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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARD

(ACRS)

EARLY SITE PERMITS SUBCOMMITTEE

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WEDNESDAY

DECEMBER 3, 2008

ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Dr. Dana A. Powers, Chairman, presiding.

SUBCOMMITTEE MEMBERS PRESENT:

DANA A. POWERS, Chairman

MARIO V. BONACA, Member

WILLIAM J. SHACK, Member

JOHN D. SIEBER, Member

J. SAM ARMIJO, Member

OTTO L. MAYNARD, Member

HAROLD B. RAY, Member

GEORGE E. APOSTOLAKIS, Member

CONSULTANT TO THE SUBCOMMITTEE:

WILLIAM J. HINZE

ALSO PRESENT:

JAMES DAVIS, Southern Company
DON MOORE, Southern Company
CHRISTIAN ARAGUAS, NRC
HOSUNG AHN, NRC
CHARLES KINCAID, NRC
SARAH GONZALEZ, NRC
LAUREL BAUER, NRC
JAMES GEORGE, NRC
BRUCE MUSICO, NRC
BRET TEGELER, NRC
JOHN MA, NRC
CARL CONSTANTINO, NRC
ALAN SHROPSHIRE, NRC
CHUCK PIERCE, Southern Company
ANGELOS FINDIKAKIS, Bechtel
TED AMUNDSON, EP Consulting
CLIFF MUNSON, NRC
JOHN PREBULA, Bechtel
BILL LaPAY, Westinghouse
BRAD HARVEY, NRC
GARY STIREWALT, NRC

ALSO PRESENT: (CONT.)

STEPHANIE COFFIN, NRC

WEIJUN WANG, NRC

REBECCA KARAS, NRC

NILESH CHOKSHI, NRC

BRIAN THOMAS, NRC

T-A-B-L-E O-F C-O-N-T-E-N-T-S

Introduction, Dr. D. Powers, ACRS 5
Southern Nuclear Operating Company Presentation,
SNC Rep...8
Overview of ESP Application.................11
Responses to Open Items.....................14
NRC Staff Presentations 115
Overview
Review of Open Item Responses
Development of Permit
Conditions, COL Items, and ITAAC
Lunch
NRC Staff Presentations (cont.)..................187
LWA Request Review
Development of ITAAC
Break
NRC Staff Presentations (cont.)..................251
NRC Staff's Conclusions
Subcommittee Discussion..........................255
Adjourn

P-R-O-C-E-E-D-I-N-G-S

8:29 a.m.

CHAIR POWERS: The meeting will come to order. This is a meeting of the Early Site Permits Subcommittee. I'm Dana Powers. I'm Chairman of the Subcommittee. ACRS members in attendance include. Jack Sieber, Sam Armijo, Bill Shack, Mario Bonaca, Otto Maynard, Harold Ray, George Apostolakis. In addition we have William Hinze serving as a consultant of the Committee.

Bill, you will behave just like a member of the Committee.

MR. HINZE: Badly?

CHAIR POWERS: Yes. Suspend your ordinary good humor and start acting like a misery dude like the rest of us.

The purpose of this meeting is to conclude, I hope, a review of the application for an early site permit submitted by the Southern Nuclear Operating Committee for the Vogtle site. They have a request for a Limited Work Authorization.

Staff has prepared an advance safety evaluation report with no open items. The Committee must review the application of the staff's SER to fulfill requirements of 10 CFR Part 52.23 and the ACRS report on these publications will be submitted to the Commission.

The Subcommittee will hear presentations by and hold discussions with representatives of the NRC staff, Southern Nuclear Operating Company and other interested persons regarding this matter. The Subcommittee will gather information, analyze relevant issues and facts, and formulate code positions and actions for deliberation by the full ACRS. We're in the information gathering mode here.

Rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in the federal register. We have received no written comments or requests for time to make oral statements for members of the public regarding today's meeting.

A transcript of the meeting is being kept and will be made available as stated in the Federal Register notice. We request that participants in this meeting use the microphones located throughout the meeting rooms in addressing the Subcommittee.

The participants should first identify themselves and speak with sufficient clarity and volume so they may be readily heard. Copies of the meeting agenda and handouts are available in the back of the meeting room.

We have reviewed -- extensively reviewed SER and application for this material and had relatively few items coming in today's meeting. We also have a Limited Work Authorization. I'm still trying to understand exactly what our statutory responsibilities are.

With respect to the Limited Work Authorization right now, I think we will treat it as though it was any other activity submitted by the staff of the ACRS and comment as appropriate on it. Our final position of that may be resolved by Dr. Shack in the full ACRS Committee.

Other than that, I think we're -- I have no other opening comments to make. Do any of the members have comments they would like to make to start this off? Seeing none, I'll turn to Christian and ask are you going to lead us off?

MR. ARAGUAS: We'll have Southern.

CHAIR POWERS: Start with Southern? Mr. Davis.

MR. PIERCE: I was just going to open up. My name is Chuck Pierce and I'm the licensing manager for the Southern Nuclear Vogtle 3 and 4 program. We do appreciate the opportunity to come here today and present our early site permit results for the ACRS. I hope we'll meet your needs today as we go through this presentation and this process.

I just wanted to spend a couple of minutes, literally 30 seconds just to reintroduce our schedule again to the members of the ACRS and just to say that, again, we are going to be talking about the Limited Work Authorization today.

We actually do intend to start work in accordance with the Limited Work Authorization late next year in about September/October 2009 time frame as the schedule shows. We will actually start excavation earlier in the year in the May/June time frame headed towards putting in the engineered backfill after we get the Limited Work Authorization.

CHAIR POWERS: For the members who didn't participate earlier, you might want to touch on the magnitude of this.

MR. PIERCE: I think part of our presentation does that but I'll mention it. This --

MR. DAVIS: We're going to get into a few of those details.

CHAIR POWERS: Okay. It is significant.

MR. PIERCE: It is a significant amount of backfill. It's going to take on the order of 12 months to actually put the backfill back in so it's a significant work effort in the context of getting the site ready for the first concrete.

From that point forward we are looking to 48 months of construction and then six months of start-up which would put us with a start-up in the April/May/June 2016 time frame. We are looking at Vogtle 3 which would be our first unit for this new design of AP1000 here in April 2016 at this point in time.

With that I'm going to turn it over to Jim Davis. He is our ESP project engineer, application project engineer, and he's managing the overall early site permit effort for us. I'll let him proceed with the presentation.

MR. DAVIS: Just basically we'll give kind of an overview of the ESP again. You've seen it once before with the draft. Then we're just going to kind of hit the hot points of the open items and information we've provided to resolve those issues.

Basically the ESP permit is made up of five parts with Part 2, the Safety Analysis Report and Part 5, the Emergency Plan, which basically is covered by the SER. We are going to go through some of our open items.

Basically since we met last time we had kind of expanded the information that was there that we presented last time to complete the LWA and the type of programs like FFD that are necessary to manage those activities, those site related activities. Basically Chapter is our introduction and general description of the site.

Chapter 2 deals with the site characteristics. Chapter 3 are some hazards analysis plus the LWA is contained in Chapter 3. Chapter 11 evaluates liquid and gaseous radioactive releases. 13 is emergency planning, security, FFD, programmatic type activities. Chapter 15 is the accident analyses and Chapter 17 is our QA program.

Basically our site is a 3,100 acre site near Augusta, Georgia. It's on a coastal plain in southeast Georgia across the river from the Savannah River Site in Barnwell, South Carolina. It's about 150 river miles from Savannah port and about 26 miles southeast of Augusta, Georgia. Just to kind of give you a bigger view of Augusta, Georgia, you can also see where it is in the state map, the location up in the right-hand side.

This is a picture of our layout for the new unit. Basically you can see the existing 1 and 2 units. New 3 and 4 will be to the west of the existing units. We have a new intake structure which is going in a little bit up river of the existing intake structure. We will be improving the barge facility for unloading of components. The switchyard will be north of the units and we'll have a substation.

The new construction facilities that we're putting in as part of preconstruction, construction lay-down areas, construction warehouses and parking as well as a batch plan will be on the further west of the proposed units.

MEMBER RAY: The new switchyard serves just the two new units or all four?

MR. DAVIS: That is correct. The new switchyard is. Here is the existing switchyard for the existing units and this will be for the new 3 and 4 units.

MEMBER RAY: It will be a separate switchyard?

MR. DAVIS: There actually will be connections between the two. It will operate as a big single switchyard even though they physically separated most of it but there will be connections between the two.

MR. DAVIS: Basically we had 40 open items, SER with open items, primary with four subjects and basically we are just going to hit the high points with those and some of the information that we provided. I'll call on different subject matter experts to present those areas.

The first one I'll do myself, No. 4. We have one open item in meteorology that dealt with a return period. Our numbers that we gave weren't on a 100-year return and NRC requested that we do it for a 100-year return period which we provided and resolved this issue.

Next I'm going to turn it over to Angelos and he's going to talk about briefly our hydrologic engineering open items.

MEMBER APOSTOLAKIS: This 100-year is used quite a lot. Is that simply tradition?

MR. DAVIS: That's the standard evaluation period.

MEMBER APOSTOLAKIS: Okay.

CHAIR POWERS: Especially with respect to meteorology it raises all the issues that we addressed once before on the fact that I don't think you can predict based on the previous 100 years. It certainly hasn't been proved to me that you can't. On the other hand, equally you can't prove you can't do it that way.

MEMBER APOSTOLAKIS: There have been instances where the 100-year block occurred twice in one week.

CHAIR POWERS: There's no reason it shouldn't happen.

MEMBER APOSTOLAKIS: In fact, I think with the Southern Company 35 years.

MR. DAVIS: All right. Angelos is our hydrologic engineer that worked on a lot of our hydrologic issues, specifically the hydrologic model. I'll turn it over to Angelos.

MR. FINDIKAKIS: Good morning. My name is Angelos Findikakis and hydrologist with Bechtel. I'm going to address the open items related to hydrology. There were four open items. In the first we were required to demonstrate the adequacy of water resources for safety related purposes and we did that. There were three open items related to groundwater and I'm going to focus the next five or 10 minutes talking about this issue.

Especially related to several open

question on groundwater model. We used the steady-state model to prepare our responses to the open items. The model we developed was a single-lay model for the water table aquifer. It was developed using site-specific data, specifically all the geotechnical data and groundwater data collected as part of the site calculation, the process and any other information that was available from regional sources. For example, groundwater research and support.

The model was developed using a fairly widely used American model, MODFLOW developed by USCS and specifically we used a interface, a Visual MODFLOW. We calculated the model using site-specific information first. We used data that was collected over a one-year period. The groundwater data didn't show any variability so we decided that it was adequate to develop a steady-state model and we calculated using the available data.

MEMBER APOSTOLAKIS: I have a question.

MR. FINDIKAKIS: Sure.

MEMBER APOSTOLAKIS: I'm trying to understand. The groundwater model tells us how groundwater moves and you said you calibrated it using one-year's worth of data.

MR. FINDIKAKIS: Right.

MEMBER APOSTOLAKIS: But we are dealing with a 100-year period here. Is one year's worth of data sufficient to calibrate the model? Shouldn't we be using a longer period?

MR. FINDIKAKIS: One year's worth of data was sufficient to calibrate the model for the existing conditions so basically to fine tune primarily the hydraulic properties and the combination of reachers and hydraulic properties that would reproduce the existing conditions.

Then once we had them all developed and we use the predictive modes to predict future conditions, then we did an extensive sensitivity analysis basically by varying different parameters within reasonable ranges to see what would happen if, for example, we have high reserves.

Also we accounted for any changes that will be introduced at the site due to the construction of the new units like, for example, the introduction of the backfill material, the changing in the distribution nature, the grading of the site, interaction of the paved areas and so forth. We did account for future conditions first and then we did account for the range of parameter values when we used the model in a predictive mode.

MR. DAVIS: We looked at more than just one year's worth of data when we evaluated the hydraulic conditions of the site. We had several years. In fact, I think we had a few years worth of PSP data that we used but we also have monitoring wells for Unit 1 and Unit 2 and even data from preconstruction from 1 and 2.

We looked at a broad range of what the hydraulic conditions are through drought conditions and through varying time periods for the Vogtle site so we looked at a lot of data. His model uses one year's worth of data just to set up the parameters and how the interaction between hydraulic conductivity and other issues with how the water acts on the site.

MEMBER APOSTOLAKIS: Has the 100-year flood ever occurred?

MR. DAVIS: I will have to -- I don't know if we've had a flood in the last 100 years. We have data for 100 years which shows the maximum flood.

MEMBER APOSTOLAKIS: No, no, no. It's not whether you had a flood in the last 100 years. Has the 100-year flood ever occurred? Have you ever had it?

MR. DAVIS: During our period of data that we looked at? Is that what you're asking?

MEMBER APOSTOLAKIS: Or that site for the last several decades. Is there any record? Is it a completely hypothetical flood or has it actually occurred?

MR. DAVIS: We have 100 years worth of data on the river and the flooding and the map, hydraulic conditions. We might not have 100 years worth of data on the groundwater for our site. We have a limited set of data on how to measure --

MEMBER APOSTOLAKIS: What data do you have on your site?

MR. DAVIS: The weather like the rain and floods and the amount of rainfall and the flooding.

MEMBER APOSTOLAKIS: Would one of them qualify as the 100-year flood? Is that how you define it in terms of --

MR. DAVIS: The 100-year flood is the maximum flood in the last 100 years and we do have a record of when that occurred, yes.

MEMBER APOSTOLAKIS: You have studied that?

MR. DAVIS: Yes.

MEMBER APOSTOLAKIS: It has occurred?

MR. DAVIS: Yes, it has occurred in the last 100 years. The maximum flood is the 100-year flood.

MEMBER APOSTOLAKIS: Okay.

MR. FINDIKAKIS: By the way, if I may add to the answer to your previous question, as Jim said, the day for the larger site that covered a period of several years, the one year -- in fact, a few more months than one year but the one-year record that they mentioned refers to the site of Units 3 and 4 where this data was collected as part of the specific program to characterize the site of the new units.

MEMBER APOSTOLAKIS: But that was not the dataset that was used exclusively?

MR. FINDIKAKIS: In a moment I'll show you a slide that shows the extent of the model. The model goes far beyond the site of the new unit. Of course, the focus of the calibration was the effort to observe the groundwater levels at the site of the new units.

MEMBER APOSTOLAKIS: Thank you.

MR. HINZE: There is considerable heterogeneity in the hydrologic properties, especially the surface material. What kind of detail vertically and horizontally did you treat these and did you have a uniform detail over the entire area?

MR. FINDIKAKIS: We considered -- we had primarily characterization of the water table aquifer.

We identified two units, the balanced sands and the Utley limestone. Then with the available data we considered the delineation of those two units. They are not very easily identified and we don't have like a very large zone where one of these materials is more predominant than the other.

There is, as you said, basically considerable heterogeneity. The longer we considered delineations, different interpretations of the data as well basically the hydrologic properties, the vertical variability that we found was not significant so we considered that it was adequate to describe the water table as a single unit vertically but we did account for heterogeneity of different materials by burying the hydraulic properties horizontally. When we did that the variability sort of reflected the vertical average of different materials on the site.

MR. HINZE: Is the Utley limestone variable in thickness so that -- I see a nod yes. I would think that this would enter very strongly into that critical distribution.

