundwater?

MR. LEWIS: No, you wouldn't.

Q. So when you say here, "Applicable design will ensure that the discharged wastewater will not reach the groundwater," you're not talking about the design of the system, you're talking about other conditions that may prevent it from getting to groundwater?

MR. LEWIS: Well, we would ensure -- in our particular case we would ensure that we've designed the leach field large enough so that we don't saturate to a point where we could get flow down to the groundwater.

Q. On page 9 of the prefiled testimony -- no, wait a minute. It's page 8. Page 8 of the prefiled testimony, question A-18. Mr. Lewis, you're the one who answered this one. Talking about the leach field, it says, the locations, in the middle of that paragraph, were chosen because they are downhill from the buildings, which is

required for good drainage, and are away from the site water supply well. If you're designing this system to not get the groundwater, why would you care where you put it in relationship to the site water supply well?

MR. LEWIS: Because the codes mandate minimum distances from the well, and they mandate that you put it preferably downstream -- downhill, excuse me, from the water supply.

Q. Why does the code mandate that?

MR. LEWIS: To make sure that you don't inadvertently pollute your water supply system.

Q. Because the water from the drainfield potentially could contaminate the well?

MR. LEWIS: Correct.

Q. You indicated, and I'm referring to page 10 -- oh, just a minute. Page 9, page 9 of your prefiled testimony. That concerning the leach fields, you were evaluating some of the soil characteristics and you looked at a couple of borings. You looked at the closest boring, E-3, to the canister transfer building and the security and health physics building, and then you looked at boring AR-1, which was the closest boring near the leach field servicing the administration building

and the operation and maintenance building. Is that correct?

MR. LEWIS: That is correct.

Q. If you'll refer to Exhibit No. 164. With respect to AR-1 -- this is from the Safety Analysis report. That's the boring log for AR-1, is it not?

MR. LEWIS: That is correct.

Q. Will you tell me what kind of soils are identified on that boring log at a five-foot depth?

MR. LEWIS: Sand.

Q. So if you have a drain line that is four and a half feet in the ground, you've got six inches between that and sand, don't you?

MR. LEWIS: Well, you would actually have crushed gravel into the sand, but...

Q. And sand is much more permeable than the clayey silt, isn't it?

MR. LEWIS: It is more permeable, yes.

Q. In fact, it's significantly more permeable than clayey silt?

MR. LEWIS: It all depends on the particles of sand. You know, this particular sand is fine sand, so it's not going to be as permeable as what you think of as like beach sand.

Q. So if you're putting water into that four and a half foot trench with this borehole, you're going to have it going down through the filter material, and then you've got a sand layer that's approximately ten feet. Isn't that correct, from the boring log AR-1?

MR. LEWIS: Okay.

Q. And if you have a sand layer, isn't it reasonable to expect that the water from the drainfield is going to flow down into that sand layer because of the more permeable layer of sand?

MR. LEWIS: Not necessarily. When you have soil that's located in an arid region, you have a lot of voids in the soil. And so even though you might have a permeable layer of ground, if you have dry sand around it, it is going to tend to absorb or wick that water to it. It would probably go horizontal as much as it would down.

Q. Every day -- does gravity make water go horizontal?

MR. LEWIS: No, but it's through capillary action, and the capillary action of the dry pores will actually draw the water.

Q. It goes down in a cone, doesn't it?

MR. LEWIS: If you have conditions where

there is enough moisture for it to go down, it could go down into a cone. But I could pour water onto a stack of napkins and it's not necessarily going to go down. It is going to go horizontal because of the absorbent nature of the napkins around it. And that would be the same type of effect that's going to occur when you have dry soils around this water.

Q. Your testimony is that sand is going to absorb the water?

MR. LEWIS: No. The pores between the granular -- between the sand particles will absorb the water, and they will hold those in suspension until they typically would evaporate out.

Q. Have you ever put a sponge in a sink full of water and saturated the sponge?

MR. LEWIS: Yes.

Q. And then you take that sponge out and you wring it out a little bit so it's not saturated, but it still has water in it, doesn't it?

MR. LEWIS: I suppose.

Q. And if you take that sponge -- you disagree with that?

MR. LEWIS: No, go ahead.

Q. You agree it's got water in it still?

MR. LEWIS: Yes, it does.

Q. And you take that sponge and you set it on the table. Haven't you observed that water will flow out of the bottom of that sponge onto the table?

MR. LEWIS: It may, depending on how much water. If you have -- the sponge has to be fairly saturated. If the sponge still has moisture in it, you may lay it on the table and no water would come out of it. It would just sit there until it evaporates dry.

Q. The sponge does have a capacity to hold a certain amount of water without it leaking out, but it doesn't have to be saturated, does it, before water will leak out?

MR. LEWIS: I don't know. It would have to be near saturated conditions for the water to leak out.

Q. Saturated condition is having that sponge in a pool of water, isn't it?

MR. LEWIS: Saturated conditions is not having any more voids left in it.

Q. And in the sponge situation, if I wring it out just a little bit, I've got some voids?

MR. LEWIS: Right. But I'm not -- I'm not sure that you're going to get -- there's no mechanism for that water to drain out. You know, if you have voids in the sponge still, it will most likely sit there.

Q. Let me give you another example. You take your clothes out of the washer and you can't put it in the dryer because it's a special fabric and you don't want to put it in the hot dryer, and you take and hang that piece of clothes up, and it's not saturated because the dryer -- or the washer has spun the water out. Haven't you ever experienced water flowing down and dripping onto the laundry room floor even though it's not saturated?

MR. LEWIS: I actually do this all the time, and I lay those clothes on top of the dryer and I never get pooling of water on the top of my dryer.

Q. Have you ever hung them vertically and had the drip come onto the floor? I'm amazed. Have you ever had that happen?

MR. LEWIS: No. I don't normally hang clothes that are completely dry.

Q. It's your testimony that water going in

at 1,700 gallons a day in those two drainfields will not go down because of gravity through that sand?

MR. LEWIS: In this particular climate it's unlikely that you're going to have that. I mean, if you go out onto the site, or if you go out in the Skull Valley area, lots of areas around there, we've reported that there are places where alkali can be observed. That alkali is caused because there is such a high evaporation rate that the water is actually -- rainwater actually gets pulled back to the surface and it brings the salts to the surface and evaporates out, leaving the salts on the surface.

Q. In order to have capillary action come back up, you have to have a finer soil, don't you?

MR. LEWIS: Well, this sand is fine sand. You're trying to characterize --

Q. If this --

MR. SILBERG: Excuse me. Can we let the witness --

MR. NELSON: Excuse me.

MR. LEWIS: You're trying to characterize a mental image of sand as all being the same, but there are different granular sizes of

sand, and this is a pretty fine sand, albeit sand, as opposed to clay or something that has a different -- I forgot what they term it, but sand is granular rock.

Q. I asked you earlier if you were a soils expert. If you have some sand in a bucket --

MR. LEWIS: Yes.

Q. -- and you pour a glass of water in that sand and you measure the volume of space in that sand and you pour the water on top of that volume of sand, you're telling me that pouring the glass of water on -- as long as the glass of water is less than the volume in the sand, it will not go down to the bottom of the sand?

MR. LEWIS: If you have a pile of dry sand and you pour a glass of water on it, it is likely not going to make it to the bottom of that container. It will disperse out radially around there and be absorbed by all of the dry sand, and you'll have some wet sand in the center but the rest of it's going to continue to be dry.

Q. So when I'm watering my house plants and I get a little bit of water in the bottom of my house plant, it means that I have saturated --

MR. LEWIS: You've poured enough --

Q. I have saturated it.

MR. LEWIS: It doesn't necessarily mean that you have saturated it. When you pour water into house plants, you can get -- because the soil contracts, usually what happens is you get water that runs down along the sides of your container to the bottom.

Q. None of that water is going down through the soil?

MR. LEWIS: Pardon?

Q. None of that water that you're watering your house plant on is making it down through that soil to the bottom?

MR. LEWIS: No, it is going down through the soil. But if you have an extremely dry plant and you pour water on it and you get water all of a sudden into the basin, it's either because you have loamy soil where the water can just quickly pass through the soil, or, if it is a very sandy, clayey type soil as we have here, it's because the water ran down along the sides of your container to the bottom.

JUDGE LAM: While Mr. Nelson is thinking, let me ask a question to Mr. Lewis.

Mr. Lewis, regarding this very fine

sand, what is its permeability relative to the soil? Any estimate?

MR. LEWIS: No, I don't know. In terms of design of the septic system, they just have -- Uniform Plumbing Code has a number of characteristics, and that's what we use to size the size of the leach field. However, keep in mind, this is just preliminary sizing. In the end we would have to do a perc test that would determine exact characteristics of the soil. And from there then we would determine exactly how large that leach field would need to be. This is just for preliminary sizing.

JUDGE LAM: So the final design would depend on what the perc test tells you?

MR. LEWIS: Yes. And that's what we have in our license application, that we would perform that perc test just prior to construction.

JUDGE LAM: Thank you.

Q. (By Mr. Nelson) Mr. Lewis, you indicated that you could just build a larger system. Building a larger system wouldn't necessarily make a difference if the quantity of water going in was less than the design, because it will drain out before it gets to the end of the

pipes, wouldn't it?

MR. LEWIS: Okay, repeat that again, please.

Q. If you have a sized system, you have a certain quantity of water coming in, if you build twice the capacity but you really don't need the capacity, when the water comes in, it will drain out based on the number of holes?

MR. LEWIS: Correct.

Q. And you won't have any at the end to drain out?

MR. LEWIS: Yeah, that's possible.

Q. So whatever water is coming in is going to drain into the area, into the same -- it's not going to be spread over a larger area, it's going to be spread over the area that the drainfield is designed for release on?

MR. LEWIS: Typically it's -- it has more to do with your distribution box and how many pipes that you drain it to, but I suppose we could say that a certain area it would drain into.

Q. Capillary action, isn't it true that capillary action not only draws the water up but it also draws the water down?

MR. LEWIS: Yes, it does.

Q. In the particular case of the drainfield where you have a filter material, a gravel material underneath the four-inch pipe, that gravel material forms a break in the capillary action, doesn't it, for water that's sitting in that gravel?

MR. LEWIS: In that region.

Q. It cannot go back up in that region?

MR. LEWIS: Right, in the trench. But eventually the water would have to percolate into the surrounding soil that's not in the trench.

Q. So is it your testimony that water that is four and a half feet into the ground plus another 12 inches, you've got five and a half feet, you've got your drain line in the ground, you've got another 12 inches of gravel, the water that's five and a half feet in the ground, and that's going to then disperse, is going to somehow by capillary action come back up and be evaporated?

MR. LEWIS: The water would be -- it would soak into the surrounding soil in equal directions, whether it would be up, laterally, or down. But it's not going to go very far because you have a lot more dry, thirsty soil than you do to make it all the way 125 feet down to the groundwater. From there, you have a lot of -- a

lot of the plants, they all have deep roots out in that area and they have deep roots to capture water that is several feet down, many, many more feet than what you're talking about in this particular case that are going to try to absorb that water.

Q. Isn't it true that where the water goes as far as direction is determined by gravity, and that whether it's dry or not dry doesn't have a relationship necessarily to how fast that water goes through that mechanism?

MR. SILBERG: I'm sorry. Could I have that read --

MR. LEWIS: Say it one more time.

Q. Let's not even repeat it. Let me try this again. If you have gravel, straight gravel, there's no capillary action.

MR. LEWIS: Coarse gravel.

Q. Coarse gravel, no capillary action. It doesn't matter whether that's wet or dry; the water is going to go right on through that except for a little bit of water that may adhere to the sides of the pieces of gravel?