MR. FINDIKAKIS: Absolutely.

MR. HINZE: Unless you might anticipate that it would change -- the vertical would change horizontally.

MR. FINDIKAKIS: Absolutely. Also in one of the -- I don't know if it's in this slide or the next slide but what we did is we consider again different summations, different delineations. We did use variable hydraulic conductivity for this unit. We had, for example, some zones where the hydraulic conductivity has a more pervasive presence and was much higher. This was part of the preservation process.

MR. DAVIS: We have the boring program which actually was widespread over the side which evaluated what was in the vertical points around the side as best you can. Then we had the monitoring wells which monitored the hydraulic contour of the site.

MR. HINZE: In the calibration work did you end up with any parameters that surprised you that were outside of the range of the measured parameters in order to get a check on your model? Do you understand my question? Are the parameters that you're putting in to make this work are they reasonable in the sense of what you have measured?

MR. FINDIKAKIS: Basically the principle that we follow is that we started with the distribution of the hydraulic properties that sort of reflected the available data and then we moved in trying to see if we could simplify it because obviously you can have it very complex and then you can get a better model.

The basic principle that we followed was that maybe a simpler model but reproduce the site conditions equally well as a more complex model is preferable. Basically we went for the simplest possible summation of --

MR. HINZE: I guess my question is did that simple lead you to parameters that were not within the bounds of your measurements?

MR. FINDIKAKIS: The answer is yes. We were in the bounds of the measurements absolutely.

MR. HINZE: Thank you.

MR. FINDIKAKIS: I think more or less we covered the rest of what is in this slide but I wanted to say again to emphasize that in this process we consider different alternatives, plausible conceptual models. This primarily consisted of how we define the zones that had all the properties of these materials.

MEMBER APOSTOLAKIS: So you don't know what happened when you considered alternative models?

MR. FINDIKAKIS: What happened is that we used these alternative models to make predictions because the primary purpose of the model was to define the pathways of potential accidental --

MEMBER APOSTOLAKIS: Were the results of the alternative models different significantly?

MR. FINDIKAKIS: The difference was, of course, in the level of the water table but in terms of the direction of pathways there wasn't a significant difference. I'll show you some -- I have two slides with results in a moment that I'll explain at this point. Very briefly, I would like to point out that this is the area that we covered with the model.

Here is the site of Units 3 and 4 here and Units 1 and 2. Here is the Savannah River. We did take the boundaries of the model at quite some distance from the units. Basically we went about a mile to the south. The reason for the model is that we tried to find natural boundaries that were defined in the model domain.

Primarily we used in the model two types of boundaries. The yellow line here defines the outcrop of the Blue Bluff Marl which is basically the edge of the water table aquifer. We used this as a boundary where the groundwater discharges to the surface. The red line here follows the surface water divide and we made the assumption that the groundwater divide coincides with the surface water divide. Basically the red line represents a no-flow boundary. This is the extent of the model domain.

I should say that besides the geotechnical and hydrogeological data that we used we did use information on the surface conditions. Basically we defined the distribution of groundwater research. We did account for the presence of buildings, of paved surfaces, and we did account for wooded versus open areas as well as for the slope of the ground flat areas where we had higher ground as opposed to areas with slope.

MR. HINZE: Is there any place where the Savannah River is influent?

MR. FINDIKAKIS: No, because the water table aquifer, the aquifer is about the level of the river. Basically the water table aquifer discharges at the higher level so there is no known interaction.

You can move to the next slide. This is a slide that sort of illustrates the calibration process. We had here the points with the yellow rectangles next to them which are all observation wells where we had data. Basically what this slide shows is the residual, that is the difference between the computed value and the observed value at this point. Our objective of the calibration was to minimize the difference.

Right here we have a plot where we have the observed groundwater levels virtually computed. Ideally if everything matches perfectly all the points should fall on the 45 degree line. As you can see they call quite close to those lines. Of course, this was the product of many iterations in the different conceptual models. This example basically is from the case that sort of represents our best match with the data.

Here is an example of the use of the model in a predictive mode. What we did is we predicted the water table conditions in the future after we accounted for the changes that have been produced at the site for the construction of Units 3 and 4. Here to illustrate the potential pathways we enlist a number of particles along the periphery of the circle that encompasses the power block of the two new units.

As you can see in this example all the pathways basically are directed to the north and up in Mallard Pond. As I said, we tried different conceptual models and we basically used all these models in a predictive mode. The result was in all the cases quite similar to that. There were, of course, small changes in the direction of the pathways but in terms of the general direction and the endpoint which was Mallard Pond there was no difference in the predictions.

However, because we had questions by the NRC staff regarding the possibility of other potential pathways we used the model to see what it would take to force the model to produce pathways in other directions. In the next slide we have an example.

As you can see here this is an illustration, for example, of a case where we do have three pathways originated from the power block directed to the west and to the south. The point I want to make is in order to produce this we had to make some quite extreme assumptions in terms of the hydraulic properties that we should have.

For example, in this particular case we had to assume that the entire area to the south of Units 1 and 2 and Units 3 and 4 this area shown here in gray, that this entire area has hydraulic conductivity that is close to an order of magnitude higher than a lot of these in other parts.

Again, this was outside the range so that is how we conclude that even though it is possible with a model to produce pathways ending up at the other receptors other than Mallard Pond this was not plausible because the assumptions that had to be made to produce the results were unrealistic. This is basically what we did in the model.

CHAIR POWERS: What I think I'm still not very clear about is to produce a model you calibrated against your normal observation. Then you dig a whole, fill in a lot of it and put a very heavy object there. How does that change things in your model? How do you conceptualize those changes?

MR. FINDIKAKIS: For this purpose we basically replaced and luckily we delineated the extent of the backfill and we replaced the materials in the model with backfill material. For the properties of the backfill we used similar values to what we had from the backfill for Units 1 and 2 because we believe the materials that would be used for 3 and 4 will be similar to what was used before. This was one way to accomplish this.

The other, of course, we accounted for the change grade and size. We accounted for the presence of buildings and paved areas. Basically when you introduce changes about hydraulic properties of the aquifer luckily and in the distribution of groundwater recharge.

CHAIR POWERS: Now, suppose that your material to the south indeed has hydraulic conductivity of 200 feet per day. I don't know what that is exactly. What would you do?

MR. FINDIKAKIS: I didn't understand the question.

CHAIR POWERS: What is the impact if that assumption, however implausible it is is true, what impact does that cause?

MR. FINDIKAKIS: I think we need to pursue this further because, first of all, as you can see here, this is a longer pathway but we didn't pursue the analysis of nuclear transfer along these pathways because, again, we described them as implausible.

I should say here the result that you see in this particular case shows high conductivity over an area over part of which we do have data and we know like, for example, like in the area of the cooling towers and we know that the hydraulic conductivity is close to more than an order of magnitude lower. It's close to two orders of magnitude lower than what we had to assume in order to produce this. That is why we didn't pursue this further.

MR. DAVIS: And you asked so what. I

mean, the paths are longer than the path we assumed. The path we assumed at Mallard Pond is a fairly short pathway to the Savannah River. If for some reason it went to the south, which we didn't evaluate it, but the path is actually much longer if it goes in a different direction.

MR. FINDIKAKIS: I guess if this were a credible pathway one would have to analyze the transfer as they come up with an estimated concentration for these receptors. Most likely the concentrations would have been lower than what we have done by analyzing the pathway at Mallard Pond.

MR. HINZE: Can I assume that the affect of the construction at 3 and 4 will not affect the infiltration significantly to impact this model?

MR. FINDIKAKIS: The question is will it affect the infiltration?

MR. HINZE: Yes.

MR. FINDIKAKIS: That obviously does not change the general direction of groundwater. One of the key questions that we looked into is -- maybe we can go to the previous slide -- was the question as to where is the groundwater divide because if you look here at these colors, here is sort of like the top of a water table mountain, I guess.

If you draw a line here and you release this to the north of this line, go to the north and then it releases to the south of this line it would go to the south. We spend a lot of time trying to figure out how this ground will divide as you change the parameters. It did shift but it doesn't shift enough to alter the pathways originating from the power block area.

MR. HINZE: How would that change?

MR. FINDIKAKIS: For example, this boundary may move a little bit here to the south. It was hard to make it move too far to the north. I mean, it might have been a little bit further to the north. It was easier to get it to most of the south by changing the assumptions regarding the distribution of groundwater recharge.

In all the combinations, all the steps that we went through we were not able to produce a credible combination of parameters that basically will push this groundwater divide further north enough to make the release of particles or pathways originating from the Units 3 and 4 going to the south.

MR. HINZE: That included the effective from the switchyard, the 3 and 4 as well?

MR. FINDIKAKIS: Yeah. We did that for

the balance of the switchyard and it did account for the fact that we have ground material there.

MR. HINZE: Thank you.

MR. DAVIS: Anymore question on hydrology? If not, we'll get Don Moore up to summarize our geology and seismic issues.

MR. MOORE: Good morning. I am Don Moore, Southern Nuclear. I'm a civil structural engineer. My area of specialty is seismic structural dynamics. My name tag says Don Moore but if I say something wrong or cannot answer a question, for the record I'm Dan Moore.

I would like to start off here. We have 22 open items in Section 2.5, geology, seismology and technical issues. This is the largest number of open items. This area is a multi-discipline area and it's fairly complex. I'm going to briefly go through these. Jim told me I had five to 10 minutes. That would give me about 15 seconds or 30 seconds for open items so what I'm going to do --

CHAIR POWERS: Why don't you take a little longer? Believe it or not Jim doesn't control the agenda, I do.

MR. MOORE: What I want to do is spend a little time. We've already presented this before but just to get everybody on the same page we thought we would give a couple cross sections of the site showing the soil/rock profile. What we have here is Unit 3 and 4.

I'm going to start at the surface. We have about 90 feet of upper sand. Right below that we have a Blue Bluff Marl which is about 70 feet. It's basically a hard clay. We have 900 feet of coastal plain sediments, lower sands, and then we hit rock and have triassic basin rock and then crystalline rock. We have a noncapable bin branch fault that divides the two rocks.

What we have here is that the upper sands are not suitable to support a nuclear power plant potential for soil liquefaction. The shear wave velocity is erratic so we are going to do an extensive amount of excavation in putting in engineered control backfill. This is similar to what was done on Vogtle Unit 1 and 2.

These units are about 800 feet apart and then Vogtle Unit 2 is about 1,500 or so feet to the right. We are basically doing this similar type of construction site preparation which I think some of the same things that are in the LWA. We are coming up with the rock hazard, our uniform hazard response structure for the rock based on an updated EPRI-SOG. Then we will take that motion and come up with a hazard at the ground surface here and at the foundation horizon.

Also what is covered in 2.5 is, of course, all the properties relating to these materials and potential liquefaction for the backfill and the Blue Bluff Marl and also bearing capacities of these materials.

MEMBER SIEBER: What will the proposition of the backfill be?

MR. MOORE: Basically sand. If we have a gradation requirement it's basically a sand -- Jim, do you want to --

MR. DAVIS: The backfill --

CHAIR POWERS: Come to a microphone and identify yourself. Do all the good stuff here.

MR. DAVIS: Yes. I'm Jim Davis from Bechtel. The backfill is basically a silty sand with a maximum fine content of 25 percent and typically near 15 percent.

MEMBER SIEBER: So it's properties are such that it will be subject to liquefication the same as -- it may be not to the same --

MR. DAVIS: No, it will be compacted to 95 percent modified proctor. It's pretty dense to liquify.

MEMBER SIEBER: How deep is this?

MR. DAVIS: There's 50 feet of it below the nuclear island and 40 feet above going back up to the ground.

MEMBER SIEBER: How thick is the marl layer?

MR. MOORE: It's about 60 or 70 feet. It varies. That's competent material, the backfill. Jim Davis is the soil engineer at Bechtel. That why I wanted him to answer this question. A similar type of backfill was used for 1 and 2.

MEMBER SIEBER: Okay.

MR. PIERCE: Don, just quickly just to answer one of the earlier questions, Dr. Powers' question, why don't you talk a little bit about the amount of backfill being moved.

MR. MOORE: This is an extensive amount of backfill. We are excavating down, of course, 90 feet but we are going to totally excavate for each unit not only for the nuclear island, which is a safety related structure, but for all the adjacent structures. I think the total amount of excavation is around 3.6

million cubic yards.

Then I think when you consider the roads going in to the pits it will be around 3.9 million cubic yards. These is an extensive amount of excavation and we have procedures in place for the backfill control, backfill specifications. Jim pointed out some of that. We have a gradation curve and the limitations on the percent fines. All material has to be placed at a minimum 95 percent modified proctor so it's very, very sense material.

MEMBER ARMIJO: It will go all the way down to that Blue Bluff Marl and that will be your transition.

MR. MOORE: Right.

MR. HINZE: Is the Utley limestone contiguous across the footprint there?

MR. MOORE: We have some limestone on top of the Blue Bluff Marl that will be removed.

MR. DAVIS: It is not necessarily contiguous.

MR. HINZE: Do you know what the reason for it being discontiguous? Has it been solutioned out in those areas?

MR. MOORE: I think so, yes. That was one of the problems we had with the upper sands because we have some collapse features that are associated with dissolution of the material.

MR. HINZE: And you will go down and remove all of the marl. That will be how far out from the nuclear island?

MR. MOORE: It will be a minimum of -- why don't we go to the next slide. What we have here this is a blow-up or enlargement. This is a structure that represents the nuclear island. It is embedded 40 feet into the backfill. The backfill is around 90 feet down to the Blue Bluff Marl.

We will get down to a competent Blue Bluff Marl material and then build up. The extent of the backfill is such that at the minimum we will look at 45 degrees. We are looking at at least 50 feet away from the nuclear island. At the base will be the point where we may start sloping up. In most cases it's further than that but we make sure that it's not just going directly below it but we look at the zone of influence. That's done for all buildings.

MR. HINZE: I guess one of the concerns here is that certain portions of the Utley might be fairly high permeability and, as a result, you don't want that high permeability leading to movement into the base of the fill. You really want to get rid of that Utley as a potential high-permeability zone.

MR. MOORE: Bill, that's the reason we went that far away from the

MR. HINZE: That was my concern.

MR. MOORE: Sure. I understand. We wanted to make sure that we excavate far enough away where that material was all competent material.

MEMBER SIEBER: Where are you going to put the excavated material?

MR. MOORE: Some of the material may be used actually for backfill. Part of it may be. The rest of it we are going to bring in. We have ball pits in the area to bring in the backfill. I'm not sure exactly where we are going to put --

MR. DAVIS: Some of the spoils that we take out of the hole are going to be filling in some of the ravines and low areas where the construction laydown is so we are going to try and use it as judiciously as we can.

MEMBER SIEBER: It's not going to be in a position where it would influence the structure itself. It's far enough away and level enough that won't occur.

MR. HINZE: Don, if I might once again.

MR. MOORE: Sure.

MR. HINZE: In reading the document how are you going to achieve homogeneity of the physical properties of the fill material from the base up? Is that going to be checked after a certain amount of layers are put in?

MR. MOORE: The backfill material has certain specs and that material would meet that spec so the homogeneity of the material would be controlled by the specs that we're using. We feel that the material with the gradation we have and the limits on the percent fines and the definition of this class of materials would provide that homogeneity.