MR. LEWIS: It most likely would, because you don't have any pores small enough for capillary action.

Q. And so permeability, from a permeability standpoint, is it your opinion that if soils are dry, that automatically means that it affects how fast the water is going down? For gravel -- let me say this again.

For a soil that's in dry condition, a sand, what you're testifying is that that sand, if it's wet, the speed of water going through that sand will be faster than if it is dry?

MR. LEWIS: If there is moisture in the sand, you have developed some hydrological connections that will cause the water to move through the sand faster. However, if the sand is dry, you have lots of air, lots of pores throughout the sand that are going to inhibit or prevent the water from flowing through there quickly.

Q. Let's look at Exhibit 161 -- excuse me -- 160, Mr. Lewis, your deposition. On page 24. We're talking about the detention basin, and there is a -- right at the top of the page it references a percolation rate of .09 inches per day, and then the question is, "Do you know, did you assist or supervise in preparation of this portion of the environmental report?" Answer, "I assisted on it, yes." Do you see where I'm reading there?

MR. LEWIS: No, I don't.

Q. On page --

MR. LEWIS: You said page 24?

Q. Well, just a moment. It's page 24, yes. I'm sorry, I was on 21. Okay. It deals with that same percolation rate. It's --

MR. LEWIS: Which page do you want me on?

Q. On page 24.

MR. LEWIS: Okay.

Q. It says, part way down the page, line 17, it says, "Is that what was done to come up with this percolation rate of .09 inches per day on page 4.2-7a of the Environmental Report Revision 7?" "Yes, it was." We're talking about a percolation rate here that you were discussing I believe in the context of the soils in that area. Is that correct?

MR. LEWIS: Well, actually the .09 inches per day would be permeability, even though I have mistakenly said percolation, but it would actually be permeability of the soil.

Q. It says, answer, "Yes, it was." Question, "This number is from a --" Answer, "The percolation rate was determined for the types of

soils that would be in the detention pond. So we took soil -- we took soil boring information from the detention pond area and applied it into the formulas to determine -- to estimate what kind of percolation you would get."

You did not do an actual percolation test to determine that number, then. Is that right?

MR. LEWIS: No. We used the information from Lamb and Whitman to determine from the types of soils we had what kind of permeability would be located at a distance down the native soils that would be in the detention pond area.

Q. Then if I go over to page 26 of your deposition, on line 4 it says, "Do you know if the percolation rate that is described on page 4.2-7a of Revision 7, Chapter 4," et cetera, "would be sufficient for you to build a properly operating septic system?"

Answer, "As I mentioned before, a septic system, the drainfield size area that it would take is determined based on the amount of percolation that you get. .09 inches per day is a fairly Low percolation. So the drainfield size would be large enough so that you could get the amount of

percolation that is required to not back up your septic system."

That percolation rate, do you know what that percolation rate is, the minimum rate is under the Uniform Plumbing Code?

MR. LEWIS: Well, the Uniform Plumbing Code, as far as I know, does not establish a percolation rate. Tooele County does, Utah does, E.P.A. does. It's all the same numbers, and that would be -- the fastest is one minute per inch; the slowest would be 60 minutes to percolate one inch.

Q. If I could refer you back to Exhibit 163. Exhibit 163, page 485, okay. On the right-hand side of the page there --

MR. SILBERG: Excuse me. Could you just slow down there? I'm having trouble with the papers. What page?

MR. NELSON: 485 of Exhibit 163.

MR. SILBERG: Got it. Thank you.

Q. (By Mr. Nelson) Mr. Lewis, are we okay there?

MR. LEWIS: Uh-huh.

Q. On the right-hand side of the page it makes this statement. "Section K-4 states: 'When a percolation test is required, no private disposal

system shall be permitted to serve a building if that test shows the absorption capacity of the soil is less than .83 gallons per square foot or more than 5.12 gallons per square foot.'" Isn't that a percolation rate?

MR. LEWIS: Yes, it is. But the Uniform Plumbing Code I believe in the code section also states, you know, it would refer you to local jurisdictional amounts. So even though they have this particular percolation rate here, that doesn't override what the local jurisdiction would require.

Q. Does the tribe have any local requirements?

MR. LEWIS: The tribe would be -- the authority for the tribal area would be the Environmental Protection Agency, and it does require --

Q. Your testimony is that E.P.A. has a septic tank drainfield standard?

MR. LEWIS: E.P.A. has -- yes, they do. The septic -- the leach field design -- the whole sanitary waste design is classified as it comes under the authority of the Underground Injection Control authority. It's considered a Class V injection well, and within those guidelines E.P.A.

has considered our particular system as a large capacity septic system, and it has rules in the design of that type of a system.

Q. I appreciate you mentioning the fact that it's a Class V well in that because of that it's acknowledged by E.P.A., is it not, that because it is a Class V well it has the potential for contamination of groundwater?

MR. LEWIS: There are some Class V wells, injection wells that do. There are a number of different types of Class V wells which the E.P.A. delineates. This particular one is just for the large capacity septic system.

Q. The purpose for the underground injection program by E.P.A., isn't it true, it is for protecting groundwater?

MR. LEWIS: It is for protecting groundwater, that's correct.

Q. You've indicated in your prefiled testimony, though, that you're going to follow the Uniform Plumbing Code requirements, haven't you?

MR. LEWIS: Well, that is correct, because if you read the E.P.A. manual, which that manual states in the introduction that it is not for detailed design purposes. It provides the

information you need for the overall design of the system, but it does not provide information on the types of material that the pipes should be, the, you know, how many clean-outs you should have in the system, how large the pipes should be. It does not contain that. And it actually refers you to use the local codes that would be in effect for plumbing type systems.

Q. And have you compared Utah's code and the Uniform Plumbing Code with respect to percolation rates?

MR. LEWIS: Yes, I have.

Q. And they're comparable?

MR. LEWIS: Not the Uniform Plumbing Code. I compared the Utah laws, the Tooele County, and the E.P.A. for percolation rates.

Q. And they're comparable, aren't they?

MR. LEWIS: They're the same.

Q. And so if we look at this number, you can't have it less than .83 gallons per square foot or more than 5.12 gallons per square foot. That's equivalent or comparable to the Utah requirements or the Tooele County requirements?

MR. LEWIS: It's possible, although I'm not sure without doing a quick calc to check the

conversion on that.

Q. Okay. I will -- if I may, this is a blowup of Exhibit --

MR. SILBERG: 67, 167.

Q. -- 167. And I want to do this as painlessly as possible, because I don't know that we need to spend a lot of time trying to do a lot of math.

If you look at Exhibit 167, the FEIS lists a percolation rate of .2 to .6 inches per day for the soils, does it not?

MR. SILBERG: Could you give us a reference to that, please? Unless everybody agrees to that.

MR. LEWIS: Actually the FEIS talks about .2 to .6 being a permeability, not a percolation.

Q. I'm sorry, permeability. Let's do permeability. Permeability of .2 to .6 inches per hour. And you wanted a reference on that?

MR. SILBERG: No, that's all right. If the witness knows, I'm fine.

Q. Now, we've got numbers all over the place, and so I'm going to try to simplify so we're all working off the same numbers as far as

comparing permeability rates and comparing percolation rates. And what I'd like to do is ask you to look at this and work off a comparable rate of inches per day. So the FEIS indicates, and I believe you also reference in your prefiled testimony these numbers, that there is a rate of .2 to .6 inches per hour. Now, that's not too difficult, is it, to convert to inches per day, because you just multiply by 24. Is that right?

MR. LEWIS: That would be correct.

Q. And so if you -- have you got a calculator, or will you take my word for it that the math is done right here?

MR. SILBERG: Do you want a calculator?

Q. I've got one if you need a calculator.

MR. SILBERG: I think they have one.

Q. Okay. Is that a correct conversion?

MR. LEWIS: It appears to be.

Q. With respect to the Uniform Plumbing Code, you have a rate there that is described as gallons per square foot per day. In other words, am I correct in saying that what they are doing is they are taking a gallon of water, they're putting it on a square foot of soil, and they're measuring how much of it seeps down through that square foot

of soil in one day. Is that what's happening?

MR. LEWIS: It would appear so.

Q. Now, if I do a conversion -- this is the worst conversion we're going to do as far as the testimony. If I -- all the rest of these are fairly simple. But this one, if I do this conversion here, what I'd like to do is just give you a piece of paper, one to your counsel and one to you, and you verify if this conversion is done right. It just shows the math. To convert this, you've got to know how many gallons are in a cubic foot.

MR. SILBERG: 7.5.

MR. NELSON: 7.5 or 7.48. Thank you. Should have asked you.

JUDGE FARRAR: I bet he also didn't need a calculator for that first one.

MR. SILBERG: Only for the first one, your Honor.

MR. NELSON: I don't believe I need to include this as an exhibit. If you'll just look at it and see if in fact that calculation has been correctly done.

MR. SILBERG: Off the record. Could I ask my witnesses if they need a break?

(Discussion off the record.)

MR. NELSON: Okay, we've got a correction. I would like to make a notation on here. It's 8.36 instead of 8.21.

JUDGE FARRAR: That's what the Applicant's people came up with. Did the Staff do the same thing?

MS. MARCO: We did not.

JUDGE FARRAR: You weren't checking it? Do the witnesses' come out the same way?

MR. LEWIS: It appears that what he has here is correct, but I'm wondering if we are reading what the code is saying here incorrectly, because that would imply that the water percs into the ground at 1.33 inches in a day. That would be extremely, extremely slow.

Q. 1.33 inches per day is extremely slow?

MR. LEWIS: Yeah. When you do a perc test you're looking for -- you fill your hole with water and you watch and you time how long it takes for the water to drop one inch. Typically it drops one inch, you're allowed anywhere from one minute to 60 minutes.

Q. But if I'm -- the way I read it, if I'm above 1.33, I'm still okay in installing a

drainfield. That lets me do it. Isn't that right?

MR. LEWIS: If we're reading that correctly, that's what it would imply, yes.

Q. Do you agree that the math has been done correctly with the change of 8.36 on the end here?

MR. LEWIS: It appears that the math -- yes, I would agree the math has been done correctly. The only thing I was questioning is whether we were understanding what they are doing here in this particular paragraph in the Uniform Plumbing Code correctly.

Q. I understand that. I'm just wanting to make sure the math was done correctly. You indicated -- we just read in your testimony that the detention basin and the soils were looked at for a rate of .09 inches per day.

MR. LEWIS: Okay, yes.

Q. .09 inches per day, you don't need to convert, is extremely Low compared to 1.33 inches per day.

MR. LEWIS: That's correct.

Q. So if you had soils that were .09 inches per day, that is extremely Low; you could not put a drainfield in that area?

MR. LEWIS: That is correct. However,

again, you're comparing permeability with percolation. And we did a review of several different perc tests that were performed in Skull Valley, two of which are within just a few miles of our particular site, and there are no perc tests that have failed. In fact, most of the perc tests that were done in the valley tend to be on the high side, along the realms of four to -- well, in our particular area, about 10 minutes per inch, which is fairly fast.

Q. So the perc tests you've done in the valley show a percolation rate that would fit within the Uniform Plumbing Code requirements?

MR. LEWIS: That we have looked at, you mean?

Q. Yes.

MR. LEWIS: Yes.

Q. But you haven't done a percolation test on the two areas where the septic -- where the drainfields are proposed?

MR. LEWIS: No, we haven't. Typically you do that when you're getting ready to build your drainfield. You go out and have the perc test performed and it passes, and you have the backhoe on hand and so you start digging your drainfield.

Q. The very Low percolation number -- maybe I'm not -- what did you describe this number as?

MR. LEWIS: Permeability.

Q. Permeability, thank you. There is a relationship, is there not, between permeability and percolation rate?

MR. LEWIS: Well, permeability is the ability of a soil to be able to pass fluids versus percolation, which is the flow through a media such as a filter or a soil or sand or something like that.

Q. Percolation is how fast it's going through; permeability is the capability of having --

MR. LEWIS: Of being able to pass --

Q. -- water going through. There is a relationship, isn't there?

MR. LEWIS: There's somewhat of a relationship.

Q. If you had soils that were that tight, .09 inches per day for permeability, it's likely they would fail a percolation test?

MR. LEWIS: It possibly would fail that percolation test. But the soils where we got the .9 information is over the detention pond, and

those particular soils at that level are like clay.

Q. So there's a variability of soils in the area? In some areas of the valley you were doing perc tests that allowed water to go down as much as eight to ten inches a day, and yet in the detention basin there was a different kind of soil?

MR. LEWIS: All of the soil in the area is characterized as having a Low permeability. But within Low permeability of soils, there is a wide range that you can have in terms of permeability numbers. All those numbers, .2 to .6 clear down to .09, all fall within a Low permeability type of soil.

Q. Permeability that allows 14.4 inches per day is Low permeability?

MR. LEWIS: Yes, it is. If you read -- if you look at the chart that we referenced in Lamb and Whitman, you'll see that all those numbers are within a range that is considered Low permeability.

Q. This is orders of magnitude more than this.

MR. LEWIS: It may be, but it is still all considered Low permeability. You have to get even more orders of magnitude to get into medium range of permeability or into high permeability.

Q. Doesn't this mean that if you take water and apply it to a soil, you are going to get 14.4 inches of movement in a day, percolation rate? You've got water going 14.4 inches in a day?

MR. LEWIS: Well, again, you're confusing permeability with percolation, but it implies that --

Q. What does the 14.4 mean, then? What does it mean if it doesn't mean water isn't able to go 14.4 inches?

MR. LEWIS: It means that the water can pass through, okay, 14.4 inches per day. But if --

Q. That's the rate --

MR. SILBERG: Excuse me. I think the witness --

MR. LEWIS: Well, you know, I mean, if you're trying to imply that, you know, this is high permeability, it's not.

Q. I didn't imply anything. I just want -- I want to know what the 14.4 means. Doesn't that mean that water is going through that medium 14.4 inches in one day?

MR. LEWIS: In one day. I believe that's what it means.

MR. NELSON: Thank you.

Is it time for a break?

JUDGE FARRAR: Time for a break.

(A break was held.)

JUDGE FARRAR: Let's reconvene and take up a couple of scheduling matters first. It's now 20 of 7:00. Here's the ground rules. The first person, not the audience, the first person involved in the proceeding who gets tired and isn't focusing, put up your hand and we'll quit. The rest of us will laugh at you for your feebleness, but we will be secretly happy for the excuse. Once you lose your focus, that's it. I mean, it's a long day for everybody. So speak up and we'll quit.

Tomorrow's seismic arguments, Mr. Silberg, what we would like to do with tomorrow's seismic arguments, take up with seismic counsel, I think it was Ms. Chancellor's suggestion that at the rate we went on aircraft we wouldn't finish with seismic in two weeks. So we will take up with seismic what we will do beyond the two weeks, but you all will want to confer with them because the first question will be in week six, our spillover week here, do we want to finish aircraft or do we want to continue seismic? So each of your teams

be ready to have your seismic person speak to that. And be thinking about the availability of witnesses and so forth. And then how much of a break we take after week six before resuming either seismic or aircraft.

Does that make sense, Mr. Nelson?

MR. NELSON: I'll try and relate that to Denise.

MR. FARRAR: She needs to speak for the whole team on how we finish aircraft and seismic. In terms of -- off the record.

(Off the record discussion.)

JUDGE FARRAR: In terms of finishing this issue, I understand we have the State Capitol -- that we can't do anything tomorrow because of witness availability. We have the State Capitol Friday morning, but the Board can only go until 1:00 because we have to go to do limited appearances at the hearing in Tooele.

MR. SILBERG: What time does that start?

MR. FARRAR: 3:30, because we can't get in to the school until the kids get out of school; 3:30 to 5:30 and 7:30 to 9:30.

MR. SILBERG: Someone had said two o'clock when you were talking about a start time.

MR. FARRAR: No. We figure we have to finish at 1:00, get some lunch and get out there. Although we could push 1:00 a little. So we could go as much as 8:00 to 1:00 on Saturday -- I'm sorry, Friday. Then the question is, have you all consulted or will we finish by 1:00 on Saturday?

MR. SILBERG: At the rate they're going -- at the rate we're going, I fear not.

MR. FARRAR: How much more cross do you have?

MR. NELSON: I have quite a bit.

MR. FARRAR: Two hours?

MR. SILBERG: Fred said he didn't think we would get through redirect tonight.

MR. NELSON: I could do it Saturday and so could Mr. Ostler.

MR. SILBERG: And our witnesses can be here Saturday.

MR. FARRAR: Then we would need to get space, which we probably can't.

MR. LAM: What about the State Capitol, would it be available on Saturday?

MR. NELSON: My guess is it probably would.

MR. SILBERG: Or this room. I take it

this room is not available?

MR. FARRAR: Not available Friday. That's why we did the limited appearances. It may be available Saturday.

MR. SILBERG: I wonder if we have checked more recently, whether it would.

MR. FARRAR: Why don't we check that. Jean, if you would check with somebody on the State Capitol on Saturday. The alternative would be continue this on Monday in lieu of starting seismic. How are the witnesses --

MR. SILBERG: I prefer not. It just keeps people here from out of town for longer. It keeps me --

MR. FARRAR: I have no sympathy for those who are out of town.

MR. NELSON: We're okay for Monday too.

MR. FARRAR: Well, I like the idea of Saturday and finish. All right. Then with all that understanding, let's then continue, Mr. Nelson, with your cross.

Q. (By Mr. Nelson) Mr. Liang and Mr. Lewis, has PFS done any specific modeling to support their claim that septic tank water will not go to groundwater?

MR. LIANG: No.

MR. LEWIS: No.

MR. LIANG: We have not done any groundwater modeling to support that.

Q. Mr. Lewis, if we could turn to your deposition, Exhibit 160 on page 12. Let's start on page 11, and it's the question there at the top on line 4.

MR. LEWIS: (Reviewing document).

Q. On line 4 the question is:

"I'm trying to find out where wastewater will ultimately end up.

"Answer: Okay.

"Question: So it's not going to be coming back up to the surface, assuming it operates properly?

"Answer: Correct.

"Question: What are the other options for this water to end up?

"Answer: Well, as it percolates into the ground, as we -- there is a certain minimum amount of soil that is required between that and the groundwater in order to provide self-water treatment, if you will,

natural treatment of the --

"Question: Filtration of the waters as they migrate downward?

"Answer: Uh-huh. But it -- you know, it's -- because of the groundwater elevation, it's not going to get that. It's going to percolate just a few inches into the soil.

"Question: How long is this wastewater system planning to be operational?

"Answer: For the life of the facility.

"Question: Would that be 40 years, then?

"Answer: Yeah.

"Question: You plan to discharge wastewater into the system for a period of 40 years; the water isn't going to come up of back up to the surface, and it's only going to migrate a couple of inches into the soil around the site, around the leach field?

"Answer: Well, it will be absorbed into the soil."

What do you mean, Mr. Lewis, by absorbed into the soil?

MR. LEWIS: The water would be held in suspension by the pores in the soil. And you have to understand that whenever I was responding to this on page 10, he was asking me in terms of pooling on the ground. So when I'm talking in terms that the water is not coming back up to the surface, I'm talking in terms that it's not going to pool on the ground. In other words, we have an inadequately sized septic system. Not that the water can't evaporate up to the surface of the ground, but that it can't pool to the ground. Do you see that on page 10 there?

Q. I understand. Do you have any more to add to the answer to that question?

MR. LEWIS: No.

Q. Continuing to read on line 12 on page 12:

"You mean down into the soil?

"Well, it's not coming to the surface, so it needs to have to go somewhere, I assume. You've got 40 years of discharge going into the subsurface. Eventually you're going to

fill up the pore space. Or have you done a --

"Answer: Just like rain. If it could over -- you know, that molecule of water could eventually find its way, finally, several feet down to the groundwater, or it could -- you know, oftentimes the water underneath the ground travels with the slope of the terrain.

"Question: And there's only so much pore space under the ground that you can put rain into, and once you fill up that pore space it has to expand into more pore space; is that correct? I'm just trying to --

"Answer: You mean until the ground becomes saturated?

"Question: Saturated, in which case the water has to migrate further out as you continue to put more water into the system?

"Answer: Yeah, but there are other forces that take place. You have evaporation that dries the soil above

the ground, you know, so --

Question: Okay, I guess we're getting back to the ultimate destination. So some of the water will come back to the surface in some form, be it evaporation or something else?

"Answer: Well, the water -- most likely it's going to travel along the slope of the ground."

What do you mean, travel along the slope of the ground?

MR. LEWIS: What I was implying is that if you have enough water it will tend to flow through the ground along the layers of the strata.

Q. So if it hits a layer it may flow horizontally?

MR. LEWIS: It may flow horizontally. For example, in your Exhibit that showed the boring AR-1, we had sandy layer for 10 feet. But underneath that we had a very clay layer. So if the water could percolate through the sand, as you previously implied, it would hit that clay level -- layer, and it could travel horizontally along the strata of the ground there.

Q. Is there any question in your mind that

that water doesn't percolate through sand?

MR. LEWIS: Pardon?

Q. Is there any question in your mind that water doesn't percolate through sand?

MR. LEWIS: No, the water will percolate through the sand.

Q. It will go down through that sand, won't it?

MR. LEWIS: If there was enough water it could push it down through the sand. But if there -- you know, as we discussed before, if you have a lot of sand that is dry and you only have a finite amount of water, it may not necessarily make it through all the sand.

Q. If you're putting 1,000 gallons of water every day onto a 1,400 square foot area, isn't that a considerable amount of water?

MR. LEWIS: Actually, we're only putting -- you're mixing both the septic systems together. Each septic system has 1,400 square feet.

Q. Excuse me. If you put 640 gallons of water every day --

MR. LEWIS: You're looking at like a half a gallon per square foot, is what you're doing there.

Q. And a half a gallon per square foot every day does not end up saturating the soils and having the water move down?

MR. LEWIS: If you did not take into account evaporation, that would be the case. However, you have an extremely high evaporation rate in an arid climate. So a lot of that water, most of that water is going to be evaporated or drawn into the plants.

Q. The evaporation rate is at the surface, is it not?

MR. LEWIS: Evaporation can actually occur several feet into the soil.

Q. The evaporation rate that is listed in your prefiled testimony of .13, that's a surface rate, is it not?

MR. LEWIS: I believe it is.

Q. And you're not suggesting that water five feet in the ground is evaporating at that rate?

MR. LEWIS: No, I'm not suggesting that. Although I am not suggesting that it's not. I don't know the mechanisms for evaporation. If you have a lack of moisture, you know, if it evaporated at the soil and you have a lack of moisture at the

surface of the soil and half an inch into the ground you had moisture, it is going to drive that moisture to the surface. So I would suspect that the higher evaporation you have at the surface it will have a corresponding, yet not necessarily the same amount, but it will have a corresponding driving force to draw that, wick that water right up to the surface.

Q. You haven't quantified the amount of water that would be pulled back up from five feet to the surface, have you?

MR. LEWIS: No, I have not.