MR. HINZE: How are you going to verify that because is that verification of these properties and the homogeneity in the vertical sense going to be by surface wave studies or is this going to provide --

MR. MOORE: During the backfill there will be controls in place.

MR. DAVIS: We are going to have a soils lab on site. As you execute the material they will be testing the material and segregating it in a borrow area, a stockpile, and then a spoils area. The sand coming out of the hole a lot of it is good material and we are going to test it as we remove it and stockpile the good stuck and spoil the bad stuff.

MR. HINZE: I'll just try once more. How are you going to check if you compacted the material enough? You are going to put in a layer? You are going to sheep split it or you going to roll it?

MR. DAVIS: Laboratory roll. It won't be sheep split. We'll have testing as it goes in. We've got criteria --

MR. HINZE: How much layer are you doing?

MR. DAVIS: We have an ITAAC which we'll talk about a little bit later which talks about the testing requirements that we developed to assure that our site design --

MR. PIERCE: Jim, you might also want to mention the test pads that we developed.

MR. MOORE: There was a -- we can get into that a bit later but we did go to ball pit areas and get material that we said was suitable for backfill and we did RCTS of that and then we actually ended up doing a test fill where we put in 20 feet of backfill material and did SASW testing and seismic testing. I actually did some RCTS of that material as well. As Jim said, we have pipe controls in that backfill and we have the density testing requirements in our SAR.

MR. HINZE: We are all agreed that it's very important that the properties underneath the site are verified. We have ITAACs that will address that. We have an independent test in the beginning, independent testing of the fill at this place and there are certain requirements on when you do the testing. You do one per lift and so forth.

MEMBER ARMIJO: Is this level of backfill unprecedented or is it fairly common?

MR. MOORE: What we are doing here is what we do on Unit 1 and 2.

MEMBER ARMIJO: Is it the same?

MR. MOORE: Actually we could change this and just put 1 and 2 there so it's basically the same thing. We definitely have a history of that and it's feasible.

MEMBER MAYNARD: I think you have a history of it here. I don't think this is something that has been done for a lot of other power plants.

MR. MOORE: Yes, that's true.

CHAIR POWERS: The difference is 1 and 2 do not have a large tank of water sitting in a large leveron.

MR. MOORE: That's true.

CHAIR POWERS: I presume we're going to get into that.

MR. DAVIS: I don't know if we're getting into this in this particular presentation but we did the seismic analysis based on the engineered field that we put in here to determine that it was acceptable at those key six points.

MR. MOORE: We did a site-specific seismic analysis. Westinghouse did a site-specific seismic analysis of the nuclear island with our soil properties and with our ground motion parameters so we have the responses of the building and we have the bearing loads and we have a full site-specific evaluation of the stability of the nuclear island on our site.

Just quickly what we did one of the things, like I said, we came up with a ground motion, what we call a ground motion response vector which is similar to what we used to call the SSE. It is at the surface of the top of the backfill. The backfill is very extensive.

This was all based on coming up with soil uniform hazard spectra at the surface. We also came up with that we call foundation input response spectra at the foundation depth which is developed in a consistent manner as was done for the GMRS. This was used as information for the SSI soil structure interaction analysis. Moving on --

MEMBER SHACK: Just a question. You said you did the site-specific analysis. Is that because you didn't fit the nuclear envelope that was assumed in the design certification and you just wanted a more explicit definition?

MR. MOORE: There was two reasons. The main reason we don't have it shown here but our GMRS and the FIRS exceeded the certified design ground motion, CSDRS. Secondly, our profile is different than the generic soil profiles, significantly different than the generic soil profiles so a site-specific analysis was necessary.

Moving on, I won't spend any time on this but this is just for your information. I think we presented this last time, our organization for doing the ground motion studies and the hazard analysis, site-specific hazard analysis. We also had a technical advisory group identified here.

MEMBER APOSTOLAKIS: Data has a subcommittee review detailed seismic analysis?

CHAIR POWERS: We have not. We're going to have to do that because, I mean, the problem -- fundamentally the issue here the first early site permit that does not have time parameter envelope at a specific plant. The inspector they have here does not agree with that that we've certified so we have to look at the details on that.

MR. MOORE: Next slide. As Jim originally pointed out, we had 22 open items on 2.5. What I have done for your benefit here is to separate these items and somewhat identify them under certain categories. Under 2.5-2 is a section that covers vibratory ground motion aspects. We have five here.

There are some additional ones but these five fall under seismic source characterization. We started with the EPRI-SOG PSHA. That was developed in 1989 and we were required to do an update based on new information or new data and to evaluate the significance of that on our site hazard. The NRC had some open items in relationship to their concern about Dames & Moore seismic characterization.

Also there was a TIP study that was done in the late '90s and published, I think, in early 2000. It's a recent PSHA and they wanted us to do it. They had questions about how we incorporated that and why we didn't use it in a certain fashion. They had issues and concerns with the east Tennessee seismic zone, some recent assessments. These basically had to do with Mmax and Mmax distribution.

One of the most important things that we did for Vogtle is the hazard is significantly controlled by the Charleston seismic source. There is new paleoliquefaction information research done in studies. This information had to be incorporated so a total update of a Charleston seismic source was done. It was done on a SSHAC Level 2 process.

MEMBER APOSTOLAKIS: What does that mean?

MR. MOORE: SSHAC Level is a study that was done in the '90s looking at PSHA and different levels at which you would do an evaluation. This was done at a Level 2.

MEMBER APOSTOLAKIS: Why not 4?

MR. MOORE: Level 4 is a very complex process that requires workshops, requires independent teams.

MEMBER APOSTOLAKIS: Why weren't they important here?

MR. MOORE: I think Level 2 was thought to be adequately sufficiently for this study.

MEMBER APOSTOLAKIS: Again, do you remember what Level 2 is? I know 3 and 4.

MR. MOORE: Level is where we have a team which basically William Lettis and Associates they went and gather information from experts on this particular issue. Then they took that information in, documented the information. They asked questions and documented the questions and the response and took that information and they independently developed an update. Then we had this update reviewed by a separate group of experts and that's how it was --

MEMBER APOSTOLAKIS: Was this Risk Engineering?

MR. MOORE: No. This was done by William Lettis and Associates. I think Robbie McGuire was involved in part of that. The major activity was done by William Lettis and Associates. These questions that were asked was the NRC needed to have more information about the documentation, what kind of documentation we had. They wanted to see that.

They also wanted to see we had -- as I said, we had a technical advisory group who did not use the total group to review this Level 2 because Carl Stepp and Dr. Chapman to do the review because of their expertise. We provided that information to the NRC. These are what the open items are.

This is the five items related to seismic source characterization. Here again we needed to update the EPRI-SOG and the NRC plus looking at how we handled these particular issues.

MEMBER APOSTOLAKIS: What is UCSS?

MR. MOORE: Pardon?

MEMBER APOSTOLAKIS: UCSS?

MR. MOORE: Update Charleston Seismic Source.

MEMBER APOSTOLAKIS: That's a standard acronym?

MR. MOORE: No, this was developed just for this but it is felt to be a definitive study and it is being used by other applicants after our submittal.

MR. HINZE: Don, can I interject here for a moment regarding the SSHAC Level 2 study? As we are well aware one of the most important things that has come down the pike since the '86 SOG report are the GPS studies of strain in the central and eastern United States. I note that Pradeep Talwani from the University of South Carolina has with NRC money and USGS money done some GPS work and is in the process of publishing that work.

There are a lot of problems in doing GPS work in the coastal plain. I think we are all well aware of that, too. I was quite taken back by the fact that there was not even a mention of these data that have been collected under the egest of the NRC and the USGS in the report. Is there a reason why that is true?

I know Pradeep was -- I think Pradeep was one of the experts that was canvassed by William Lettis Associates. Knowing Pradeep it would be very unusual that he wouldn't bring up his work on the GPS. Why haven't we seen this data? Why aren't we at least acknowledging the existence of this data and refuting it. If it needs to be refuted, so be it, but it seems to me this is data -- these are data that need to be considered. Is there a response to that?

MR. MOORE: Bill, I'm not really able to answer that question. We probably need to have somebody like Scott Lindval or whatever to answer that question. They are the ones that pulled all the information together. This work was done in the 2004, 2005, 2006 time frame. My understanding is that all relevant information was looked at. I'm not sure if you saw the 2.5.

MR. HINZE: I sure tried to.

MR. MOORE: Okay. All right. That was a documentation of what was looked at.

MR. HINZE: It's not in there.

MR. MOORE: If it's not in there, then --

MR. HINZE: The 2004/2006 last measurements made by Talwani were like 2001, I believe, that he's referred to. I think there has to be some acknowledgement of these data to make this -- to clear the air on the use or abuse of GPS data and defining the updated Charleston because this is so very important to the Vogtle site.

MR. MOORE: Definitely the Charleston seismic source is the controlling factor for the Vogtle site. Bill, I do not have a specific answer for that for you.

Our next four open items are still related to 2.5-2 ground motion. As I mentioned, we have the PSAK but we have to bring the motion of the hazard up to a soil uniform hazard response spectra so the NRC has some additional questions on methodology for calculating the soil uniform hazard response spectra and methods that we used.

We have additional information on that. The adequacy of our equivalent linear approach for site amplification. This is based on relating to soil strain. The soil properties are nonlinear in their function of the strains on soil. Then we provided the NRC some additional hazard information so they can perform an independent verification of the site-specific GMRS.

There was an open item for additional

information on how we calculated the vertical GMRS which is based on the development of a ratio V over H. We multiplied that ratio times the horizontal to get a vertical GMRS.

MEMBER APOSTOLAKIS: But you used the American Society of Civil Engineers standard during the spectrum?

MR. MOORE: No. The Spectrum are based on -- I'm sorry. The ASCE 4305 performance based approach is what was used. I misunderstood.

MEMBER APOSTOLAKIS: That requires the use of some fragility curve.

MR. MOORE: Sorry. What?

MEMBER APOSTOLAKIS: There is a fragility curve of some structure, an integral part of this.

MR. MOORE: Correct.

MEMBER APOSTOLAKIS: I'm wondering which fragility was that?

MR. MOORE: It is based on a performance of --

MEMBER APOSTOLAKIS: Ten to the minus five.

MR. MOORE: Right.

MEMBER APOSTOLAKIS: But inside there in the integral there is --

MR. MOORE: If you follow the basic design codes -- basically if you follow the basic design codes for design, that is considered as part of the -- that is the fragility part and if you follow that and meet the code requirements this is a demand and when you put the two together you are shooting for a performance goal.

MEMBER APOSTOLAKIS: That's my question.

MR. MOORE: The fragility is based on meeting code requirements, design to code requirements.

MEMBER APOSTOLAKIS: For which component? Which structure?

MR. MOORE: It would be for like following ASME for piping. We have that specified in ASC 4305. For example, reinforced concrete is ACI 349.

MEMBER APOSTOLAKIS: You use all of them? Do you use the worse one?

MR. MOORE: No, it depends on -- if you are designing a reinforced concrete structure you can use the ACF code and the C49. If you're doing design analysis you would -- for analysis you would meet the NRC's Reg Guides. We also have ASCE 4's guidance.

MEMBER APOSTOLAKIS: There is only one ground motion response spectrum. Right>

MR. MOORE: Correct.

MEMBER APOSTOLAKIS: There's only one.

MR. MOORE: That's correct.

MEMBER APOSTOLAKIS: If I follow that standard it tells me that I have to use the fragility curve, presumably one fragility curve because I'm going to get only one response spectrum. It's not clear to me which fragility curve I'm going to use. I have no idea. It's not explained in the standard. It's not explained anywhere. I hear things like, "No, this is a plant-level fragility curve." I've heard the words but I haven't seen any definition of it anywhere.

MR. MOORE: A study was done for the NRC by Bob Kennedy and Robbie McGuire. It was presented showing basically meeting -- the goal is that we would have what we call a HTHCLF 1.67 times ASSE. I know that --

MEMBER APOSTOLAKIS: But the HTHCLF for different fragility curves is different. I read the evaluation and, again -- yes, sir.

MR. MUNSON: My name is Cliff Munson. I'm the branch chief for GS Sciences Engineering, Geotechnical Engineering Branch. If you will recall, we deliberated this -- not to dismiss your question but we deliberated this extensively for the Clinton ESP where the approach was introduced. We went through that extensively.

The performance-based approach we calculate a ground motion value assuming that probability, that 1 times 10 to the minus 5 value. If we actually back calculate a ground motion value from the fragility curve we assume a beta value, the standard deviation. We back calculate the ground motion value for each spectral frequency so we do it for one Hertz, 2.5, 5, 10.

Each spectral frequency will have a different fragility curve. We back calculate the ground motion assuming that 1 times 10 to the minus 5, that we have to meet that 1 times 10 to the minus 5. We assume a margin between the SSC and the onset of inelastic deformation. We assume that margin is just for one.

MEMBER APOSTOLAKIS: I understand the process but when you say the fragility curve whose fragility curve?

MR. MUNSON: It's a logarithmic fragility curve with two perimeters. It's a --

MEMBER APOSTOLAKIS: What are the codes?

MR. MUNSON: There is only one code.

MEMBER APOSTOLAKIS: But what? For which component? Which spectrum?

MR. MUNSON: We are assuming that the whole nuclear power plant in aggregate can be approximated with one fragility curve.

MEMBER APOSTOLAKIS: You work out some place and there is a fragility curve?

MR. MUNSON: Yes. That's covered in ASCE 4305, I believe.

MR. MOORE: There was a study that looked at assuming --

MEMBER APOSTOLAKIS: Derek, can you send me that?

MR. WIDMAYER: Okay.

MEMBER APOSTOLAKIS: All I have is a table of contents.

MR. MUNSON: We have copies of it.

MEMBER APOSTOLAKIS: So there is a plant-level fragility curve.

MR. MUNSON: Um-hum. Right.

MEMBER APOSTOLAKIS: That is derived from the fragility curve --

MR. MUNSON: So we are assuming single failure. Right? Just because we're assuming one fragility curve we are assuming that the failure of one will end up with seismic core damage, you know. That's the assumption with that. If you're further interested we can bring up the Clinton material that we had before.

MEMBER APOSTOLAKIS: I think the Chairman will have to make a decision at some point whether we want to review the whole approach. It was reviewed under Clinton's application but maybe the whole committee at some point should get involved. It was involved in the Clinton but reviewing the seismic evaluation, I think, is something that would be worthwhile.

MR. MUNSON: It also was adopted in our new regulatory guide 1.208.

MEMBER RAY: Since the staff has the floor here, let me interject a question that may be related. The SER makes this observation about the exceedance of the AP1000 certified design. Then it makes a statement that I would like you to comment on. It says, "The staff did not evaluate in-structure response at nuclear island because it was not needed for the LWA request. I don't know if that is related to George is asking or not because it's talking about what goes on in the structure. What does that mean or is that saying it will be done as part of the COLA or what?

MR. MUNSON: This is the wrong staff person for that.

MEMBER RAY: Okay. Sorry.

MR. ARAGUAS: We can certainly answer that but I would request that we can hold off until the afternoon meeting where we will talk about the LWA and we'll go into detail.

MEMBER RAY: It seems related to the question that George asked.

MR. TEGELER: Good morning. My name is Bret Tegeler. I work in the Office of the NRO in the Structural Engineering Branch. The reason for the LWA that we did not evaluate the in-structure response was that the LWA -- the scope of the applicant's LWA involves sort of foundation preparation such as the concrete mudmat and the waterproof memory.