Q. So you don't know if you had a gallon of water five feet in the ground, how long that would take to be pulled back up to the surface somehow and then evaporate, you don't know that time?

MR. LEWIS: Not specifically. It may be the same as the evaporation rate on the surface, but I'm not sure about that.

Q. Do you consider yourself an expert in how that water would move from five feet down to the surface?

MR. LEWIS: No. That's why I said I wasn't sure how fast the evaporation rate would be five feet down.

Q. You indicated that to characterize the soils you would go in and dig a hole and then you would run your perc test in the area of the drain field; is that correct?

MR. LEWIS: That's correct.

Q. If you could look at your deposition -- excuse me, your prefiled testimony on page 29, the answer to question 66.

MR. LEWIS: Okay.

Q. The last sentence, "It is highly -- in the highly unlikely event that small amounts of contaminants did enter the sanitary waste system, the natural filtering action of the soils would prevent them from entering the groundwater." What do you mean by natural filtering action of the soils?

MR. LEWIS: There are actually a few ways that the soil filters the water passing through it. Biological contaminants ate up by microorganisms, heavy metals can plate out, as we call it, on to the soil around it. Usually the codes require that you maintain about three feet of soil above groundwater to ensure that no contaminants will enter the groundwater. It doesn't take very much soil to filter out

contaminants.

Q. You're not talking in your testimony about domestic waste contaminants here, you're talking about the unlikely event that hazardous materials may find their way into the sanitary waste system, aren't you?

MR. LEWIS: Well, I mentioned actually both. Biological would be natural contamination versus if you had hazardous waste, that would be most likely in the form of like heavy metals.

Q. Have you done any testing on the soils to determine the capacity of those soils to filter?

MR. LEWIS: No, I have not. But again, like I say, that the codes typically use about three feet, which is a overall standard that provides a conservative amount of filtration to remove contaminants, whether or not organic or non-organic.

Q. You indicated to me earlier, and I think agreed with me, that this septic tank drain field is designed just for domestic wastes?

MR. LEWIS: That is correct.

Q. Any natural filtering of the soils would depend on the type of soils and the constituents of those soils, wouldn't it?

MR. LEWIS: Yes, it would.

Q. And have you done any testing on these soils?

MR. LEWIS: No, we have not. However, what I'm trying to tell you is that when the codes establish three feet, they are looking at any type of soil. Three feet of any type of soil is a very conservative amount of filtration to remove contamination.

Q. That's for domestic wastes; isn't that correct?

MR. LEWIS: It's more than just for domestic wastes. If you read in the EPA manual on design guidelines it has levels of what I mentioned earlier as -- it would be like tolerated contaminants that were non-organic. Those -- there is filtration of those type of things which could be hazardous materials as well.

Q. Do you have a hazardous waste lagoon --

MR. LEWIS: Pardon?

Q. If you have a hazardous waste lagoon and you line that lagoon with a liner, isn't it true that for a clay liner the permeability of that liner must meet .0000001 centimeters per second as far as a tightness?

MR. LEWIS: That is true. But you're talking about a basin or something that has an extremely high concentration of hazardous wastes. And what the EPA has is there are acceptable levels of hazardous materials that can go into a septic system, but they are not -- they are many, many much lower concentrations than what you would have in a hazardous material basin.

Q. But that is the permeability number that's used, isn't that correct, for a hazardous waste lined facility?

MR. SILBERG: I'm sorry, hazardous waste?

Q. (By Mr. Nelson) A lined pond or lagoon that has hazardous waste.

A. That is the number that is used. Because at that permeability you can ensure that the dilution that you would have below the liner would be of an acceptable level.

Q. I would use Mr. Ostler to indicate that the conversion is right and we won't take the time to do that. But if you look at the permeability, this is 1,000 times less permeable than this number, 4.8, isn't it?

MR. LEWIS: Approximately, yes.

Q. If your testimony is correct that there will be a natural filtering action of soils, it really wouldn't matter whether someone accidentally dumped some solvents or some hazardous materials into the septic tank drain field because it would never get to groundwater based on the filtering of the soils; isn't that true?

MR. SILBERG: Could you -- when you said dump some contaminants, I think was the phrase, could you specify the amounts you're talking about? I think the question is pretty vague.

Q. (By Mr. Nelson) Let's assume that an employee who has some waste solvents in the operation and maintenance building, and it's quitting time, and he doesn't have anyplace to put those and he says to himself, I'm going to take this five-gallon can because it's a real hassle to send that out to Grassy Mountain to the hazardous waste facility. And I know I've been trained, but gee, I've got my wife waiting to go to dinner and this is an easy way to do it because there's the toilet. So he goes over and dumps it down the drain, a five-gallon can.

Are you saying that that five-gallon can of waste solvents, and I'm talking about waste

solvents that we would use to clean an engine or something like that, that the soils will treat that waste solvent and you won't have a problem? It will filter it out, is that your testimony?

MR. LEWIS: First off I'm saying that it will probably be a lot easier for the guy to take it over and set it down in the storage area than dump it into the sink. But should he decide to do that, that would be an extremely high concentration as to the amount of -- five gallons? That would be an extremely high amount of concentration compared to the amount of water.

Q. So the soils can't deal with that; is that correct?

MR. LEWIS: It could damage some of the soils around the drain field if it was poured in there. But, I mean, that's why we have engineering provisions, that's why we have training, that's why we have procedures and stuff, to prevent that from occurring, that type of fluid. But, you know, even your percolation or permeability rate there for a liner assumes that there is going to be some level of contamination entering the soil underneath.

Q. There is a small amount that actually makes it through that clay liner, isn't there?

MR. LEWIS: Yes, there is.

Q. And so if you have a permeability rate of 4.8 inches per day, you've got a considerable amount of material going down through that soil?

MR. SILBERG: I'm sorry, are we talking about hazardous waste material or water coming through the system?

Q. (BY MR. NELSON) Water, water.

A. Water, that's right. It's not the same thing. You know, what you have in your little basin there is hazardous materials.

Q. Let's put water in that basin.

MR. LEWIS: Okay.

Q. I've still got water going through that layer, don't I?

A. Yes.

Q. That's what permeability means, I've got water going through the layer. If I've got water going through at 4.8 that is 1,000 times faster than it would be going through here.

MR. LEWIS: Okay.

MR. FARRAR: For the record, "here" meaning the clay liner?

MR. NELSON: Yes. 1,000 times faster than the clay liner.

MR. FARRAR: Mr. Nelson, I'm not sure we got an answer to what happens to the five-gallons of the hazardous material flushed down the toilet. And let's assume -- let's not argue the premise for reasons we'll discuss later, take that premise as given.

MR. LEWIS: So what happens to the five gallons?

MR. FARRAR: Right down the toilet.

MR. LEWIS: If it's flushed down the toilet? It would enter -- well, of course it depends on what type of material it is. If it is diesel fuel or lube oil, for example, that he dumped down in there, the septic system or the septic tank would actually prevent a great deal of that from going into the ground simply because it is designed so that the top layer of the water does not enter into the drain field, it would rise to the top and it would -- you would prevent it from doing it. But there would, if you dumped five-gallons down there and no water, there would be a high concentration of material that entered that -- that could enter that drain field and would damage a small, but it would damage an area of soil in the drain field area.

MR. FARRAR: And then what would happen to it in terms of reaching groundwater?

MR. LEWIS: The EPA says that typically lube oils don't tend to travel through the groundwater, they tend to actually become sludge and tend to stay in one spot into the soil. Diesel fuel, it tends to vaporize and evaporate out. If you had enough water flowing through the system, it is possible that you could flush that down to the groundwater. But in our case if you don't have -- I mean, if you don't have enough water to make it to groundwater, you're not going to flush it down there either.

Q. (By Mr. Nelson) You're aware, aren't you, of the underground tank program by EPA, underground storage tanks for fuels?

MR. LEWIS: Yes.

Q. You're also aware that there are literally thousands of sites in the United States that have had diesel fuel in them that have leaked out of the tanks that is now floating on groundwater in the country?

MR. LEWIS: I'm aware of that.

Q. And that diesel fuel has sometimes been there for years, hasn't it?

MR. LEWIS: In the groundwater or in the tanks?

Q. In the groundwater.

MR. LEWIS: Yes, it has.

Q. And it hasn't by capillary action gone back up and evaporated at the surface?

MR. LEWIS: No. But most of those areas where you've had that are back east where you have high humidity, you have moisture in the ground so that you have mechanisms to prevent it from evaporating out and drove the oil or the diesel fuel down to the groundwater. And, I might also add, that the groundwater in those cases is typically very shallow groundwater.

Q. Would you be surprised if I were to represent that there are over 2,000 sites in the State of Utah that have contamination in the groundwater from fuel storage tanks in the ground?

MR. LEWIS: And that would be from large amounts of leakage?

Q. From service stations and diesel fuel tanks that have been in the ground.

MR. LEWIS: But the groundwater in Utah, it varies. In your own Exhibits, Grassy Mountain has groundwater about four feet down. So to say

that there are places in Utah that have diesel fuel on them is not surprising if the groundwater is very shallow. That is easily understood.

Q. So it's your testimony that you don't believe that in the State of Utah we have contamination as deep as twice the length of this room by diesel fuel that has been released into the ground?

MR. LEWIS: If you had a large enough leak in your diesel fuel, the diesel fuel alone could act as a driving force to get down to the groundwater, but it would take --

Q. But if water --

MR. SILBERG: Excuse me.

MR. LEWIS: But it would have to be a large quantity enough to drive it down there. Our septic system does not have enough water in it to drive it down 125 feet into the ground.

Q. (By Mr. Nelson) But your septic tank system has water being applied for the one system at a rate of 650 gallons per day over a 1,400 square feet area. Fourteen hundred square feet, what is the dimension of that on each side? What's the square root of 1,400?

MR. LEWIS: It would be 35 feet square.

Q. Thirty-five feet square. So you've got a 35-foot square area. The distance from me to you is probably about 35 feet, maybe a little bit more?

MR. LEWIS: It's maybe a little bit more. The distance from me to you is about 20 feet.

Q. So maybe a little bit more. A 35-foot square area that you're putting 640 gallons of water per day on everyday for the entire year, during the winter when there's snow on the ground and there's no evaporation, and you're saying that that doesn't affect the diesel fuel and pushing potentially diesel fuel down to the groundwater?

MR. LEWIS: Well, let's quantify how much water that is. Like I said earlier, that is about a half a gallon or a little less than a half a gallon per square foot. So it's not as much as you make it sound per square foot. It's a half a gallon per square foot. In the wintertime there is some evaporation that occurs. And second, at those shallow depths, most of that water is going to move into adjacent strata and it's going to freeze until it thaws out in the spring.

Q. Your testimony is that the water moves horizontally, freezes and then in the spring comes

back up to the surface?

MR. LEWIS: I said most of the water, if the water -- or if the soil surrounding the drain field is arid, it's going to wick that water over and it's -- because if it's -- even if it's cold, it's still going to move the water over because the water is warm enough to still move through the soil and it's going to freeze. Those frost depths in that area are fairly Low.

Q. You mentioned if I computed it out it really wouldn't be very much water if I looked at a half a foot per day. If I use the 650 gallons for the one drain field and the 400 gallons for the other drain field, I'm not even going to use the number that you have said which is three-quarters more, if I use those lower EIS numbers and I run that for 365 days a year, I'm going to be applying to a approximately two sections that are 35 feet square, 383,000 gallons in that year, do you consider that to be an insignificant quantity of water?

MR. SILBERG: I really think we've been around this issue numerous times. I think it's repetitive and redundant at this point, your Honor.

MR. NELSON: If you'll answer that

question I'll agree with Mr. Silberg and move on.