MEMBER RAY: I understand that. I'm only asking when does the in-structure response get dealt with because --

MR. TEGELER: At the seal-off stage. I'm sorry.

MEMBER RAY: So it's just not dealt with. The in-structure response isn't being addressed as part of this. That's the way I read it.

CHAIR POWERS: That is correct.

MEMBER SHACK: George is worried that the definition of the SSE which is dealt with here and then will be used in the COL to analyze the structure response.

MEMBER APOSTOLAKIS: In this performance-based approach what they call the risk integral which integrates also the response of the structure in defining the spectrum. They work backwards.

MEMBER RAY: You know, we're talking about single failures and so on here. It sounds to me like --

MEMBER APOSTOLAKIS: That's my question.

MEMBER RAY: You know, we are --

MEMBER SIEBER: Part of the certified design is a specification of what the seismic capabilities will be, even though specific components inside the structure like pipe hangers and so forth may not have been defined in detail. There is an acceptance criteria that says that when we're done all this piping and all these components will meet this minimum criteria. That's the basis for deciding whether the site is suitable.

MEMBER MAYNARD: I don't mind this being

dealt with at the COL stage. The thing we have to be careful of is that we don't end up with a certified design and a site permit that are -- it's a Catch-22 situation that we have something approved that doesn't really fit together at the COL stage.

MEMBER SIEBER: That's the issue today.

MEMBER RAY: That's the issue I was trying to raise, Jack. If that is the issue today, how are we dealing with it?

CHAIR POWERS: I looked at it a little bit. This is the issue, by the way. The other issue that we really have here and I have looked ahead. We are going to cover that as we go plowing forward. Right now we have a few open items that are being covered. Sooner or later we have to get to this because this is the one case where we have a specific design on a specific site. The two have to mesh somehow.

MEMBER RAY: Trust me. There are going to be a lot of them coming down the pike later because this is a normal thing to happen.

CHAIR POWERS: I don't think we've got a whole lot of early site permits coming down the pike.

MEMBER RAY: Well, I meant --

CHAIR POWERS: We have COLs coming down

the pike where things don't mesh very well.

MEMBER APOSTOLAKIS: One last question. Is the fact that you have two units there -- actually four, affecting anything?

MR. MOORE: I'm sorry?

MEMBER APOSTOLAKIS: This performance of 10 to the minus 5 is applied independently of how many units you have?

MR. MOORE: Correct.

MEMBER APOSTOLAKIS: But the earthquake would be shaking both?

MR. MOORE: Each unit is a separate -- the DCD relates to one unit. We are just going to be building two of them.

MEMBER APOSTOLAKIS: The earthquake acts as a major potential common cause failure.

MR. MOORE: Correct.

MEMBER APOSTOLAKIS: If I look at the risk integral again -- maybe we are getting into too much detail here but if I look at the risk integral it's developed for one reactor and I'm wondering if I have one next to it you said it's only 800 people.

MR. MOORE: Correct. Right.

MEMBER APOSTOLAKIS: Surely the earthquake is shaking both.

MR. MOORE: Correct.

MEMBER APOSTOLAKIS: So when I determine the spectrum of using the performance based approach, shouldn't the fragility -- now I will need a site-level fragility as opposed to the plant-level fragility? Why not?

MEMBER SHACK: Because the Reg Guide doesn't ask you to do that.

MEMBER APOSTOLAKIS: I'm sorry. That's a legal problem.

MR. MOORE: I think, as Cliff mentioned, the fragility on a design everything meets a certain design and the work that was done for the industry by Bob Kennedy and others we provided a report to the NRC on the performance based approach and the basis for that. We have seismic core damage frequency studies and basically these plants are designed for a certain level and they are supposed to have a minimal seismic margin and that --

MEMBER APOSTOLAKIS: Anyway, maybe it's for another meeting. This is getting too detailed.

CHAIR POWERS: At any rate, these people can't answer your question. They cannot answer your question.

MEMBER APOSTOLAKIS: I think so.

CHAIR POWERS: I think the question is probably not answerable even the rest of the day but it's a question that ought to be raised.

MEMBER APOSTOLAKIS: I assume at some point we discuss how to proceed with these things. How to proceed independently of this particular ESP. Is it still the best place to learn about this method, the Clinton application? I read it.

CHAIR POWERS: The Clinton application is extensive and there are some ancillary documents that were also used to understand things. The clearest exposition on what was done for Clinton is actually provided by our extinguished colleague Mr. Shack. He can consult with you extensively.

MEMBER APOSTOLAKIS: Do you agree on something?

CHAIR POWERS: He made an exposition.

MEMBER SHACK: I think I understand what they did. I tried to explain it in an e-mail but I apparently didn't succeed or I disagree.

MEMBER APOSTOLAKIS: We will have to deal with it in another meeting.

CHAIR POWERS: I am interested in the resolving these issues here.

MR. MOORE: Thank you. Here again this is just the development of the GMRS. There were four open items. The applicant provided additional information to the NRC that helped him address these issues.

Next slide. We have one open item on Section 2.5.3, surface faulting. This has to do with the upper sands, plus we are removing those upper sands. The issue is that there were some deformations in these upper sands and the NRC wanted additional description of these features which are deformations basically injection sand dikes.

Basically the data shows that these are based on the solution collapse of the soil causing the soil collapse and these sand dikes are formed and they are non-tectonic. That was the information that was provided to the NRC, additional information to assist them in evaluating that issue.

Now we go to 2.5.4. 2.5.4 is the stability of subsurface materials in foundation. It really basically relates to defining the soil property of the site, thee bearing capacity of the material that will be supporting the structure, and the potential for liquefaction.

Here we have summarized the numbers but basically what this is, we had a two-tiered site investigation. We had the ESP which was a limited site investigation because the site is -- the Unit 1 and 2 site is basically similar to unit 3 and 4 which is 1,500 feet away. We used a lot of the unit volume to material. We did do some site-specific testing but it was limited.

We had plans to immediately after the ESP to go into a COL site investigation which was much more extensive. In the original ESP we submitted the ESP soil investigation data. Then, as Jim has mentioned, in LWA we included or added and that requires for the NRC, of course, a more comprehensive surface information data while these RAI's are related to needing more site-specific surface data field information, field tests and lab tests.

What was done was that most of the COL work was finished around 2007 and what we did was we updated the ESP SAR Rev 4 which included substantially more site-specific information based on the COL investigation, site investigation. These were used to assist the NRC in their review of these open items and basically they needed more site-specific soil data.

The next one is just a small issue but basically, as I pointed out before, soil behavior properties are non-linear based on percent shear strain and there was a clarification about we have some plots in there that extended some of the degradation to the shear modulus and sampling ratio up to 3 percent. We corrected that mainly because, for one reason, our strain never exceeded 1 percent for our site response analyses. We also corrected or changed the figures to reflect that clarification to the NRC.

The next one is liquefaction potential. Here again we had more data from COL investigation, more information on the backfill. As I mentioned earlier we did a very extensive backfill test Phase 1 where we developed a test backfill and actually went in and measured the shear wave velocity and got properties that are consistent with the actual in-place placement of the backfill.

Also we got additional information on the Blue Bluff Marl. Based on those data and laboratory tests a liquefaction analysis was done showing that liquefaction potential is not an issue for this site. The last one, 22, is we need to calculate the bearing capacity of the material that supports the nuclear island, status and dynamic. We used the COL SSAR data that was assembled to assist in doing that. That was provided to the NRC.

Also we provided a settlement calculation or provided settlement estimations based on the soil properties that were developed in COL. We also showed that we provided our capacity, bearing capacity, to the demand showing a significant safety margin. These are the 22 items. Are there any other questions? Here again, this is only supposed to be a five to 10-minute presentation.

MR. DAVIS: Next we are going to cover our emergency planning and we are going to have Ted Amundson, our consultant, come in and present this information for us.

MR. AMUNDSON: Good morning. I'm Ted Amundson. I'm with EP Consulting. I've been working with Southern Nuclear for the last several years preparing the proposed emergency plan for Vogtle Units 3 and 4 which we plan to also roll in via the site plan encompassing all four units.

The SER with open items in the area of emergency planning contained 13 open items and I'll briefly discuss the resolution of those open items. There were five open items related to the ITAAC that we had proposed and had proposed for Units 3 and 4.

Just a quick characterization of those open items, there was one ITAAC open item related to

Unit 4 procedures. We had proposed that we provide procedures in an ITAAC. That would be our implementing procedure, emergency implementing procedures.

We had proposed that we would provide those along with Unit 3's ITAAC. The staff pointed out that there might be some differences in the procedures once we incorporated Unit 4 so we added a new ITAAC, a Unit 4 ITAAC, to include those procedures at that time also.

There was a couple of items related to corrections making sure we lined up with the appropriate guidance correctly. We made those corrections. We had also a couple of issues related to the detail of the acceptance criteria particularly in the emergency plan exercise that we will be conducting.

We made those changes. Also we clarified that we would also be running an exercise, a graded exercise, for both Units 3 and 4. That will be two separate exercises, albeit the exercise for Unit 4 will be limited in scope because many of the issues will be properly characterized during the Unit 3 ITAAC.

We also had three items related to details in the emergency plan. For example, at the time that we responded to RAIs we had not confirmed that a new school that's located in Berk County had been corporately characterized into the Berk County plan so we provided that information at the time of the open items and were able to close that item. That private school had been corporately documented and taken care of in the Berk County plant.

There were several issues related to clarification of the table B-1, the staffing plan table, emergency plan staffing plan table that we had proposed. We continue to work with the staff and they were able to close those items out during the open item resolution period.

MEMBER MAYNARD: I'm not sure where this question fits in with this part from the staff augmentation. There was a discussion about the 60 minutes versus 90 minutes.

MR. AMUNDSON: We had proposed to clarify that as a 75-minute augmentation time. That would be to clarify including the time it would take to notify the staff and then the time they would have to respond. After further discussions with the staff we basically went back to what we have in the existing Unit 1 and 2 which is the 60 minute response time.

That will probably be subject to further analysis at some time in the future but for now we are committing to the 60 minutes.

MEMBER RAY: Have you considered an emergency at more than one unit at the same time?

MR. AMUNDSON: That is always basically built into your emergency planning to some extent. For example, if you have a site-level emergency, high wind or so on, that impacts the whole site.

MEMBER RAY: Well, we were just talking about a seismic event, for example, more than one unit speaking of staffing here. Loss of on-site power, for example, that would affect all units. I'm just asking whether the emergency planning that you dealt with so excessively has looked at an emergency of more than one unit at the same time.

MR. AMUNDSON: Well, again, we are basing the plan as a site plan. For example, the staff augmentation, there is separate staff augmentation for Units 1 and 2 and Units 3 and 4. If you look at the staff augmentation we have enough staff to staff an accident at Units 1 and 2 at the same time that we have an accident at 3 and 4.

MEMBER RAY: In other words, talk about a new operating facility, I think, being --

MR. AMUNDSON: Technical support center?

MEMBER RAY: -- technical support center. It would surprise me that you had the capacity to deal with simultaneous emergencies at more than one unit that is centralized.

MR. AMUNDSON: Actually you do have that capability because you have the information pulling in from all the units into one central location. It is a large facility and has ample size and equipment to handle events of more than 1 unit at a time.

MEMBER MAYNARD: Are you utilizing the same people for Unit 1 and 2 issue as you are for 3 and 4 or do you have different people lined up?

MR. AMUNDSON: I don't think we've worked out all of the details on who is going to be on the duty teams but certainly you have to look at the training and qualification for all members of the duty team. There certainly will be different training and qualification requirements for Units 1 and 2 versus Units 3 and 4, for example, because the EAL structure is somewhat different, or will be somewhat different.

You will probably have sufficient duty teams when you are putting that all together. You will put duty teams together that will handle the emergency on either unit, or both units, both sets of units.

MEMBER MAYNARD: I believe I did see there were some ITAACs to cover this COL stage for the staffing and the requirements there.

MR. AMUNDSON: When you run your drill and exercise, or when you run drills and your exercises, one of the things you will verify is that you are able to meet your staffing requirements. That is correct.

Then to continue, there were also several questions, open items related to the evacuation time estimate study. For example, there was one issue related to how we were going to move people with special needs. We provided additional information for that particular question. There were some questions related to the populations that we might expect to see, key populations in a wildlife management area in the emergency planning zone.

We provided that information. We verified that the state and local organizations who had reviewed the ETE and determined its impact on their plans. We also verified that our dose protection software had been appropriate reviewed to see if there were any impacts on that software based on the results of the ETE study. Those items were all closed.

There is one open item related to EALs.

We have not yet as an industry completed all of the work on EALs for advanced light water reactors. As a result of that particular open item we ended up with several permit conditions. Basically there are three sets of two permit conditions related to EALs.

That is, there are three separate permit conditions. Each permit condition has 1 and 2 for both units, one for Unit 3 and one for Unit 4 so you end up with six permit conditions. I'll get into a little bit of the detail on that in the next one.

There was also one permit condition identified with the PSC location. We are proposing a common TSC for the site. The AP1000 DCD specifies the location of the TSC as being located inside the power block so we are carrying a permit condition to address that particular issue.

Go to the next slide. Breaking down the permit conditions. If you read the ASER there are actually seven permit conditions that the way the numbering scheme goes they begin with No. 2 through 8. EALs 2 and 3, permit conditions related to EALs 2 and 3 basically we had committed to preparing EALs in accordance with a proposed NEI guideline NEI 07-01, which is EALs for advanced light water reactors, passive advanced light water reactors. Once that is endorsed then we have a permit condition that says that we will be revising our EAL structure to meet the latest version of NEI or the endorsed version of NEI 07-01.

Permit conditions 4 and 5 address the issue that there are certain design details related to the AP1000 that at this time are not yet fully complete. For example, the rad monitor vendor has not been selected. Until we select the rad monitor vendor we won't have the response curve that we can use in our calculations to determine the set points for various rad monitors that we then would use as an EAL level for responding to particular emergencies.

Further conditions 6 and 7 are related to also the notion that there may be certain site-specific issues that will not necessarily be resolved, or cannot be resolved at this point anyway, and we will have to resolve those issues at a later date.

The point is that we will be converting these permit conditions to COL license conditions as part of the COL process. We are awaiting RAIs from the staff and once those RAIs come in we will then begin the process of revising those COL applications to include the appropriate permit license conditions.

The permit condition related to the TSC

after discussions with the staff we believe we will be able to resolve during the COL phase of the application and that permit condition we expect will be resolved and will not require a license condition going forward.

That's a quick summary of where we are with emergency preparedness. Any questions?

MR. DAVIS: Thank you. With that I'll kind of wrap it up and talk a little bit about LWA and pre-construction activities, just how they were included in the application and some of the scope and schedule.

Basically our initial submittal of the ESP application did include an LWA request under the old rule and basically those were in LWA 1 which covers the things typically considered pre-construction under the new rule. A lot of the site preparation activities we had asked for under the old rule.

Through the process at Rev 2 of the application we actually added an LWA-2 which is for safety related work. We included that in our application along with additional information to support that analysis but there was no unresolved unreviewed safety issue to allow us to proceed forward with that. Then after the rule came out, the revised

LWA rule, we updated the ESP application in our Rev 3 to conform to the new rule so we have an LWA for the safety related activities.