MR. FARRAR: All right. I think that's a good solution. Go ahead.

MR. LEWIS: When you consider evaporation and transpiration, and all the other factors involved, you do not have whatever you said, 300 and some odd thousand gallons just sitting there in the ground.

Q. (By Mr. Nelson) With respect to the detention pond, you've indicated that you used the .09 inches per day. There is also a permeability rate of .071 inches per hour that is referred to on page 15 of the -- excuse me, page 15 of the prefiled testimony. Mr. Liang, this is your testimony. It's the answer to question 36 and it says:

> "Mr. Liang: Additional site specific permeability data was not necessary. Previous work provided ample information with which to evaluate the site and potential environmental impacts to the proposed facility. The CTB-5 data, .071 inches per hour, provided great confidence that the generally applicable permeability values reported

in the EIS, .2 to .6 inches per hour, conservatively characterized the site."

How was that -- excuse me. That CTB-5 is a designation for the well -- or not the well, the hole that was drilled, is it not, to determine depth of the groundwater?

MR. LIANG: That is one of the purpose objective, yes.

Q. And that CTB-5 well was the one that you came up with for the 125 feet to groundwater?

MR. LIANG: Yes.

Q. And that permeability number of .071 inches per hour at the CTB-5, if you convert that today it's just simply multiplying it by 24 hours; isn't that correct?

MR. LIANG: Yes.

Q. So you get a permeability rate of 1.7 inches per day. How was that permeability number arrived at for the CTB-5 well?

MR. LIANG: We perform a constant head permeability test, as we show in Stone Webster Company categorization GTB-15, revision 2, which explain very detail how we arrive that number by constant head permeability test.

Q. Okay. On the next question, backing up

to page 14 of the prefiled testimony:

"Question 35: We performed a field pumping test at the monitoring well CTB-5."

Is that the way you came up with the .017 inches per hour permeability rate?

MR. LIANG: In this special case, when I say pumping test, it's just as I just said earlier one, that is constant head permeability test.

Q. Okay. If we can go to the end of your answer to that question 35.

MR. LIANG: Yes.

Q. It says, "Using the field pumping test data, we calculated the permeability to be .142 feet per day or .071 inches per day."

MR. SILBERG: Inches per hour.

Q. (By Mr. Nelson) I'm sorry, inches per hour. Is that correct?

MR. LIANG: Yes.

Q. You were measuring, were you not, permeability at the depth at the bottom of the well, weren't you?

MR. LIANG: Yes, sir. Yes, that's true.

Q. You were not measuring permeability at the surface?

MR. LIANG: Yes.

Q. So that permeability rate may or may not have anything to do with the permeability rate that's up at the surface soils?

MR. LIANG: It may or may not.

Q. And the only way to know what's up at the surface is to actually do a test at the surface?

MR. LIANG: Yes.

Q. If we go to page 4-12 of the Environmental Impact Statement, which is Exhibit 161, 4-12, the middle paragraph says, "The storm" -- I'm looking at the paragraph that starts, "The detention basin would be constructed." Do you see which paragraph I'm starting on there?

MR. LIANG: Yes.

Q. The second sentence, "The stormwater detention basin will be a 8-acre basin, 10 to 1 embankments. PFS estimates that the percolation rate for water in the basin would be .09 inches per day," which we have got up on the chart, "which is significantly lower than the estimated percolation rate for underlying soils."

Now, dropping down it says, "Since the estimated seepage rate for water through the

detention basin floor is much less than the estimated percolation rate for water in site soils, it is unlikely that saturated flow conditions will occur during infiltration unless there is degradation of the compacted soil layer or groundwater perching zones exist -- or groundwater perching zones exist beneath the detention basin."

What kinds of actions would degrade the compacted soil layer, if you know?

MR. SILBERG: I'm sorry, is that addressed to Dr. Liang or Mr. Lewis?

MR. NELSON: I'm sorry, Dr. Liang.

MR. LIANG: I don't know the answer to what cause of that degradation of the compact soil layer.

Q. (By Mr. Nelson) There was mention of the frost in the area. Do you know what frost heave is, or is that better addressed to Mr. Lewis, Dr. Lewis?

MR. SILBERG: Mr. Lewis.

MR. NELSON: Excuse me.

MR. SILBERG: He's a Mr. and he's a doctor.

Q. (By Mr. Nelson) Okay. Mr. Lewis, are you better able to deal with the question of frost

heave?

MR. LEWIS: It depends on how deep you want to go into it, but --

Q. What's your understanding of the word "frost heave"?

MR. LEWIS: The word "frost heave" occurs whenever the -- if you have saturated conditions and it freezes, since water expands when it freezes something has got to go somewhere so you get heaving action of the material.

Q. So if you have a compacted soil and you have frost, it freezes and it causes it to, in essence, break apart a little bit, expands it?

MR. LEWIS: It could crack it, yes.

Q. And so once that happens your permeability is greater?

MR. LEWIS: Because you have a fissure in the liner, so to speak.

Q. It's not just a single fissure, is it? When you get frost in there it expands the whole piece of soil, doesn't it?

MR. LEWIS: Okay.

Q. Isn't it true that that decreases the tightness of the soils?

MR. LEWIS: At the surface it would do

so. But we have actually several feet of clay. There's like 10 feet of clay underneath this detention basin in that area, just natural clay that's occurring that has an extremely Low permeability level. And so, you know, what I'm understanding you to say, first off, you have to have water in the soil in order to get frost heaving to occur. It's got to be saturated, otherwise you're not going to get it to freeze and heave in the first place.

Q. Is there going to be some frost heave in the detention basin?

MR. LEWIS: If you have water in there in the wintertime, I suppose you could get some frost action that could take place.

Q. If you get a snowstorm that drops five inches of snow on the top, melts, has some water in the soils, freezes, you're going to get some frost heave, aren't you?

MR. LEWIS: If you have five inches of snow that drops on it you would get about an inch or less of water into the top strata of the detention pond that would -- that could freeze. It could cause minute amounts of heaving, but it could --

Q. Is that what's referred to in the EIS as one of the things that could affect the permeability of that layer in the detention basin?

MR. SILBERG: Objection. I think you're asking the witness to speculate as to what the authors of the EIS had in mind. I think he can certainly reflect his understanding of the language, but asking him to speculate as to the intent I think is going beyond this witness' --

Q. (By Mr. Nelson) Let me read the next sentence and see whether you agree with this. Referring back to the language in the EIS, the next sentence says, "If processes such as frost heave or vegetation root penetration cause disruption of the compacted soil layer increasing its permeability, the seepage rate through the floor and side slopes of the detention basin could increase." Do you disagree with that statement?

MR. LEWIS: I don't necessarily disagree with the statement. However, we did not rely upon any compaction in the detention basin to provide any kind of lining for lowering the permeability through that soil.

Q. You've indicated that the permeability is .09 inches per day for the detention basin.

That is magnitudes lower than the FEIS description of the permeability for the soils even at the lowest end; isn't that true?

MR. LEWIS: The .2 to .6 inches per hour is a general characterization of the permeability in Skull Valley area. It's general. The .9 inches per day permeability --

MR. SILBERG: I'm sorry, .09?

MR. LEWIS: .09 inches of permeability is based on the types of soil that we saw at the bottom of the detention basin from the soil drillings. Even though they are magnitudes apart, again, they are still both well within the low permeability range of soils.

Q. (By Mr. Nelson) You indicated soil drillings in the detention basin.

MR. LEWIS: Just south of the detention basin.

Q. If I could refer you to page 24 of your deposition, starting on line 9, page 24 of your deposition, the question is:

"Question: You've collected samples in different areas and performed permeability tests on them?

"Answer: No. What we have done is

we've done soil borings all around the site so we know what types of soils that there are. And so from that you can apply some empirical formulas to get a reasonable estimate of what kind of percolation one could assume at that location."

"Question: Is that what was done to come up with this percolation rate the of .09 inches per day?"

And I won't read the rest of the reference.

"Answer: Yes, it was."

"Question: And this number is from a --

"Answer: The percolation rate was determined for the types of soils that would be in the detention pond. So we took soil, we took soil boring information from the detention pond area and we applied that into the formulas to determine the estimate of what kind of percolation you could get, reasonably expect to get in that area."

That testimony would infer that you had soils in the detention pond. But what you're telling me

now is is that you had samples in the area of the detention pond, but not actually in the location of the detention pond itself?

MR. LEWIS: Well, I believe in my deposition -- yes, deposition, it does say "in the detention pond area," on line 25 of page 24. We have two borings that are within a few feet of where the detention pond would be. They are not in the detention basin, per se, but they are just south on either side of the detention basin.

Q. And so in this area that's marked on this facility map, even using the larger area there was no actual soil borings in that detention pond area --

MR. SILBERG: Asked and answered.

Q. (By Mr. Nelson) -- that was taken?

MR. SILBERG: I really think -- let me just make a comment. Maybe it's just the hour, but when we decided, all parties decided that we could litigate this contention in a day, the parties came up with their estimates of how much cross-examination they would have. I think the State did not predict it would have anything like four to five hours of our witnesses plus the staff witnesses. We've now had, I guess, probably five

hours of just our witnesses. I have really not objected to it, but I really think that the length of this cross-examination is really starting to get excessive.

MR. FARRAR: Mr. Nelson?

MR. NELSON: Everything in this proceeding has gone beyond what was estimated.

MR. SILBERG: No. I predicted I would have two hours of cross this morning and I had an hour and-a-half.

MR. NELSON: Well, I am trying to as efficiently as I can get through this. And it would be easier if I could get a direct answer, I believe, but I'm doing as best I can. And I don't think it's unreasonable for me to continue because it's important to know in that detention pond area what has and hasn't been done as far as the underlying basis for the Environmental Impact Statement and for the representations that are in the prefiled testimony.

MR. SILBERG: And I think you have that information and you've had it; it's in the depositions, it's in their testimony. I really think we're taking an excessive amount of time on this.

MR. FARRAR: Let me ask the staff if they have an opinion on this.

MS. MARCO: It does seem excessive, but I wouldn't know what's in his cross-examination plan, only you would.

(The Board conferred off the record.)

MR. FARRAR: Mr. Silberg, if that was an objection, we're going to overrule it at this point. That's not to say you don't have -- that there's no basis for what you said, but we try to apply the same rule to every party. And it would be premature at this point to suggest that Mr. Nelson is taking too long.

Mr. Nelson, I would -- as we see it, there's been nothing dilatory or rambling about this. The only suggestion we make, Mr. Nelson, is at some point it becomes clear you don't like the answer you're getting, but asking the question again is not going to change the answer. So if you would bear that in mind, I think we would -- we can move right ahead.

MR. NELSON: Thank you, Judge Farrar.

MR. SILBERG: Thank you, Judge.

Q. (By Mr. Nelson) If I could refer you, Mr. Lewis, to Exhibit 165. Exhibit 165 is a page

from Attachment 2, Geotechnical Data Report, it's a page that lists several bore samples, boring samples. Do you see that page?

MR. LEWIS: (Indicating affirmatively.)

Q. There's a column there, Water Content, is there not?

MR. LEWIS: (Indicating affirmatively.)

Q. With respect to the detention pond, C-1 was one of the boreholes that you used to evaluate the percolation rate and the soils in the area of the detention pond, was it not?

MR. LEWIS: To evaluate the permeability.

Q. Excuse me, the permeability. C-1 is located pretty near the detention pond; is that correct?

MR. LEWIS: Yes. It is located just on the southeast side of the detention basin.

Q. If you look at the table, Exhibit 165, as I understand your testimony, is the amount of moisture in the soil has a bearing on movement of liquid through the soil. And if you look at the samples at a depth of 10 feet, in C-1 there's three samples there, is there not, that are at a depth of 10 feet?