Basically this is just like a high-level schedule that describes some of the preconstruction activities and LWA activities. We have three key milestones kind of planned around. No. 1 for us is the PSC includes construction and allows us to go forward and pay for it. That's a real key milestone for us.

The second milestone is the ESP approval. Of course, we need ESP approval on the LWA to proceed forward with certain activities that we've requested. It's all focused towards the final milestone where we achieve our COL permit, our license which allows us to pour concrete.

If you look at it, we actually have started some preconstruction activities already, some demolition, stormwater control, removal of old slabs, buildings that are in the footprint of where 3 and 4 are going. We've already started doing a few of those preconstruction activities. We have some trailers on site for the construction personnel.

Basically we are looking at the middle of '09. After we have PSA approval we will begin excavation. As I said, we have several million cubic yards of backfill -- I mean, fill material to remove. It's going to take us about six months to actually dig the hole. If you look at a plan view that we've had in another presentation, you are looking at a nine-acre area if you look at the surface area of how big our hole is going to be. The outside perimeter of our hole covers like a nine-acre area. It's going to be a very, very large area.

Once we get the hole dug the regulations require us to notify the NRC to come out and we are going to do some geological mapping. All the layers that are exposed and there to observe as well as the marl that we get down to we'll contact the NRC and they will be on site to take a look at the geological formation. Then we'll map those.

MR. HINZE: What is the length of the ramp that you -- will you use a ramp?

MR. DAVIS: Yes.

MR. HINZE: How extensive will that be?

MR. DAVIS: That's a good question. Bob or John, do you want to answer it? We are going to have a two-to-one slope for the hole but then the ramp is going to be -- I don't know what the grade is. Do you know, John?

MR. PREBULA: I believe --

CHAIR POWERS: Take the microphone. We can't let you hide.

MR. PREBULA: My name is John Prebula. I'm with Bechtel. The ramp in and out of the hole would be two different slopes. As far as I know under the current plans with Westinghouse and Shaw the ramp end would be up 10 percent. The ramp out would be at 6 percent. Six percent at 90 feet deep is somewhere on the order of 540 feet.

MR. HINZE: Will the bulk of that be the same as the fill for the major hole?

MR. PREBULA: As of today it is, yes.

MR. DAVIS: We will achieve a 95 percent compaction. We've been in discussion with the staff on whether it has to meet the same criteria.

MR. HINZE: That's what I'm getting at, right.

MR. DAVIS: As we analyzed in the application, what we have committed to is if you assume the warning ramps, the two-one slope, and from the marl up it will all be the same material. We haven't really committed to the ramp putting that material in with the same criteria. I'm assuming we could put in standard practice backfill. There's regular industry for that because it's outside of the zone of influence.

MEMBER SIEBER: You can have no structures built on top of the ramp area.

MR. HINZE: Yes, but you don't want high infiltration either on those ramps in the excavation area. The groundwater problems.

MR. DAVIS: What Angelos mentioned earlier we have modeled the planned contour after construction and what type of surface we are going to have for the gravel grass. Most of the area where the ramps are coming in is going to be relatively flat. It's going to be somewhat we may have roads and gravel areas.

MR. HINZE: But you don't want infiltration pathways headed down towards the --

MR. DAVIS: The backfill material in the ramps is going to be much more dense than the in situ materials. I would hope that we are not introducing anything in a piece. Basically you have six months of excavation. In late '09 we will begin the backfill operations at that point in time. We will be under the LWA activities and we would have our ESP hopefully followed by nine to support those activities.

Basically you have a little bit of our year time period for the excavation from the bottom of the hole to the top of the hole. Once we put in about 50 feet of backfill material to reach the level of the bottom of the nuclear island, we will again put in a MSE wall which is a mechanically stabilized earth wall. Actually, it's like a retaining wall. I've got a couple of pictures. These walls will actually be the outside form for the nuclear island.

Once we get the walls started we will actually put in -- once in a while we will put a mud-mat in and then we will apply -- we've asked for permission or LWA for that. Then we will put a waterproof membrane on that mudmat and starting up the MSE walls. Once we have the waterproof membrane in then we'll pour another mudmat on top of that to protect it from construction activity above it. The MSE wall and the backfill will continue on to the early 2011 and as the wall comes up the backfill comes up with it and then we will coat -- once we reach the surface we'll coat the rest of the walls with waterproof membrane.

MEMBER SHACK: And this is basically the same construction you had at the other units?

MR. DAVIS: No, this is different.

MEMBER SHACK: This is different.

MR. DAVIS: Unit 1 and 2 actually the

foundation levels of some buildings actually are built on the marl. They are down that deep. Like your NCW towers, your aux building, those are all built on the marl themselves. Unit 3 and 4 no building structure will be on marl. They will have at least 50 feet of backfill to the first foundation level.

Other things in here just a couple of things to show where we've been, the work been doing and the mudmats. All of this is targeted to support first concrete which hopefully if we get our COL late 2011 that will support the first concrete which is the red bullet.

Basically what I thought I would do real quick with the new rule what things are construction, what are not considered. 10 CFR 50.10 has a definition of what construction is not which construction requires LWA. The activities in which we are going to participate or pursue are kind of included in some of this. We are already doing -- we did the site excavation during activities based on the LWA.

Right now we are currently clearly and grading. We are putting in stormwater controls, demolition of buildings in the 3, 4 footprint. We can proceed with excavation as allowed by the application

-- I mean, allowed by the rule so we'll be digging a hole. We don't need the LWA for that. The list continues on on the next slide.

MEMBER SHACK: Okay. But you will have your PSC when you --

MR. DAVIS: Right. We will be able to recoup the money we are going to spend before we do it. That is the plan. Several things that we will put in as we are putting in the backfill that don't necessarily require an LWA but they will go in after we start the LWA activities like potable water system will go in, our well water system will go in, sanitary system will go in.

It will also be used -- certainly the systems we are going to use during construction like potable water for drinking, the water for your back plant, things like that. Your sewage treatment facility, your waste water treatment all are going to go in during the construction time period and LWA.

Also, parts of those will be utilized for operations as well. It will be the same system but a little bit different configuration. The well and some of the piping will actually be used during operations as well.

Basically, you know, as we described

before, we are going to be putting in the engineered fill LWA. The reason is because of liquefactions which Don explained. We'll dig down approximately 86 feet and then bring it back up. Controls with the QA program, testing for the backfill. As we went through the LWA review process -- I've got another slide that's coming -- we developed ITAAC for the site, specific engineering design of the backfill and the water treatment.

Just an example. Once we get through with the backfill we'll have pretty much a swimming pool. We'll have while we're waiting on the COL to put their first concrete in basically we have the retaining wall which is an outside form for the nuclear island and we'll have it waterproofed and we will be up to grade before we get our COL. That's our goal to support that concrete and advance our schedule as much as we can to be ready for the COL.

MEMBER MAYNARD: What's that wall made out of again?

MR. DAVIS: I've got a couple of slides on it. The MSE wall is a mechanically stabilized wall. You drive down the expressway and you see a wall like that, that's your mechanically stabilized wall.

MEMBER ARMIJO: So those are concrete

blocks?

MR. DAVIS: Panels.

MEMBER ARMIJO: Panels. Behind that is the earth?

MR. DAVIS: There are structural straps that hold it. As you bring your backfill up you're putting the anchors in on the back of the panels and then you backhoe up and keep putting more panels in it.

MEMBER SHACK: How deep are those anchors?

MR. DAVIS: Forty feet back away from the wall. We actually as part of our planning -- let me back up here -- we actually did a little test pad where we put in some of the panels. We got some just to illustrate how our fill material would work with these panels and using small equipment what type of technique would we need to use adjacent to the walls so that we didn't get displacement.

We did a test fill back in July of '08 just to illustrate that our material would work with these panels and that we could control the location and the compaction behind the wall. That was one of our test pads, test applications that we did. The NRC actually came down and did a site visit while we were doing this.

MEMBER ARMIJO: Is there any slope to those things or are they just straight vertical panels?

MR. DAVIS: They will be straight. We'll use control. Since this is going to be the forms for the outside of the building, you know, we'll control it with survey and equipment. Actually we had the manufacture expert there and there is a slight tilt when you first put it in but as the backfill and stuff there is a controlled amount so that we monitor that it's going to be vertical.

MR. HINZE: How do you compact that behind it?

MR. DAVIS: We have small vibratory rollers that looks like a big lawn mower almost. We put it in in smaller lifts. The big equipment you put in six to eight-inch lifts. If you use the smaller equipment, you know, we are going to develop a spec based on the performance of the small equipment and you'll put it in in smaller lift thicknesses to achieve the same compaction and that was part of this test program was to find out what small equipment to bore.

MEMBER ARMIJO: Did you use that with Units 1 and 2?

MR. DAVIS: No, no. Since Unit 1 and 2 was down like the foundation of the marl Unit 1 and 2 used actually system help pitchathane which is almost like wallpaper. It's pulled back and they applied it to the side structure. Then they would add like a styrofoam board, hard board they put against it to protect it from the vibratory equipment.

We did use small equipment adjacent to the building so we wouldn't damage it because we couldn't get the heavy equipment within about four feet of it so we used similar small equipment but it was a different method. The panels we got here were textured.

MEMBER SHACK: Those are the anchors in that top picture coming back or is it just level things?

MR. DAVIS: That's just the wood holding it vertical. I don't have a really good picture of one with the straps but it's a flat strap with ridges on it and they lay it in and then you put the soil on top of it and you compact it so it will hold it.

Here's an illustration of something you'll see every day when you drive down the road.

MEMBER MAYNARD: That's curved.

MR. DAVIS: That one is curved. We're

going to have a curve in ours too. It's not new technology. It's something that is used commonly every day so that was our plan to use something that would work for us.

This is just a couple of illustrations of the waterproof membrane we're going to put in. It's a spray-on membrane. The reason we have an LWA, an ITAAC with our LWA, this is something that wasn't considered in the DCD.

It was prepared by the consortium of Westinghouse and Shaw because they were looking for something that was easier to do than what was described in the DCD so we had a lot of questions with the NRC. This is the membrane that we had come up with that Shaw would like to use. It's a spray-on elastomeric membrane based on methyl methacrylate resins. I put that down because I didn't know exactly what it was.

MEMBER ARMIJO: How important is that? If it tears or leaks later after you put in all your foundation, is that a big deal? Is it a problem? Is this a nice to do or is it the integrity of this --

MR. DAVIS: I don't believe that the waterproof membrane is a safety related function for the DCD design. Is that correct, Bill?

MEMBER SHACK: It's a non-safety issue. Excuse me.

MR. DAVIS: Bill LaPay with Westinghouse is here to help us on some of our questions.

DR. LaPAY: Dr. LaPay, consultant to Westinghouse. The waterproof membrane is a non-safety item. The requirement says an ITAAC based on the coefficient of friction that you must achieve that you're going to discuss in the next slide.

MEMBER ARMIJO: But as far as the waterproofing characteristics, eventually it will start to leak and is it important?

MR. DAVIS: The manufacturer gives it, I believe, 100-year life. Is it critical for the Vogtle side?

MEMBER ARMIJO: Yeah, right.

MR. DAVIS: It is not really critical for us. I mean, it's part of the design that you would put it in. But for the Vogtle site our water table is like 15 feet below the bottom of the slab. In effect we are putting it in because it's required but does it really affect the Vogtle site specifically from a waterproofing issue? Not really.

MEMBER MAYNARD: It's not really -- it's nice to do?

MR. DAVIS: For us it's a nice to do. The design, the DCD design is qualified for a water table up to like two feet from the surface. It just so happens the Vogtle site is 15 feet below the bottom of the nuclear island.

MEMBER MAYNARD: The membrane, where does it go, just underneath the bottom?

MR. DAVIS: No, it will go up all the way to the surface.

MEMBER ARMIJO: All the way to the surface.

MR. DAVIS: We'll have to have --

MEMBER ARMIJO: Will that be right against the walls of like the reactor building?

MR. DAVIS: The nuclear island? The MSE walls are going to be the outside of our form. They are going to be like remain-in-place forms. We will spread it on the MSE wall.

MEMBER ARMIJO: Okay.

MR. DAVIS: Then we are going to form up the other side and put the rebar in and we will poor against it so we'll poor against that membrane.

MR. DAVIS: That will be kind of between two concrete --

MR. DAVIS: Sandwiched. I did cover this

kind of originally but our construction, some of the spoils is going to go to the west side of the reactor because there are some ravines of stuff but most of our construction facilities and sport structures and batch plants and stuff are going to be less of the new Units 3 and 4.

Here are some of the ITAACs. The ITAACs for us are site specific. Because we had site design backfill and because we proposed a waterproof membrane that was given in the DCD design. ITAACs were proposed with the staff on what would be appropriate level of assurance and an ITAAC that would be acceptable for them.

Basically some of your earlier questions were the placement. We have an ITAAC on the placement testing as the backfill goes in to assure that it achieves 95 percent so we'll be doing that. We'll have to provide an ITAAC letter and support documentation that verifies that we achieved this compaction rate for our fill material.

In addition to that there was the design criteria for 1,000 foot per second shear wave velocity at the foundation level. The NRC was concerned that even though we had testing and test fill and stuff they felt like it was appropriate to have some as-built verification of that once the backfill was completed.

We committed to an ITAAC. Once we achieved the ground elevation with our backfill we'll go in and run some shear wave velocity tests to demonstrate that we did achieve the shear wave velocity in that 40-foot depth and we achieved that 1,000 foot per second in our test pad so we have a lot of confidence that we'll get it 40 feet in the actual backfill for the units.

MR. HINZE: How is that going to be done, Jim?

MR. DAVIS: The testing?

MR. HINZE: Yes.

MR. DAVIS: I can let Don kind of speak to it.

MR. MOORE: Don Moore, Southern. The initial testing will be done with SASW, spectral analysis surface waves. There will be a backup test, an additional test, possibly a seismic test just to verify that they are given reasonable results.

MR. HINZE: So the cross-hull will be based upon the results that you get from this?

MR. MOORE: There will be a confirmatory test. It could be a seismic cross-hull test and maybe something else but for right now the plans are that the basic fundamental testing will be SASW.

MR. DAVIS: And then, as Bill mentioned just a few minutes ago, we had proposed this new waterproof membrane and because of the two mudmats sandwiched with the waterproof membrane you introduce a shear plane and the DCD requires that your coefficient of friction between the nuclear island base slab and your foundation whenever there is soil rot be a .7 coefficient of friction.

Because you introduce that shear plane between the two mudmats they were interested in how that waterproof membrane material was going to meet that criteria since we introduced that shear plane. We have committed to an ITAAC to do some testing, get the vendor that produces the waterproof membrane to do a test to demonstrate that it will meet that .7 coefficient of friction. Those were the ITAAC developed to support the LWA activity.

MEMBER MAYNARD: Quick question on that first ITAAC under Inspections and Tests it says, "Required testing will be performed during placement of the backfill materials."

MR. DAVIS: That's correct.

MEMBER MAYNARD: What is meant by required testing? Is there a requirement already established or will that be developed later? Required testing can mean a couple different things.

MR. DAVIS: Part of the application was the design of the engineered field and we proposed certain criteria for the fill which one was a 95 percent compaction. The gradation will be within a certain spectrum, the type of material that we use. We said how often we would test it over so many lifts and square feet you would run certain tests. This is just to --

MEMBER MAYNARD: Okay. So that's already documented.

MR. DAVIS: We kind of get a design spec in the ESP application of the type of backfill that we are going to put in and this is just an ITAAC that goes along with it to demonstrate we met those. Method design.

That's all I have. If you all have any questions, I will be glad to answer them.

CHAIR POWERS: Stay close.

MR. DAVIS: We will.

CHAIR POWERS: What I'm going to do is take a break. Before I take a break I've got some assignments. We should actually review the SER and we are about to hear about the SER. Then we have to prepare a draft position for consideration by e full Committee.

When we left this we had about 22 open items in the seismic area which is really the principal safety hazard. The Subcommittee and the ACRS only review the matters related to safety in respect to this SER. Most of these open items on the seismic I think can be excused by saying they were done and they are closed now.

Bill, I wonder if you could prepare us a paragraph that says what needs to be said on those open items? I think I want to explicitly outline in the draft position to the Committee what was done on characterizing the East Tennessee Seismic Zone and what was done on defining the locations of the Charleston seismic source. I think I want to just say something in the letter explicitly what was done in there.

I wonder if you could handle similarly for the emergency plan. Again, most of that material I think we can just say it was done. I'll leave to your judgment if we need to explore for the whole Committee anything explicitly about those. You might include in there emergency action levels as well.

Bill, if you need to advise me on what we say about this Limited Work Authorization. I don't have any explicit guidance on what the ACRS reviews about the work authorizations here. Some relate to safety and included the ITAAC. I don't know what we're going to say.

My tendency is to say yeah, the staff has granted them a Limited Work Authorization and we don't have any objections to it. I think that is all we need to say on this but I'll leave it to you to give me some guidance on that. With that, why don't we take a break until --

MEMBER RAY: Mr. Chairman, I didn't speak quickly enough when there was a question as to whether there is anything more. May I?

CHAIR POWERS: You definitely may.

MEMBER RAY: This is -- I want to phrase this correctly so I don't lead us off into bunny trails. I'm interested in the safety implications of this concentration of generating resources tied into the grid. In other words, the loss of off-site power event. My question is in the ESP context what has the applicant done, if anything, to address the issue of the integration of this larger resource into the grid?

MR. DAVIS: Specifically for ESP that is a

COL question and we did not address that. ESP is more is your site acceptable for the design you want to put on the site. Loss of on-site power is not an evaluation we would do at the ESP period.

MEMBER RAY: Let me just make a point. It is site related in that the site is related to the grid.

MR. DAVIS: That's correct.

MEMBER RAY: The integration of the site into the grid seems to me is an issue that is related to the site and not to the reactor itself. That's just my opinion and that's why I asked the question. I would certainly have anticipated addressing the question of having this increased demand for off-site power and this increased size resource in the grid as part of the site consideration irrespective of the reactor itself. That's what I would have done but you've answered the question you haven't done it so that's that.

MR. DAVIS: We have done it but it's just not part of the ESP application and we have evaluated. We did grids, stability analysis, and we know what the plans are for additional transmission lines.

MEMBER RAY: That's not the question I'm asking. I realize it's not part of the application.

Can you tell me that you've done it? I guess the answer is yes.

MR. DAVIS: Yes.

MEMBER RAY: Yes, you have.

MR. DAVIS: Yes. We have planned the new transmission line and we have done a grid stability analysis to support the new units but it's not part of this --

MR. PIERCE: This is Chuck Pierce. That is actually in Chapter 8 of the COL occupation so if you went to occupation I think you would find what you are looking for there.

MEMBER RAY: Okay. Well, I'll certainly consult that. Thank you for that reference. I'm really more into process space here now in which I am concerned about site permitting without any consideration of grid integration from the standpoint of the safety implications of that. I would have expected transmission interconnection to be part of the site permitting.

CHAIR POWERS: I don't see any reason why you could not prepare a draft position with respect to that or how to amend the ESP process to include that item. I mean, if you want to prepare the paragraph, I don't see why you can't.

MEMBER RAY: It just seems to me the inherent in site permitting to say how the hell are you going to plug this into --

CHAIR POWERS: I understand.

CHAIR POWERS: Professor Apostolakis.

MEMBER APOSTOLAKIS: Perhaps it should not be mentioned in the context of this year's --

MEMBER RAY: No, I'm not trying --

MR. DAVIS: It's not part of our site evaluation but we had to --

CHAIR POWERS: You don't have to respond to it.

MR. DAVIS: Just one site. We had to do that planning because part of the environmental report is the environmental impacts of putting those transmission lines in. We had to start that planning process early. We had to know where it was going to go, how it was going to tie in with this, and what the environmental impacts are.

MEMBER RAY: Well, I didn't want to get into the environmental part but I was sure you had done it. I'm concerned only about the safety implications.

MEMBER SIEBER: The first thing you do is transmission and capacity planning. That's where the idea of building the plant comes from.

MR. DAVIS: If we couldn't justify that we needed the plant, we wouldn't be getting our PSE certification. We have load projections for Georgia Power Plant which provides the need.

MEMBER RAY: You don't need to tell me but I'm really just trying to dig at this little piece which is the loss of off-site power and ultimately is the emergency power resources adequate for the conditions that you expect once the plant is operating. That's basically where I'm coming from.

MR. DAVIS: That is addressed in our COL application.

MEMBER RAY: Okay. Thank you.

CHAIR POWERS: We will take a break until five of.

(Whereupon, at 10:40 a.m. off the record until 10:58 a.m.)

CHAIR POWERS: Let's come back into session. On consultation with the Chairman of the ACRS we believe that with respect to the LWA that our obligation to the full Committee is to ensure that sufficient ITAACs have been identified, that this meets it safety requirements, the ITAACs have been identified, and the acceptance criteria defined.

Okay? I think it's a fairly limited scope of activity.

Okay. With that I will turn it over to Christian and he will give us a quick tour on what the staff found when they reviewed the licensee's application and what were the important points in the SER.

MR. ARAGUAS: Again, my name is Christian Araguas and I am the lead project manager for the safety review of the Vogtle ESP application. As you well know, the purpose of today's meeting is to cover two things.

First is the conclusions the staff drew with respect to the review of the ESP application and the second being the review of the LWA. What I wanted to remind you guys, and I'm sure you're aware, is that at the previous ACRS meeting we covered the findings we had made with respect to any areas that didn't have open items.

We didn't touch on anything with respect to the LWA because we hadn't had enough time to make any sort of conclusions with that. Our presentation with respect to the LWA will be a bit more detailed. When we talk about the ESP we are just focusing on the closure of the open items. With that, we can address any questions the committee has.

CHAIR POWERS: Yes. The strategy should be you will have to go into a little more detail, although I think the licensee did a pretty good job in outlining what he's going to do. I think your obligation is, "Okay, how do I define the things that are pertinent to safety here?" If it's not clear, the seismic issues are the focus of our attention here.

MR. ARAGUAS: I'm hoping we can address those questions.

The next slide is just to cover the agenda for the rest of the day. What we're going to do in the morning time or now is just we're going to cover the ESP aspects for the closure of the open items. Then in the afternoon we'll go into, as I mentioned, the LWA. What I'll cover as part of this presentation we'll just go over really quickly the scheduled milestones we've already met.

What's remaining I'll do a very high-level summary of the application. You'll see it's pretty similar to what you've already heard from Southern. Then we'll go into resolution of the open items and conclusions on the advanced SER. Again, in the afternoon we'll discuss LWA. We'll talk about some of the RAIs that were issued.

One thing to notice is with respect to how we review the LWA for efficiency purposes we decided not to go out and issue a supplemental SE. We thought it would be more efficient to just incorporate another round of RAIs and just close out any remaining issues on a issue-by-issue basis until we came to resolution.

With that, I just wanted to touch on some of the milestones. You recall the application came in August 2006. The acceptance review took about a month. We finished in September. With respect to the inspections the staff conducted, any audits and RAIs were all completed by April 2007. Again, the SER with open items was issued August 2007. Of course, we met in October of last year on that document.

We received the LWA two weeks prior to issuance of the SER with open items and we issued all RAIs by the July 2008 time frame and, of course, the purpose of today's meeting. We issued the advanced SER in November of this year.

So what's remaining? We have the full Committee meeting tomorrow and then, of course, we are expecting a letter from the ACRS with respect to conclusions within a month's time frame. Following that we will issue the final SE in February of 2009. The ASLB has laid out its schedule for when it wants to conduct the contested and mandatory hearing. Those will be conducted in March 2009 and then we expect a decision in summer of '09 time frame.

MR. WIDMAYER: Sorry. The slides aren't matching up with what I passed out.

MEMBER SIEBER: They don't match.

MR. ARAGUAS: Where is that they don't match?

MEMBER MAYNARD: What I have here and what you have up there are two different things.

MR. ARAGUAS: This is for Limited Work Authorization request.

MR. ARAGUAS: Let me look on the table there. It's the wrong handout.

MEMBER SIEBER: These are nice slides.

CHAIR POWERS: Let's go ahead. Most of the Committee can read off the screen.

MR. ARAGUAS: All right. So a lot of this, as I mentioned, you've already heard from Southern so we'll try to move quickly so we can get to the actual technical discussions. The proposed ESP site is located in eastern Berk County and it is 26 miles southeast of Augusta, Georgia.

The site is adjacent to and west of the existing Units 1 and 2. The applicant is Southern

Nuclear Operating Company and they are acting on behalf of their four co-owners. Again, the application is requesting a site approval for two reactors.

To touch on this again, the ESP application request site approval for the Westinghouse AP1000 certified design. The request is for a term of 20 years. Something unique to this ESP as we've talked about throughout the day is the fact that they have asked for an LWA under the amended LWA rule that was issued last year. Again, they've also asked for complete integrated emergency plans and that is another aspect of this application that is different from the previous three.

This slide Southern had put up. It's just the specific review areas that we focused on for the early site permit. That includes the areas that were additional to the LWA. You'll notice the areas where it's bolded is where the open items were that we planned to talk about today. As you can see, we have one in meteorology, four in hydrology, we've got 22 and the bulk in seismic geology and the geotechnical review. Then there were 13 in emergency planning. There's a total of 40 and, again, all open items have been closed.

With respect to the permit conditions, there are nine permit conditions in the advanced SER. That's seven different from the one we issued as part of the SER open items. There are five COL action items instead of the 19 that were proposed as part of the SER with open items and just to touch on the discrepancy there. We'll go into a little more detail as part of later presentations. A lot of the COL actions items we had did fall under the geotech area. A lot of those were closed out with the receipt of the LWA application or request.

Okay. The first open item we had was dealing with meteorology and I'll just quickly read to you the open item. The applicant provided justification for using a 30-year period of record to define the AP1000 maximum safety design temperatures. Staff believes the temperature should be based on 100-year return interval. The basis for this question, this open item, was for Southern to establish the historical maximum temperature per the General Design Criterion 2. The staff took a position and felt that it was more conservative to actually establish those values based on 100-year return than what was used at the time which was a 30-year return.

CHAIR POWERS: The staff in making a

judgment does not seem to recognize or place credence on the idea of global warming. Is that true?

MR. ARAGUAS: Brad, do you want to answer that?

MR. HARVEY: This is Brad Harvey with NRO. The staff does recognize the phenomenon of global warming at this point. I think we point out in the SER that there is margin between what the site characteristics are in terms of extreme temperatures and wind speeds and so forth as compared to what design parameters are for the AP1000 reactor design that the applicant has chosen. We are sort of recognizing that margin that exist there has compensating for the potential affects of climate change.

MEMBER SIEBER: And how much margin is there in terms of temperature?

MR. HARVEY: It depends on the parameter but there is on average two or three degrees fahrenheit between what the 100-year return periods are and what the design is for.

MEMBER ARMIJO: Just for perspective, what was the maximum temperature for the 30-year return and the 100-year return? Did it change at all?

MR. HARVEY: The 100-year return is 115

degrees fahrenheit. Off of the top of my head I think the 30-year was either 107 or 109 sticks out in my mind.

MEMBER ARMIJO: It made a --

MR. HARVEY: Come again?

MEMBER ARMIJO: It made a small difference.

MR. HARVEY: Yeah.

MEMBER BONACA: Did you look at recent trends?

MR. HARVEY: Yes, actually. The applicant did a decent job with that in their write-up in the SER. Basically there were higher temperatures in the 1930s than there have been more recently reported. If you look at the last 60, 70 years that was actually the highest temperatures in our region.

They looked also at where maximum temperature had occurred, a number of regional reporting meteorological stations. It's spread out over several different decades so it doesn't appear to be at least within that site region a trend that is yet being observed.

CHAIR POWERS: We have global cooling going on at this site.

MR. HARVEY: It's happening all over the

place.

CHAIR POWERS: Thanks, Brad.

MR. ARAGUAS: And just to close out, the applicant did respond and did provide the requested temperature site characteristics based on a 100-year return.

With that I will turn it over to our hydrology experts to talk about how we closed out the open items in that section.

MR. KINCAID: My name is Charles Kincaid. I work at Pacific Northwest National Laboratory and a consultant with the NRC, hydrologist, hydrogeologist. What I'll go through are the open items. This first slide basically shows three topic areas, 2.4.8, 9, and 11. These all rely on a single open item 2.4-1. It basically noted that there would be some need for safety-related water for initial filling and occasional makeup purposes for the tanks that are above the reactor.

In this regard the applicant had not provided design parameters for these values and noted explicitly where that water was coming from, that sort of thing, so we have this open item. They have since provided all that information. We discussed it and basically there are two tanks both with 780,000 gallons. It is to be supplied by groundwater. We've looked at the groundwater capability that exist at the site and noted that it's ample to do the initial filling and the occasional makeup water.

Basically this is not a safety-related external force of water. As you are aware, this design does not require that during checkup. Closing that open item, which that information did, really closes out as it appears in both or all three of these 2.4.8, 2.4.9, 2.4.11.

On Groundwater open item 2.4-2. this open item really dealt with coming to grips with and developing an understanding of how the groundwater level might change over time because of construction, because of the new backfill, because of changes to the surface configuration and the recharge. All these things come into play in our question in creating this open item.

What the applicant did, as you saw from the presentation by Findikakis, they did some site walk-down. They developed a more thorough understanding of the water table aquifer. They developed a model of that aquifer and subsequently they tested it for post-construction conditions looking at higher recharge rates, different conductivities of material in the backfill material.

They provided that model to us. We tortured it a bit more which you will see some results of. Basically in our analysis what we did is we looked at a fairly aggressive higher recharge rate of half of the instant precipitation of 48 inches so 24 inches is the kind of infiltration that we applied.

Two, the power block and the cooling tower area. We looked at lower hydrologic productivities in the backfill. The normal value of geometric means of the properties measured for Units 1 and 2 was 3.3 feet per day. We used 1.3, the lowest measured value. We looked at predicted max mode hydraulic and came to the conclusion that even torturing the model we could get to 176 but no higher. So we conclude basically that this open item is answered.

Now, I've got a couple slides here. The next one here you see this or something very close to it was part of the early package you saw and it just gives you the lay of the land and outline. Basically there is a ridge on which 1 and 2 is constructed and 3 and 4 will be constructed and, as was noted, the flow of the groundwater system is off of this ridge and goes toward Mallard Pond to the north and to the south it goes to various drainages including the Daniels

Branch drainage to the southwest.