MR. LEWIS: That's what I see.

Q. And the water content numbers are 30, 38 and 46. That's percent water by weight, is it not?

MR. LEWIS: I don't know. I'm not familiar with this table.

Q. It's either -- it has to be -- from your expertise, it has to be either percent water by weight or percent water by volume, doesn't it?

MR. LEWIS: Again, I am not familiar with this particular test result so I don't know.

Q. Did you evaluate C-1 with respect to moisture content?

MR. LEWIS: No. I did not determine what the permeability was based on the soils. I referred that to our soils specialist who then provided me with the permeability that would occur at C-1 and B-1.

Q. So you didn't evaluate any kind of moisture numbers in your conclusions that water would not be going down to groundwater?

MR. LEWIS: I don't believe -- excuse me. I don't believe that the permeability is going to change depending on how much water you have in here. Permeability is the ability of soil to transmit fluids.

Q. Didn't I understand your testimony earlier, though, that if it was dryer it wouldn't go down as fast, but if it were wetter it would go down faster?

MR. LEWIS: It would percolate faster.

Q. Percolate meaning going down through the soils?

MR. LEWIS: Percolate can be horizontal or vertical.

Q. So if you were to look at that water content, that would be significant to you in knowing what kind of a reaction would be happening in the soil as you put water --

MR. SILBERG: Mr. Chairman, I think this witness said he didn't know these test results, he couldn't explain them, they weren't his. Now, this is an example where I think we're going over material that's been questioned.

MR. FARRAR: Mr. Nelson?

MR. NELSON: I'll move on, your Honor.

MR. FARRAR: All right.

Q. (By Mr. Nelson) On page 11 of the prefiled testimony, question 25, you indicated there's an evaporation rate of .13 inches per day was the assumption that you made in doing the

computations on doing the detention pond. Is that number an average over the year?

MR. LEWIS: Yes, it is.

Q. For the time period October to March it would be higher -- I mean would be lower and for the summer months it would be higher?

MR. LEWIS: That should be correct.

Q. If you had a 100-year storm on October 1st, that evaporation rate would not apply for the next several months, would it?

MR. LEWIS: If you had a 100-year storm on October 1st it would be extremely abnormal. Typically you only have storms through the months of possibly as early as April through about September.

Q. You're testifying that the water that is put down on the site of 7 to 12 inches every year occurs primarily during the summer months?

MR. SILBERG: Objection, I think his testimony referred to a 100-year storm. I think the question is a totally different issue.

MR. FARRAR: But I think it's a fair follow-up. Objection overruled.

MR. LEWIS: Say that again, please?

MR. NELSON: Would you read it back?

(Pending question read back as follows:

"Question: You're testifying that the water that is put down on the site of 7 to 12 inches every year occurs primarily during the summer months?")

MR. LEWIS: Yes, it would. It would be primarily due to rain. You would get some moisture that occurs in the wintertime from snow, but the snow most likely is of Low moisture content and contributes -- does not contribute much to the annual amount of water.

Q. Have you evaluated the meteorologic data in Skull Valley to know when the water is -- when the rains and when the storms occur on an average, that data is available, isn't it?

MR. LEWIS: Yes, it is.

Q. Have you evaluated that and looked at it?

MR. LEWIS: I personally did not, but a colleague of mine did evaluate that in terms of trying to determine what times of the year that we could predict a 100-year storm. And that's whenever we came up with the values -- or the months of April through September. Primarily in the spring months, but you can get some as late as

August and sometimes into September.

Q. If you get a 100-year storm, your prefiled testimony says that will be 4.77 feet of water in the detention pond; is that correct?

MR. LEWIS: You could have up to 4.77 feet of water in the detention pond. Now, that conservatively assumes that there is no absorption of the water in the storage pad area. That means that all of the water, we assume, that drops in the 99 acres goes to the detention pond. That actually would not occur, but that is our conservative assumption to determine a conservative depth of water in the detention pond.

Q. If you have water at any depth in the detention pond it tends to be a driving head, does it not, to push water into the ground?

MR. LEWIS: It would not be very much of a driving head. Remember, about 27 inches is one pound per square inch. So about five feet is about two pounds per square inch. Two pounds per square inch is hardly enough pressure to be considered a major driving force through the soil.

Q. More water goes into the ground if you have a pond above it?

MR. LEWIS: Slightly.

Q. You did some computation in the prefiled testimony that you just let that assumed 4.77 feet of water remain in the pond and either percolate out or evaporate that the water would be in there for 260 days; is that correct?

MR. LEWIS: That is correct. But again, this is a conservative computation. What we're trying to determine is what would be the maximum amount of time that water would stay in the detention pond. So we assume a Low permeability and we assume a Low evaporation rate. In other words, we don't assume as high as we could have during the summer months to project a conservative amount of time that water could reside in the detention pond.

Q. On page 31 of your prefiled testimony, at the top of the page on 31 before question 70 the statement is, "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." Where will that water be drained to?

MR. LEWIS: To the soil below the detention basin.

Q. You've indicated that you would test

that water for radiologics. Would you test that water for non-radiologics?

MR. LEWIS: We would -- yes. We would actually do a visual examination of it again to determine if there was a -- any sheen that could be observed on top of the water. At that point, if there was no radiological contamination and if we could not determine that there was any visual indication of hydrocarbons in the water, the water would be assumed to be --

Q. So your answer here is --

MR. SILBERG: Excuse me. Could you let him finish, please?

MR. FARRAR: The water would assume to be?

MR. LEWIS: Clean enough to pour out onto the soil downstream of the detention basin.

Q. So your testimony here is similar to the testimony with respect to the sumps, that you're going to look for a sheen, but you're not going to specifically sample and test for solvents or metals or diesel fuel? You would just look for a sheen and then you would put it out on the ground?

MR. LEWIS: The most predominant hazardous material that you should be able to

detect if there was any to detect in the detention basin would be diesel fuel. In my research for this hearing I discovered that all of the lube oils that we are using at the site are not even considered as hazardous materials. So they wouldn't necessarily be -- wouldn't be required to test for, and that pretty much leaves us down to diesel fuel. Perhaps there could be some possible antifreeze, but not likely.

MR. FARRAR: Mr. Nelson, I may be wrong and I won't ask the reporter to read back the question, but I think that question could have been answered yes or no. Now, we have a rule that you can answer -- the person asking the question is not entitled to limit you to a yes or no, and you're always free to explain yes or no, but I would ask you in light of the comments of a few minutes ago to listen to the question and if it can be answered yes or no, please do so. And then maybe we'll need an explanation or maybe not.

MR. LEWIS: Okay.

MR. FARRAR: I think that was a yes. The question was you were going to do the same thing with the water in the detention pond that you would in the sumps if you didn't see a sheen, the

answer is yes?

MR. LEWIS: Yes.

Q. (By Mr. Nelson) If I could refer to the next question of the prefiled testimony on page -- or it's question 70, the last sentence. "To the extent that any amount of contaminant was in the detention basin water, this mixing with waters of the valley," which is waters flowing through the valley, "this mixing would further dilute the contaminate making any potential environmental harm even more unlikely."

Are you suggesting that so long as the volume of water going through the valley will dilute out any contaminants that you don't need to be concerned about that?

MR. LEWIS: What I'm suggesting here, and the question involves having a second severe storm on top of your 100-year storm event so that you actually get water, more water than the detention basin can hold, such that it would spill down the spillway. Most likely we would have had plenty of time to have gone out and taken a sample of water to determine if it was contaminated or not. A second storm on top of it where you had that much water would be a lot in terms of the

amount of contamination and so that your concentration levels of contamination would be even lower.

Q. Is it acceptable in the design of a stormwater or wastewater treatment facility to use dilution as a criteria for resolving any issues?

MR. LEWIS: We don't typically use dilution to resolve wastewater solutions. However, the EPA does provide levels of concentration -- concentration levels of hazardous materials that are acceptable. And so if you have enough water you're going to have much smaller concentrations of contamination.

Q. When you design you don't design based on dilution?

MR. LEWIS: No, we do not.

Q. The liner that exists in the detention pond, we've talked about frost heave, we've talked about the wheat grass. Doesn't the roots of the wheat grass tend to increase the permeability in any kind of a soil there?

MR. LEWIS: Again, in our environmental report we did not rely on the permeability under the detention pond --

Q. I understand that. I'm just asking you,

does -- do roots change the permeability?

MR. LEWIS: I don't think I can answer that. I don't know.

Q. If you had a one-inch storm in the area of the fuel storage pads, that 99 acres, a one-inch storm over 99 acres, if you divide 99 by 12 you're going to get the number of acre-feet of water that would be coming down on that site. It would be approximately 8 acre-feet of water; is that right? Does that sound reasonable?

MR. LEWIS: If you had a -- all right, repeat.

Q. A one-inch storm.

MR. SILBERG: One-inch being one inch of rain?

Q. One inch of rain. One inch of rain on the 99 acres, if you divide 99 by 12 inches you get 8 acre-feet of water that would come down on that 99 acres; is that correct?

MR. SILBERG: I'm sorry, give me that again. If you divide 99 acres by --

Q. 99 acres is a one-inch storm, so you would have to get an acre-foot. To get to the foot you would have to go 12 inches an acre-foot to compute the water. So you divide 12 inches into

the 99 acres, you get 8 acre-feet of water.

MR. LEWIS: That sounds reasonable.

Q. The conversion factor for acre-feet to gallons of water is 325,851 gallons per acre-foot. Are you aware of that or that's not something that you would know?

MR. LEWIS: No, not without looking in a manual to see what the conversion was.

Q. Does that sound about right based on your experience in working with water resources?

MR. SILBERG: Mr. Chairman, I think the witness just said he didn't know. I mean, if counsel wishes to testify or postulate and assume the numbers we can do that, but again --

MR. FARRAR: That objection is sustained. We can get that in some other way, through your witness or each of us with a scratch pad.

MR. NELSON: I will do that.

Q. (By Mr. Nelson) Referring to page 16 of the prefiled testimony, Mr. Liang, this is a question that you answer. I'm sorry, it starts on page 15. Mr. Liang, question 37. "PFSF site borings and laboratory test data identified a subsurface profile consisting of three layers;

silt, silty clay and clay silt. No sand was identified to a depth of 25 to 35 feet below existing grade."

That was not true of the one boring AR-1 that we looked at, was it not? There was sand at a depth of 10 feet for that boring?

MR. LIANG: For this specific boring location, yes.

Q. And if you refer to -- if I can refer to Exhibit 164, there is a second boring log, AR-2.

MR. SILBERG: I'm sorry, what's the Exhibit number?

Q. (By Mr. Nelson) Exhibit No. 164.

MR. LIANG: Yes.

Q. For AR-2 there is sand at a depth of five feet, is there not?

MR. LIANG: Yes. But the AR-2 is not locate at the site. Is beyond the boundary of the site.

Q. Where is AR-2 located?

MR. SILBERG: I'm sorry, that was AR-2 you're saying? Okay, I found it.

MR. LIANG: The AR-2 stand for access road number 2, boring location.

Q. (By Mr. Nelson) If you'll refer to

Exhibit 166, 166, the first sheet is the Plot Plan and Locations of Geotechnical Investigations. AR-2 is right there in the bottom right-hand corner of the diagram, isn't it?

MR. LIANG: Yes, I see it.

Q. So it is in the area of the facility?

MR. SILBERG: Define "area of the facility," please.

Q. (By Mr. Nelson) It is in the area designated by this map?

MR. LIANG: In the area designate by this map, yes. But is beyond the site of so-called a site boundary for the control area.

Q. Based on AR-1 and AR-2, would you conclude that there is some variability as to the depth of the sand in this area?

MR. SILBERG: I'm sorry. By "area" you're referring to --

MR. NELSON: In the area that is identified on Exhibit 166, the sheet number 1 of 2, Figure 2.6.2.

MR. SILBERG: Gotcha.

MR. LIANG: Yes, this is one single exception.

Q. (By Mr. Nelson) There's two boreholes

that is different; isn't that right?

MR. LIANG: Within the Exhibit you're referring here, yes.

Q. Mr. Lewis, I would like to refer you to --

MR. FARRAR: Mr. Nelson, before you leave that I'm a little confused. As I understand AR-2, it's about 2,000 feet from the administration building and one of the leach fields. Why, when you found sand there do you write a statement that says there's no sand found? I understand that's not within however you've defined the site boundaries, but wouldn't that send up a red flag and say, Gee, we found sand over here. The way the earth is put together it might well be sand over here 2,000 feet away or 1,500 feet away? I'm measuring with my pen here?

MR. LEWIS: If I can be permitted to answer that, that's not necessarily the case. As you move further and further east of the valley you get into the alluvial fans from the Stansbury Mountains which are considerably more sandy than the basin area of the valley.

MR. FARRAR: Okay. Thank you.

Q. (By Mr. Nelson) May I just follow-up

then with a question? If you'll look on the same figure and locate AR-1, AR-1 is located right next to the administration building and was the boring that was used to determine what to do with the drain field for the administration building; isn't that right?

MR. LEWIS: Correct.

Q. And AR-1 has sand in the same location at five feet, doesn't it?

MR. LEWIS: In the upper layers it does, but not in the lower layers as does AR-2. That would tend to make sense. As your sand layer is depleted out, you would get less and less sand as you went further and further west.

Q. If I could refer to the Environmental Impact Statement, page 3-13, again, that's Exhibit 161. Referring to the first full paragraph about three-quarters of the way down, Mr. Lewis, I believe this question would be for you, there's a sentence that says, "Localized induced recharge could occur beneath ponds or continually saturated areas if sufficient excess water is available or through natural or man-made permeable pathways beneath water ponding areas."

Do you agree with that?

MR. LEWIS: Well, actually I think my colleague here would be more appropriate to answer that.

Q. Thank you. Mr. Liang, Dr. Liang.

MR. LIANG: The statement is correct. I agree with that. But may I add, this is a assumption saying local -- if localize have some kind of ponding, then this statement is correct.

Q. If I have a detention pond with water in it, that would meet the criteria of being a pond or a saturated area, wouldn't it?

MR. LIANG: No. Because according Mr. -- my colleague Lewis saying that most the time the pond will be dry except some major event like a 100-year rainfall with some others, but at that time we also have some measure the pumps out. But most the time detention pond dry, no standing water.

Q. If I could refer to Dr. Liang your testimony, prefiled testimony at page 33, the question is, "Would holes drilled elsewhere on the PFSF site provide a path for contamination to reach groundwater?" And your answer is, "No. All boreholes in the proposed canister transfer building in the PFS site were grouted with comment.

Some other boreholes were backfilled with soil, but they were generally less than 50 feet in depth."

With that statement in mind, would you look at back to Exhibit 166, the maps of the boreholes and refer to the second page, figure 2.6-19 from the Safety Analysis Report. Is that a figure that represents the fuel pad storage area, the 99 acres?

MR. LIANG: The Exhibit you point out is Figure 2.6-19, that representing the storage pad area, yes.

Q. If you look at that figure there are a number of boreholes shown with the alphabet letter first and then a number following. Those are the boreholes based on the legend; is that not correct?

MR. LIANG: Alphabetical and then follow with a number, yes.

MR. SILBERG: You say some of them. You say anything with a letter followed by a number?

MR. NELSON: I'm sorry, a single --

MR. SILBERG: A single letter.

MR. LIANG: A single letter.

Q. (By Mr. Nelson) A single letter followed by a single number is a borehole; is that correct?

MR. LIANG: I don't know.

MR. FARRAR: You mean a single digit number or --

MR. NELSON: Single digit number.

MR. LIANG: Following a single character.

Q. (By Mr. Nelson) Let me state this a little better. There are designations A-1, B-1, C-1, C-6. Those, based on the legend with that kind of designation, those are borings?

MR. LIANG: Based on the legend, yes.

MR. SILBERG: Excuse me. I don't see anything in the legend that says B-1.

Q. (By Mr. Nelson) There's a little insignia in the legend, is there not, that is a little square -- right next to the A-3, there's a little symbol there. And everywhere on the storage pad area that that little symbol appears is a borehole; isn't that correct?

MR. LIANG: Yes.

Q. You then have another symbol that is categorized as a Geomatrix boring. And there are a number of those throughout the site with a letter followed by a two digit number. What is a Geomatrix boring?

MR. LIANG: Oh. That, my understanding, is a subcontractor who did the seismic refraction survey. I may be wrong because that's what I was inform that.

Q. It's a Geomatrix boring. Are you boring into the ground?

MR. LIANG: I don't know.

MR. SILBERG: Geomatrix is a company.

MR. LIANG: Is a company. I don't know --

MR. SILBERG: That is contracted to PFS.

Q. (By Mr. Nelson) Is the boring going into the ground?

MR. LIANG: I don't know the detail of their survey.

Q. You have on the legend also a cone penetration test and dilatometer test. Do you know what those are?

MR. LIANG: No.

Q. You don't know whether that involves penetrating into the ground?

MR. LIANG: I don't know.

Q. There are a number of test pits that are listed there. Do you know what a test pit is, what they're referring to there?

MR. LIANG: No, I don't know.

Q. You represent in your prefiled testimony that, "The borings in the area of the canister building were grouted with cement." Do you know if any of the boreholes or whatever other testing that is reflected on Figure 2.6-19, whether there was any grouting or cementing of any of those holes?

MR. LIANG: I don't know.

Q. There's 8 inches of compacted gravel that is over that 99 acres. We've discussed that. My question is, when you get a one-inch rainstorm and that water hits the gravel, isn't it possible to have a sheet flow of water going along the less permeable area below the gravel, a sheet flow going at least there along for a little bit and contacting many of these boreholes or testing areas?

MR. LIANG: You're saying we have 8 inches of gravel and then you have how much rainfall?

Q. An inch rainfall.

MR. LIANG: An inch rainfall. And your question is you would have a sheet of water move to where?

Q. Potentially you could have water moving

along on that less permeable layer below the -- at the bottom of the gravel that could contact those areas of boreholes?

MR. LIANG: Yes, it could. Depend on the slope of the area.

Q. And if it did contact it, the fact that you have disturbed in many places in that area without -- assuming they weren't grouted, it potentially could go to groundwater?

MR. LIANG: My understanding, the borehole are all grouted or backfilled with the cutting. So I cannot say assumption you say some borehole not grouted because not applicable in this case.

Q. It may or may not be less permeable than the original soils? You don't know?

MR. LIANG: I don't know the answer.

MR. SILBERG: Can I have the last question and answer read back?

(Record read back as follows:

"Q And if it did contact it, the fact that you have disturbed in many places in that area without -- assuming they weren't grouted, it potentially could go to groundwater?

"MR. LIANG: My understanding, the borehole are all grouted or backfilled with the cutting. So I cannot say assumption you say, some borehole not grouted because not applicable in this case.

"Q It may or may not be less permeable than the original soils? You don't know.

MR. LIANG: I don't know the answer."

MR. SILBERG: Thank you.

Q. (By Mr. Nelson) The area that is graveled, the 99 acres -- Mr. Lewis, I think this question is perhaps for you. The area that's graveled in the 99 acres, if you put 8 inches of gravel on there, initially water that hits that in any kind of a quantity will probably percolate down at least the 8 inches, won't it?

MR. LEWIS: It will percolate somewhat into it. I don't know if it would make it 8 inches or not, but --

MR. SILBERG: How much rainfall are you postulating?

MR. FARRAR: Mr. Nelson, we're having a

problem with if that's rainfall on the gravel and the casks and it's not contaminated, what difference it would make if it goes down the boreholes.

MR. NELSON: There is a quantity -- our argument is is there is a quantity of water that because you have graveled the entire area, there is a quantity of water that will be moving into the groundwater. If there are contamination spills, leaks from vehicles, that there will be a 99-acre area that you will have vehicles traveling over, you will have areas that potentially in that area you will have water going down into the aquifer.

MR. FARRAR: The vehicles being the huge device that moves the casks?

MR. NELSON: And trucks and facilities.

MR. SILBERG: And that's different than tractors driving over the farm fields probably more frequently than cask transporters going over the gravel.

MR. LAM: Well, I think Mr. Nelson's point is well taken. I think he's going down the path is there a better hydrologic conductivity here.

MR. NELSON: That's the argument.

JUDGE FARRAR: Go ahead.

Q. (By Mr. Nelson) You, Mr. Lewis, have indicated that evapotranspiration will deal with much of the rainwater that falls in that area; is that correct?

MR. LEWIS: That's correct.

Q. There will be no plants in that entire 99-acre area, will there?

MR. LEWIS: No, there will not.

Q. So the transpiration part of it won't be applicable?

MR. LEWIS: That would be correct.

Q. So any liquids at that point would have to be leaving the site by evaporation before going into the groundwater?

MR. LEWIS: They would probably have to be evaporated since below that is, I believe, a five-foot layer of soil cement which is basically like concrete.

Q. The soil cement covers the entire 99 acres?

MR. LEWIS: It covers all around all the pads, yes.

Q. The 8 inches of gravel is on top of soil cement?

MR. LEWIS: Yes.

MR. SILBERG: You got it.

MR. LEWIS: Pardon?

Q. (By Mr. Lewis) So you have 99 acres of soil cement?

MR. LEWIS: I don't know if it extends out the full 99 acres, but I know that we have soil cement surrounding all of the pads in the storage area, yes.

Q. Soil cement is in this area surrounding these fuel storage pads?

MR. LEWIS: Yes, sir.

Q. Have you done any tests on the permeability of that soil cement?

MR. LEWIS: No, I have not.

Q. Mr. Liang, you've indicated that you're a modeling and monitoring expert; is that correct?

MR. LIANG: Yes. I have done a lot of groundwater modeling.

Q. When you do an assessment of a site, you have to determine the baseline, don't you, of the groundwater, the baseline quality of the groundwater?

MR. LIANG: The answer is depend on the requirement or the need to do that.

Q. If I wanted to be able to assess whether I was contaminating groundwater, I would put in a couple of monitoring wells, would I not, above the area to find out what the baseline is; isn't that correct?

MR. SILBERG: Excuse me. The baseline of what?

Q. (By Mr. Nelson) The baseline of the contaminants in the water.

MR. LIANG: For PFS site?

Q. I'm just talking generally about with respect to how you would monitor for contamination in groundwater. In order to monitor for groundwater contamination you would have to put in some wells upgradient to determine what was flowing into the site and what quality that was in order to figure out whether the site was being contaminated; isn't that true?

MR. LIANG: Not true because the first in my mind is do I need to do a monitoring effort to evaluate the site. The first thing I decide is there any source of contaminant for the site. Secondly, I will look into if there are any hydrologic link between the surface water or groundwater. Then if this is both a yes, then I

will say what the parameters, the information or parameter I need to do my groundwater modeling.

So if before that I have to identify is there any contaminant soils, any credible path or any possible link between the high surface hydrology or the groundwater hydrology.

Q. Let me be specific and refer you to Exhibit 161, the Environmental Impact Statement, the very first sheet past the cover sheet there is a location of the proposed site map, Figure 2.1. Do you see on that map a dot that's labeled Tekoi Rocket Engine Test Facility?