In this rather tortured look at the problem that we did, we have taken the applicant's model, installed it, tested it to make sure it was a strong model with conversions and so on. The thing that we did is we took the area where the power block lies and that entire power block and the cooling tower area was given this 24 inches precip or infiltration per year. What we show then is it's true that the bulk of the travel paths do release from this perimeter set of node points and still go to the Mallard Pond drainage.

There are a few that go off to the side here. Basically the groundwater is going underneath to Daniels Branch drainage. The groundwater table in that area is below the strain bed so it's not a depiction there. That actually the pathway the groundwater would take.

I would note that the stream paths that you see going towards the Savannah River directly you saw it in the applicant's application where they had applied in a very structured way the same kind of infiltration rates on the Unit 22 and Units 3 and 4. In this we have broken that. We put higher values on 3 and 4 to purposely try and stretch this model.

If one were actually putting together a more rigorous model in this stretching mode that we've done, we would put higher application rates, higher infiltration rates on Units 1 and 2 and that would block that flow to the Savannah River directly and the water table aquifer.

This does show that with higher rates you do get a preponderance of flow towards Mallard but you do get a little signal saying it could go off towards the Daniels Branch. That is important to know. The other thing about this slide, and the reason I put this slide in to show, it does demonstrate the higher infiltration rate of 24 inches per year.

It does show the results when you go to a lower conductivity and the insert shows these pathways. It's the height of the water table that is on this figure that you probably can't read. I can't read it looking at it down here. This is the figure that gave us the 176.

MEMBER SIEBER: I have a quick question. If I look at the applicant's cross-sectional drawing of the plant site the marl layer above the level of the Savannah River would not impede any influence of infiltration from the Savannah River to affect the top 100 feet or so.

MR. KINCAID: True, yeah.

MEMBER SIEBER: So I should just ignore the fact that the Savannah River is there with respect to water available somewhere near the surface at the plant site?

MR. KINCAID: That's true. It doesn't play a role there. The Savannah River is inter-related with the deep aquifer system which we do look at that on the environment side. It does inter-relate with that aquifer system and the deep production wells that produce water for the plant but that is not a safety issue.

MEMBER SIEBER: Okay. If you go down the Savannah River you can see this layer up on the hillside.

MR. KINCAID: If you do the boat tour and go up the river along the shoreline it's evident that you've got this blue marl, yeah.

MEMBER SIEBER: Okay. Thank you.

MR. HINZE: While you are stopped here for a moment let me ask you I was interested in how the modeling that was done for 1 and 2 compares in terms of the results of the modeling as well as the hydrologic properties that are being used with this model. Have you made any comparisons?

MR. KINCAID: Well, No. 1, I don't believe there was any modeling done for 1 and 2. I might be wrong on that but that's my feeling. We did --

MR. HINZE: Certainly they have hydrologic properties.

MR. KINCAID: Yes, and they have water table information and, indeed, some of the additional data that we looked at as well as the applicant looking back in time was the presite condition monitoring from the mid-'70s through the construction period and dewatering period. All that data was reviewed to see what made sense here.

In Unit 1 and 2 FSAR it is a pathway from Unit 1 and 2 to Mallard Pond. It is their pathway at that time as well. I believe that is their pathway today. The topography of the site plays a strong role in the high point in this system. Today the high point, well, we've got this graphic up. This presents a future condition but it's not all that far away from present day condition. The high water table is actually beneath the proposed Units 3 and 4 cooling towers so it's in this immediate vicinity.

MR. HINZE: Is that being enhanced by this 24-inch infiltration rate?

MR. KINCAID: Yes.

MR. HINZE: Is that realistic, Charles?

MR. KINCAID: Is 24 realistic?

MR. HINZE: This is now being used for 1 and 2. Right?

MR. KINCAID: True. Well, they did use 14 or 16. Just nod if I'm -- yeah, somewhere in there. They did use a pretty aggressive infiltration rate. We chose a half largely as a result of work done for the NRC in studying infiltration rates and how it can be moderated by vegetation. Much of this work was done for low-level waste disposal sites. A half is kind of rather a large value. It's on the higher end of what is possible.

MR. HINZE: This is totally estimated. There are no lysimeter measurements or any types of measurements of infiltration?

MR. KINCAID: There are and those that involve gravel. Basically beneath the cooling towers you are likely to have a vegetation-free surface. You are likely to have a material like a gravel that allows infiltration. We looked at that as typical of what you might see from a lysimeter with gravels and no vegetation which had been studied in Hanford and elsewhere, even the Savannah River site. These data support the idea of a third to a half. A half is a bit aggressive but a third to a half.

MR. HINZE: Okay. So this is not an amplified gravel.

MR. KINCAID: Not terribly. Not terribly. I would note also that we did --

MR. HINZE: What kind of uncertainties would you put on it?

MR. KINCAID: Well, I think a half is at the extreme so if you wanted to put a range on it, the range might go from maybe a quarter up to a half and the analysis that the applicant provided has a value in between those and we took more of the extreme value to test it more thoroughly perhaps.

I would note that it is pretty aggressive to put that kind of infiltration rate on the power block. It may be more appropriate to put it like we did on the cooling tower. That is also supporting the idea that the high will remain in this area and perhaps block anything moving from the power block area in this direction.

MEMBER ARMIJO: How about the other way around? Let's say you had extended droughts and the infiltration rate was much, much lower than current values. Does that change your conclusions at all about where the water will go?

MR. KINCAID: Not really. The topography plays a dominant role here as well as the infiltration rate.

MEMBER ARMIJO: Which it's sensitive to.

MR. KINCAID: Yeah. Actually the area has been going through a bit of drought recently and the water tables as measured for the ESP and site investigation demonstrate this high at the cooling tower area presently. I don't see that changing. Historically if you go back in time to the pre-site conditions you see it's on the very edge of what they monitored in those days but you can see that the higher values are out on this ridge in this area.

MEMBER MAYNARD: For all these cases the water table was always below the bottom of the structures?

MR. KINCAID: The base of the structures is 180.5, so 180 basically. We tortured it and got it up to 176. The DCD allows you to go to 218 so we have really laid the foundation for, you know, if perchance in the future if the water table goes above 165 within the site, we have laid the foundation for having done the analysis that allows the NRC to say it's fine to 218.

MR. HINZE: What is that high gradient

extending northeast across the area?

MR. KINCAID: That is a function of marl largely. The marl system -- basically there is a ravine where you see the Mallard here.

MR. HINZE: Yes.

MR. ARAGUAS: Do you have a laser pointer?

MR. KINCAID: That would be great. This area here is a ravine and underneath that ravine the topography of the marl itself breaks off pretty sharply and the water table breaks off with it and heads down into that ravine.

MR. HINZE: So there is actual flexure there on the marl? The marl is --

MR. KINCAID: It's not essentially flat, no.

MR. HINZE: Does it have that steep of a gradient? How steep of a gradient does it have?

MR. KINCAID: I don't have the map.

MR. HINZE: That looks like a pretty steep gradient on that water table there.

MR. KINCAID: That's realistic. The marl itself may be more subdued in its breakoff but it mirrors that pretty well.

MR. HINZE: Could the Utley limestone be entering into this at all?

MR. KINCAID: Into the marl situation? No.

Right in this vicinity in order for this model to function real well, or as well as it does, this vicinity right here was assigned a very high hydraulic conductivity consistent with the existence of what is called Utley Spring which is -- for Mallard Pond. The variability and conductivity, there are values up in here assigned but there is a very high value had to be assigned in this vicinity in order to get the model to respond correctly.

MR. HINZE: Thanks very much.

MEMBER SIEBER: And the overall flow gradient is generally to the east?

MR. KINCAID: For this aquifer, for the other table aquifer that we are most concerned with here, north is in this direction. The flow is basically off of this ridge to the north and around through the ravine there. As you can see here there are some values, some pathways that move towards the west. Very little of this -- I mean, I think even Unit 1 and 2 the movement of groundwater is actually back in this direction.

This actually lays a bit of foundation for the next couple of open items. This next one dealt with whether or not the applicant had looked at a sufficient number of pathways. We left the SER with open items and moved towards where we are today, they had provided data and the groundwater model that we discussed. They have done post-construction analyses as have we. Basically we found that their analysis is complete with respect to the data and the model of those pathways.

The Mallard Pond drainage pathway was confirmed by the NRC staff as being the most likely of pathways. We did show in what I just discussed that there are some potential for a Daniels Branch drainage as well. This is plausible. We would say it's unlikely.

In order to make it at all possible you have to incorporate the ideas of uncertainty and spacial variability in the material properties and the spacial variability of recharge rates. As a result we don't show today in that analysis I just showed that there is introduce by this drain.

But it wouldn't take much, perhaps, in spacial variability and conductivity and recharge rates for the pathways that do move in that direction, albeit in a tortured model. It did move in that direction to actually go to the Daniels Branch to be intercepted by the stream and move off in that direction so we do look at that further.

MR. HINZE: Is that because we don't have enough information?

MR. KINCAID: And likely will not. I mean, you are asking for a fairly highly resolved sampling program. I think it's always going to be a bit uncertain in our minds whether or not it goes in that direction or could go in that direction. It certainly moves at these higher infiltration rates that we put on the model, the 24-inch per year. It did move in that direction.

It did move beneath it. Of course, the water table was lower and below the stream bed at that point. If you move down the ravine a bit farther, and not too much farther, you do intercept the stream so it's just a matter of what kind of spacial variability there might be in those locales.

MR. HINZE: Or down-cutting the stream itself.

MR. KINCAID: Pardon?

MR. HINZE: Or down-cutting of the stream itself. Erosion?

MR. KINCAID: Yeah. There is actually -- they actually call that stream portion that we went beneath the Grand Canyon because it's no unique. It appears to be stable at this point. I would note that we did look at other pathways as a result of this. We looked at the tertiary pathway. We looked at the pathway to the Savannah River and pathway to the Debris Basin 1 so we did evaluate other pathways as well.

We took the tertiary aquifer pathway a bit farther even in the SER with open items and that is actually been incorporated now. I just would note that by looking at all these pathways, foundations of release locations, feasible pathways, we now feel that the open item is closed.

The next one, open item 2.4-4, the applicant needs to specify the nearest point along each potential pathway that may be accessible to the public. In the site boundary there is an interesting little quirk where the stream that flows out of Mallard Pond range and through the Savannah River actually crosses a boundary of the site and enters into the Hancock Landing area and then leaves that and goes back into the site.

It's the sort of thing you might miss in a blink if you drove by it. It's a real situation. The water, the stream itself, leaves their control and then comes back into their control. We discussed that with NRC staff and that point becomes the accessible environment.

With all our further looks at Daniels Branch as well, that stream leaves the site property well in advance of the Savannah River so we did an independent analysis that looked at the problem a bit differently than the applicant. We looked at the catchments of the Mallard Pond and Daniels Branch drainages. We looked at monthly watershed runoff and we derived from that the minimum watershed flow.

Now, to do that we looked at five watersheds that are unregulated but monitored in the region to gather our data and start gathering data on the watershed runoff. And we looked at a 12-month moving window through that dataset to determine the minimum year, the minimum flow for a year to come up with the values to use, the flood rates to use to see if we were in compliance with 10 CFR Part 20, Appendix B, Table 2.

We found that we were. There is more to say about that. That is basically that in doing that analysis we needed to take into account the absorption that the applicant had put forward as minimum absorption in both the backfill material and in the aquifer itself. That requires basically that you have that absorption and we felt that to have that absorption you've got to be able to demonstrate that you don't have chelating agents present and taking that absorption to Kd of zero.

So our conclusion is that the applicant has clarified the site boundary and noted the stream drain, the Mallard drainage, does leave the site. We have also learned where the Daniels Branch drainage leaves the site. The open item itself is closed but this has led to a COL action item 2.4-1. It is stated here that the NRC staff analysis demonstrated that a release to the groundwater environment of a radioactive liquid will meet the requirement.

However, use of a minimum distribution coefficients in the analysis implies that no chelating agents can be commingled with radioactive liquid effluents. Therefore, the action item requires that at COL or CP applicant confirmed that no chelating agents be commingled with these radioactive waste liquids and that such agents will not be used to mitigate an accidental release.

Alternatively, we suggest that they could have these experiments repeated with chelating agents present and they could show that Kds are nonzero and that with those nonzero Kds they do meet the requirement. There's a couple of pathways here but we felt that an action item was necessary to close this out.

MR. HINZE: How much of a problem is that?

MR. KINCAID: There is literature that when you add chelating agents to liquids, even radioactive liquids, at DOE sites anyway, that you do potentially ruin the Kd. You do get to where competition for the absorption site is taken over by the chelating agents and you are free to move

MR. HINZE: Good catch.

MR. KINCAID: It can be a problem.

MR. ARAGUAS: Okay. That concludes our discussion on hydrology unless you have any further questions.

MR. HINZE: I have a question. In reading the document there is a discussion commonly of the methodology that have been used by the applicant. Quite commonly there is -- I'm doing it myself right now, but the methodologies are generally acceptable. I don't understand generally. Generally is not a very definitive term and when I read the document I couldn't understand whether there were exceptions to that because generally, you know -- and are there exceptions then to what you have stated by using that term generally?

MR. KINCAID: I would only be able to answer that if I had the specifics in front of me. If it was a statement such that the groundwater model utilized MODFLOW is generally accepted. Yeah, in terms of -- it depends on is it three dimensional. Is the world three-dimensional that you are trying to model and you are using a two-dimensional model, you know, those kinds of things.

MR. HINZE: It wasn't just with MODFLOW. This was -- I noticed this as I went through that this term generally was reappearing. All I would ask is that you go back and you look at this document. Do a search on generally. If you can exclude generally, your document will be much improved in my view.

MEMBER APOSTOLAKIS: It might change the meaning.

MR. HINZE: Sorry?

MEMBER APOSTOLAKIS: It might change the meaning of the sentence. There is generally acceptable and then you make it is acceptable. If a methodology is a general methodology, this means that there are some -- there may be some exceptions.

MR. HINZE: Yes.

MEMBER APOSTOLAKIS: And I'm concerned about that.

MR. ARAGUAS: We'll take a look at the document. With that we'll jump to the Section 2.5 discussion which is the geology, seismology and geotechnical engineering. With that I would ask for the presenters to step up.

MS. GONZALEZ: I'm Sarah Gonzalez. I'm a seismologist and I was one of the technical reviewers for Section 2.5. If you go to the next slide, you'll see a list of all the technical reviewers that were also involved. There are quite a few of us.

Next slide. Section 2.5 of the Vogtle SER with open items was issues with a total of 22 open items and 12 COL action items. All of the open items and COL action items were resolved. This presentation is going to focus on the resolution of the significant open items, the ones pretty much we're going to talk about how the ones -- how the open items that we discussed at last year's ACRS meeting were resolved.

MEMBER MAYNARD: Sarah, your papers are hitting the microphone.

MS. GONZALEZ: Oh, thanks. Okay. So for Section 2.5.2, vibratory ground motion, that will be presented by myself and Laurel Bauer. We're going to talk about three of the significant open items. They were the Dames & Moore Mmax and probability of activity, the Eastern Tennessee seismic zone, and the Charleston seismic source update.