MR. LIANG: Tekoi Rocket, yes.

Q. Tekoi Rocket Engine Test Facility; do you see that?

MR. LIANG: Yes.

Q. In looking at this map, north is to the top.

MR. LIANG: Yes.

Q. What is, based on your understanding of the water resources and water flow in the water, what is the direction of groundwater flow on this map, what direction?

MR. LIANG: On the basis of what I read in the Waddell Report.

MR. SILBERG: I'm sorry, the what report?

MR. LIANG: The Waddell Report, I assume this will be in the area of Skull Valley. The general direction of the water, groundwater flow is to the north, which is top of the figure.

Q. (By Mr. Nelson) The Tekoi Rocket Engine Test Facility, are you familiar at all with whether or not that facility used large quantities of fuels in doing their testing?

MR. LIANG: No, I am not.

Q. If PFS wanted to make certain that there wasn't any contamination coming from upgradient, and upgradient, the Tekoi facility would be upgradient based on your description; is that correct?

MR. LIANG: Yes.

Q. You would put a monitoring well in south of the proposed facility and check it for fuels, wouldn't you?

MR. LIANG: Base on my model experience, if I look at this figure and the base under what I measure is based on the scale, which is maybe four or six mile away from the boundary of the PFS site, my expertise experience is not a major concern

because if any contaminant on that inactive rocket engine test site would be dilute a million times maybe in concentration. That's only my expertise guess.

Q. PFS would not want to be responsible for any upgradient contaminants, I am sure; isn't that correct?

MR. SILBERG: Mr. Chairman, I really think besides the fact that we've now been at this for seven hours, which I think is an unfair amount of cross-examination for this type of testimony, we're now going into cross-examining on the Tekoi Rocket Test Facility, which is a solid motor, rocket motor test facility, did not use any fuel. We're talking about something that has no relevance here. I really think we are overreaching it and I'm really objecting to this continued cross-examination. Aside from the fact that these witnesses have been through a day's worth of cross-examination. I really think we're well beyond the point of usefulness.

MR. NELSON: I'm trying to make some inquiry into monitoring at the site and I will represent to the panel that I am down to a few number of questions. And I'm trying to just

indicate what a baseline assessment would be if you were going to assess groundwater quality and what would you do to do that.

MR. SILBERG: Well, then let his witness put it on. These witnesses have said it's not necessary.

MR. FARRAR: Okay. I think we started this session at --

MR. SILBERG: 2:15.

MR. FARRAR: So it's only six hours.

MR. SILBERG: I'm sorry. It seems like seven to me.

MR. FARRAR: And the Board has been through another day in the morning on another subject. Let me ask a question. These days progressive forward looking companies who want to be prudent do more than the law requires. Why wouldn't you want to monitor before you start building anything? Why wouldn't you have baseline measurements? Any company that has its eyes on the ball does that these days, in my opinion. And I have a basis for that opinion which we'll talk about tomorrow. Why wouldn't you do that?

MR. LIANG: Because it depend on your professional judgment. Sometime as engineer we

always using engineer judgment, is that necessary or not. In my view, because this is distant from the site boundary, also what kind of contaminant potential possible --

MR. FARRAR: Forget it. Excuse me for cutting you off. Forget the rocket engine test. Just generally, why wouldn't you want to have a couple of wells there so you know what's going on? Then if you're right you can dismiss the State's concerns. You can say, you know, we looked at it ahead of time, we looked at it two years later and it's fine in any case?

MR. LIANG: The decision making is not for me to decide. Normally we have a organization, a project organization which we confer is that necessary or not. I can recommend based on my technical expertise, but the decision to make it should that be input or not. But in my point of view, I don't see there's a need for that for this case.

MR. SILBERG: Mr. Chairman, I really would like to make a comment at this point, and I know we're all tired. But I must take exception to your comment on that you have a position as to what a prudent company would do. I truly believe,

respectfully, that that's an inappropriate for this Board or Chairman of this Board to be putting that position forward. Because if you have a position, then I think you should not be judging the record on this case. You obviously have to weigh the evidence.

MR. FARRAR: Well, I wanted to give him a chance to comment on whether that was his opinion of what a prudent company would do, is why I asked him the question. I understand your point and I can assure you, and as I think you've seen through the weeks here, that we ask questions, we try to develop the record.

MR. SILBERG: Well, I appreciate you asking questions, but there was embedded in that question I think you said your personal position that you would discuss more tomorrow.

MR. FARRAR: I meant in terms of asking questions that would enable them to comment on what their opinion was of that approach.

MR. SILBERG: And I certainly have no objection to that. I welcome that from the Board.

MR. FARRAR: If it didn't sound like that, that's what I meant to say. We have been here 11.5 hours as a Board. If I didn't say it

exactly the way I meant it we can have it with the understanding I've now given. Do you wish to make any kind of motion?

MR. SILBERG: No, sir.

MR. LAM: I can assure the parties, I, for one, do not have any position on this matter until I weigh and balance all the evidence in the record.

(The Board conferred off the record.)

MR. FARRAR: Mr. Nelson, what's your pleasure?

MR. NELSON: I'm prepared to go for a little while longer. I don't think I have much more on cross-examination for these two, but I'm prepared to come back on Friday morning too.

MR. FARRAR: Mr. Silberg?

MR. SILBERG: I thought Mr. Nelson said he just had a few more questions. Maybe I'm misremembering, but how are the witnesses feeling?

MR. LEWIS: I feel fine.

MR. LIANG: I feel fine.

MR. SILBERG: How many more questions do you have, Fred?

MR. NELSON: Fifteen, 20 minutes at the most.

MR. FARRAR: Before we resume, Mr. Silberg, I might add in addition to your comment, I thought by asking the questions the way I did I would get to the point quickly about monitoring, whether it was worthwhile or not. So I was trying to move the proceeding along. Perhaps I stated what I was trying to do incorrectly. Go ahead, Mr. Nelson.

Q. (By Mr. Nelson) Is the reason -- or PFS has not proposed to monitor groundwater for non-radiologic contaminants?

MR. SILBERG: Asked and answered. Let's move on.

MR. NELSON: I don't believe I have asked that question about monitoring the groundwater.

JUDGE FARRAR: I think --

MS. MARCO: Actually, I think we heard it twice, one with the detention pond and then again with the sumps.

JUDGE FARRAR: And I think --

MR. NELSON: That's surface water. The sumps and the detention pond was a checking on surface water.

MS. MARCO: Correct.

MR. SILBERG: I think the Chairman just asked that same question.

MR. FARRAR: I think I asked that question. And whether or not people liked the way I asked it, I thought I got a comprehensive answer. A comprehensive answer as far as this witness is able to say.

Q. (By Mr. Nelson) Is there a reason -- to your knowledge, is there any reason based on cost that monitoring is not being done?

MR. SILBERG: Objection. This is a technical witness, this is not a management witness. It's an inappropriate question for this panel.

MR. FARRAR: Do you have a basis for answering that?

MR. LIANG: I don't know the answer to that question.

MR. FARRAR: Fine.

Q. (By Mr. Nelson) I would like to refer you to Exhibit 158, state's Exhibit 158. It's the very first one in the packet. There is a page from NUREG 1567, and I would refer you to the Section 2.4.5, subsurface Hydrology. In the middle of that sentence -- well, let me read the paragraph that

starts, "If the site," and then ask you a question.

"If the site is located over an aquifer which is a source of well water, the groundwater aquifers beneath the site, the associated hydrologic units and their recharge and discharge areas should be described. The results of a survey of groundwater users, well location, source aquifers, water uses, static water levels, pumping grades and drawdown should be provided. A water table contour map showing surface water bodies recharge and discharge areas and locations of monitoring wells to detect leakage from storage structures should also be provided."

Mr. Liang, do you interpret that to mean that the environmental report and the EIS should have identified the locations of monitoring wells to detect leakage from the storage structure?

MS. MARCO: Objection.

MR. SILBERG: Objection. You're asking this witness to comment on an NRC staff standard review plan. Inappropriate question for this witness.

MS. MARCO: And furthermore, the Standard Review Plan that is being discussed relates to the safety review, it does not relate to

the environmental review that is to be conducted.

MR. SILBERG: Therefore, it relates to radiological contamination.

MS. MARCO: That's correct.

MR. FARRAR: Mr. Nelson?

Q. (By Mr. Nelson) Let me follow-up with a question then. Is it your understanding that Standard Review Plan, Mr. Liang, refers only to radiologic contamination?

MR. SILBERG: Objection, Mr. Chairman, it's asking an inappropriate question of this witness. The Standard Review Plan stands on itself. This Board, these parties, know exactly what a Standard Review Plan does.

MR. NELSON: I believe that I am entitled to ask questions concerning Mr. Liang's involvement because he has testified that he was the one who was consulted on preparation of the environmental report and the initial monitoring and modeling decisions, and we've reviewed that in his deposition testimony. I'm just trying to ask him about this particular document that is a Standard Review Plan for Spent Fuel Dry Storage Facilities, which is what I think we have here.

MR. SILBERG: And the Standard Review

Plan is a model for how the staff conducts its report, conducts its review. And I suspect this section does not relate to the environmental report. Ms. Marco has the entire document and she can confirm that.

MS. MARCO: I have that. That is correct, it's a safety review guidance document that does not relate to the EIS preparation.

(The Board conferred off the record.)

MR. FARRAR: Ms. Marco, you're going to have some witnesses on the stand eventually on this issue?

MS. MARCO: We intend to put our witness on the stand, yes.

MR. FARRAR: The objection is sustained.

MS. MARCO: However, I think the same issue would apply, that this goes to the Staff Safety Evaluation Report and does not go to the ER. In fact, in the Introduction section when it speaks to the purpose and scope it says, "This FSSRP provides specific guidance for the staff's preparation of the staff's Safety Evaluation Report. It provides guidance relating to compliance with NCF Part 20, Part 72 and portions of other CFR parts incorporated by reference in 72.

The scope of the SRP includes structure, systems and components that are important to nuclear safety and other information or supporting equipment requiring NRC review and approval."

MR. SILBERG: Let's move on. You can think about that objection to come, but I think it's relevant. It's dead on point.

MR. FARRAR: We'll move on when I finish thinking about what I'm going to rule on this.

MR. SILBERG: I thought you did rule, sir.

MR. SILBERG: It's probably because it's moving on seven hours.

MR. FARRAR: No, it's moving on 12. The objection is sustained and let's call it quits for tonight. We will assume this issue in the State Capitol. Is that right, we've confirmed that? The State Capitol on Friday morning at nine o'clock.

MS. MARCO: Will it be in that same room before, the one that we had previously?

MR. FARRAR: If I could speculate I would say yes.

MR. NELSON: It is. I believe it's Room 129.

MR. SILBERG: Can we start earlier than

9:00?

MR. LAM: Well, we have a long day Friday, Jay?

MR. SILBERG: I would request that.

MR. FARRAR: Well, we have to quit at 1:00 so we can get out to Tooele for the limited appearances. I'm sorry, let's start at 9:00 and we'll go to 1:00 or a little thereafter. Tomorrow we'll be here at 1:00 to have the seismic motions argument and to discuss the future schedule of the proceeding. That's it for tonight.

(The proceedings were adjourned at 8:55 p.m.)

CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Private Fuel Storage, LLC

Docket Number: Docket No. 72-22-ISFSI
ASLBP No. 97-732-02-ISFSI

Location: Salt Lake City, Utah

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.

/s/ Diana Kent

Diana Kent
Official Reporter
Neal R. Gross & Co., Inc.