For Section 2.5.3 surface faulting, which will be presented by Laurel Bauer, it's going to focus on the open item related to the injected sand dikes. Section 2.5.4 originally Jim George was going to be presenting this section, although unfortunately he has been out for the past few days. He's been ill so I'm going to take over the presentation but he's going to be here to answer questions. Carl Constantino, a consultant for us, will also be here to answer questions.

We are going to talk about several open items related to Section 2.5.4. There are quite a few open items related to a limited number of borings and tests to characterize the static properties of the load-bearing layers at the site. There was an open item on the limited number of shear wave velocity measurements. There was also an absence of lab tests to determine the soil dynamic properties. That was also an open item. We will also briefly mention how the 12 COL action items were resolved.

The first open item for Section 2.5.2 is related to the Dames and Moore seismic source zone Mmax and probability of activity. The issue was with this open item that Dames and Moore EPRI-SOG team assigned very low weights and very low probability -- sorry. They assigned very low weights for larger Mmax values and low probabilities of activity to two of their seismic source zones. The results was that the Dames and Moore hazard curves did not adequately characterize the regional seismic hazard at the Vogtle site.

To resolve this the applicant determined that the contribution from the Dames and Moore team was insignificant at the Vogtle site. Basically what they did was they removed the Dames and Moore hazard input from the calculation and the result was that the hazard curve only increased by less than 5 percent, a very small increase.

MEMBER APOSTOLAKIS: So when the issue was formulated somebody disagreed with the weights that Dames and Moore assigned. On what basis?

MS. GONZALEZ: Well, compared to the other EPRI teams as well as more recent seismic hazard calculations the Dames and Moore team characterized the probability of activity in a way that was a lot different from these recent studies and the other EPRI teams. Basically they said that for the host source zone that includes the Vogtle site they assigned it -- they stated that there was only a 26 percent probability that earthquakes above a magnitude 5 could occur in this region. That was --

MEMBER APOSTOLAKIS: So the issue was that it was inconsistent with other people?

MS. GONZALEZ: Yes.

MEMBER APOSTOLAKIS: Did they give any arguments why they felt that way?

MS. GONZALEZ: It was more of just their interpretation, although it was just wasn't really -- it was just inconsistent with the other teams and generally what other more recent studies have done for the site.

MEMBER MAYNARD: For this type of study the fact that they are a little bit of an outlier does that mean that they're wrong?

CHAIR POWERS: I think we explored this rather thoroughly in our first examination and the problem was we couldn't understand why they have done what they've done. That is not a case of being a contributor. You couldn't tell where they had come up with it. I mean, they are more than a magnitude office in some areas with respect to every other study. It raised a question.

MR. HINZE: I think each team had to define its assumptions upon which it made its decisions.

CHAIR POWERS: You have read the material as well as I have.

MR. HINZE: I was a member of one of the teams so I kind of remember that and you had to come up with those assumptions. I think Dames and Moore -- I think the way to handle this is to look at Dames and Moore's assumptions. I think that is what you've done and found that there is reason to question them.

MS. GONZALEZ: Yes. If you go to the next slide this --

MR. HINZE: While we are interrupted, we talk about the Eastern Tennessee seismic zone, the Charleston seismic zone as the two major seismic zones in the 320 kilometer radius. When you look at the map of the area, what you find is that the radius reaches out to the edge of the continental shelf where you have the continental margin.

My recollection is that Basham and Adams with the Canadian seismologists made some studies associated with the Grand Banks earthquake of 1929 and the whole problem of the seismicity of the continental margin, particularly in the Gulf of St. Lawrence area because of putting up of the petroleum, the oil and gas power.

They came up with that this should be considered a seismic zone and that it was possible to have earthquakes up to the order of magnitude 7. That is the same margin of the continent that we have down in the Georgia bight. It occurred to me as I looked at this, not last fall but recently, that maybe we should be giving some consideration to this as a seismic zone.

I was wondering if you and your colleagues have looked at what might be the earthquake that would not be the maximum earthquake that could occur on that that would not be detected. Therefore, we have no earthquakes along the Georgia margin of the continental crest.

What would be the maximum earthquake that could occur there that we would not see? Maybe that is a double negative but you understand where I'm coming from. What is the detectability? Therefore, perhaps this is a seismic zone and we are dealing with magnitudes that are of the order of magnitude of 4 or less from the historical standpoint and we're not seeing them because they are out there in the ocean.

MR. MUNSON: If I could perhaps -- this is Cliff Munson, branch chief of the Geosciences Branch. If you look at the updated Charleston source model, this doesn't directly answer your question but they did extend one of the source zones pretty far out.

MR. HINZE: But that was just Grand Banks faulting out there.

MR. MUNSON: Is your question more along the lines of what paleoliquefaction features would we see from something like that?

MR. HINZE: Historical seismicity because certainly when you establish a seismic source the first thing is the seismicity.

MR. MUNSON: Okay.

MR. HINZE: Maybe we're not seeing the seismicity. I agree the probability has to be extremely low but I want to be certain that we are capturing all the possible seismic source zones, or at least we are considering all of the potential seismic source zones.

MR. MUNSON: I would have to say from a process standpoint we approved the EPRI-SOG models as a starting point for the hazard studies. Going forward we look at new information that would indicate that those models might be out of date. To date I haven't heard what you are postulating as a possibility so that wasn't something we considered for this ESP.

MR. HINZE: I understand, Cliff. You're right. I just wanted to raise this as something that we might consider if you are starting with EPRI-SOG. I know that the model that we worked with was a northwesterly extending which is now ridiculous considering the Bowman area whether it extended into the ocean along Ben Sykes' fractures that are across the continental margin. That was incorporated to a degree in that SOG model. Do you have any feel for what kind of magnitude earthquakes would have to -- that could occur up there that we wouldn't detect?

MS. GONZALEZ: Is this the Helena Banks fault?

MR. HINZE: No. I'm talking about the continental margin.

MS. GONZALEZ: Okay.

MR. HINZE: The continental slope margin.

MR. MUNSON: We would have to get back to you on that.

MR. HINZE: You know, you're getting into the highly extended zone that Russ --

MR. MUNSON: Yeah, I'll make a note of

that and we can talk later.

MR. HINZE: Thank you, Sarah.

MS. GONZALEZ: Okay. This figure just shows the 10-Hz total mean hazard curve. This is the screen curve is the total hazard and the dark blue curve --

MEMBER APOSTOLAKIS: I can't see anything.

MS. GONZALEZ: You can't see anything? Can you see this?

MEMBER APOSTOLAKIS: It's very small blocks. Can you use a cursor? Oh, no. You can't.

MS. GONZALEZ: Okay. The green curve is the total hazard and the dark blue curves are the five other EPRI teams total hazard curve. This red curve is the Dames and Moore hazard curve. You can see it's quite a lot lower than the other teams. This light blue curve is the Charleston seismic source hazard.

The total hazard at the site is determined by averaging the six EPRI teams and adding in the Charleston zone, what the applicant did to show that the Dames and Moore team, you know, removing it was insignificant. They just took it out and then recalculated the total hazard. It only increased by --

MEMBER APOSTOLAKIS: What is that total

again? Can you repeat the total? The total is a result of what?

MS. GONZALEZ: The average of the six EPRI teams and then adding Charleston as well because the Charleston zone was updated.

MEMBER APOSTOLAKIS: Yeah, that's the second curve.

MS. GONZALEZ: They just removed Dames and Moore and it was a very small increase in the hazard curve.

MEMBER APOSTOLAKIS: So they gave equal weight to all the teams.

MS. GONZALEZ: Yes.

MEMBER APOSTOLAKIS: Except when they are way out there.

MS. GONZALEZ: Yeah. Well, they kept them in. They just showed that it really wouldn't have increased the hazard.

MEMBER APOSTOLAKIS: That's right.

MS. GONZALEZ: We considered that open item to be closed based on the applicant's analysis.

MEMBER APOSTOLAKIS: That would have given them equal weight, too. It wouldn't have made any difference.

MS. GONZALEZ: The next open item is the

Eastern Tennessee seismic zone. The applicant concluded that no new information has been developed since 1986 that would require any revision to the original EPRI model. The staff concluded that more recent studies suggest that significant revisions to the EPRI model are warranted.

More recent studies such as the TIP study place a significantly larger probability of activity -- sorry, they place a significantly larger probability on larger and maximum magnitudes than the EPRI study did.

In order to resolve this we performed our own sensitivity calculations. We increased the maximum magnitude of the Eastern Tennessee seismic zone. That showed that increasing the maximum magnitude did not significantly increase the hazard at the Vogtle site.

MR. MUNSON: Just to add to what Sarah is saying, the reason why that is is because the Eastern Tennessee seismic zone is quite a distance from the site so that's why it didn't have an impact.

MS. GONZALEZ: And the Charleston seismic source really dominates the hazards. That's another reason. This just shows the results of our sensitivity calculation. This is the total hazard curve. The dash line is the Charleston hazard. It's pretty much dominating the hazard. These other curves are the results of our sensitivity study. We range the maximum magnitude from 6.0 all the way up to 7.8. However, we kind of looked at magnitude 6.5 because that was kind of a more representative magnitude for the more recent studies.

At magnitude 6.5 the hazard at .1G only contributed to .21 percent, less than 1 percent of the total hazard and 1 percent hazard that's the EPRI criteria for including a seismic source zone in a hazard analysis. We concluded that the applicant didn't really need to -- for the Vogtle site they didn't need to update it.

MR. HINZE: Is that 7.8 an abounding condition that you put on it or is there any basis for that?

MS. GONZALEZ: The EPRI teams did include a whole range of maximum magnitudes. They had a distribution and some of their magnitudes did go as high as magnitude, you know -- they went up to magnitude 7.75 but they had lower weights for those maximum magnitudes.

MEMBER APOSTOLAKIS: So these EPRI curves are from the '80s?

MS. GONZALEZ: Yes, they're from the '80s.

MEMBER APOSTOLAKIS: And Charleston is the latest?

MS. GONZALEZ: The applicant -- actually what they did was they totally updated the Charleston seismic source zone and they removed the original EPRI Charleston characterizations.

MEMBER APOSTOLAKIS: The other guys were not aware of Charleston?

MS. GONZALEZ: They did have their own characterizations of Charleston but there have since been paleoliquefaction studies that have warranted updates for those zones.

MEMBER APOSTOLAKIS: What does that tell us about the expert opinion? Pretty bad.

MS. GONZALEZ: It depends on the data that is available.

MEMBER APOSTOLAKIS: That's a problem.

MR. HINZE: I don't want to be put in the position of defending that but I think this is just for the Vogtle site and that's what you're talking about.

MS. GONZALEZ: Yeah, this is just the Vogtle except --

MR. HINZE: And this is -- excuse me. Go

ahead.

MEMBER APOSTOLAKIS: Go ahead, Sarah.

MS. GONZALEZ: Sorry. Yeah, this is just for the Vogtle site, Eastern Tennessee. This issue is being addressed as a generic study by NEI. They are looking at the Eastern Tennessee seismic zone and the Dames and Moore seismic zones as a part of a generic study. At Vogtle it was too far away from Eastern Tennessee to matter and the Dames and Moore also didn't really matter there either.

MEMBER SHACK: It's good to have a dominant source.

MS. GONZALEZ: Yeah.

CHAIR POWERS: Or a source a long ways away.

MR. MUNSON: If I could, the EPRI-SOG models, as we went over last time, were developed in the '80s and we continue with each application to scrutinize them very carefully to see what the impact of those models are in light of more recent studies. That is the dominant focus of our reviews.

MEMBER APOSTOLAKIS: Yes, but my question was different. I understand what you're doing. If I were building the reactor in 1988 what would I have done?

MR. MUNSON: You would have used the EPRI-SOG.

MEMBER APOSTOLAKIS: Thank you very much. That's my question. Okay.

MS. GONZALEZ: Okay. That open item was closed because of those results.

The next slide. The third open item for Section 2.5.2 is related to --

MEMBER APOSTOLAKIS: You have the most beautiful slides I've seen in a long time. It was worth the trip.

MS. GONZALEZ: The applicant performed an update of the Charleston seismic source zone. This figure just shows their updated source zone. As you can see, they have -- they developed -- this is the representation of the Charleston. They had four different geometries. They were differently weighted. The update was primarily based on paleoliquefaction data and Laurel Bauer is going to discuss this open item.

MS. BAUER: As Sarah just said, the third open item for this section is related to paleoliquefaction and the basis for that open item is the paleoliquefaction features that you see further inland from the A source here which was given a weight of 70 percent.

What we did was we basically asked the applicant to provide further documentation on what paleoliquefaction was looked at further inland and the basis for that was because if there is enough paleoliquefaction further inland from Charleston it may necessitate a different source zone model.

What the applicant did was they provided additional documentation based on expert opinion for the paleoliquefaction studies that were done further inland. Let me go back. These liquefaction features, these outliers here, are approximately 45 to 65 miles from the Charleston epicentral area.

Basically what the applicant concluded based on the expert opinion is that the sediments that were located along the Edisto River where these features were found are considered to be liquefiable sediments and it is not unusual to see liquefaction this far from the source zone.

Also the features are fairly sparse versus the features that you see within Zone A here. In addition, there are liquefaction features both to the northeast and to the southwest down here at distances further from the inland liquefaction. Based on that we concluded that having the -- using the source zone

A does not necessarily -- the liquefaction features further inland did not necessitate a different source zone model.

MR. HINZE: I guess what that means is that inland except for the Abasco River --

MS. BAUER: The Edisto River.

MR. HINZE: -- the soils are not susceptible to liquefaction and, therefore, they provide no information on the seismicity of the area. Is that a corollary?

MS. BAUER: Well, one of the experts who did look at the paleoliquefaction, Steve Obermeier, who has done a great deal of work in that area, did, in fact, look along the rivers because the sediments are considered to be liquefiable or, at least, moderately susceptible to liquefaction.

MR. HINZE: We're talking other than the Edisto River?

MS. BAUER: In that general area the Edisto River is the farthest inland that they have looked because along that river the exposures were so good, or at least they good enough to be able to see evidence for liquefaction.

In other areas up to about 30 miles from the coast the sediments are considered to be highly susceptible and as you go further inland moderately susceptible.

MR. HINZE: Whatever that means.

MS. BAUER: One of the problems is while at least three different people did look for liquefaction in these areas, it's not -- it wasn't necessarily documented when they didn't find liquefaction.

MR. HINZE: That's the real problem, isn't it?

MS. BAUER: Right.

MR. HINZE: And you have identified that problem.

MS. BAUER: What we did we asked the applicant to go back and look at some of those areas and they talked to Steve Obermeier and Amick who did work in the early and mid '90s to get some information on where else they might have looked.

MR. HINZE: You also have to be concerned about what time of year they looked, too.

MS. BAUER: That's right.

MR. HINZE: At this point in time we don't really know anything about paleoliquefaction landward of the Edisto River.

MS. BAUER: That's correct.

MR. HINZE: Yeah. I think that's an important kind of conclusion to reach. Let me ask you while we're looking at that diagram, are Jeff Munsey's work with the PBA included in here? Because he has identified a number of new sources of historical seismicity information, identified new events in the southeast and I'm wondering whether those are included in this presentation.

MS. BAUER: Um, I --

MR. HINZE: I know he has one in South Carolina.

MS. BAUER: Liquefaction features?

MR. HINZE: No, no. These are seismic events.

MS. BAUER: Okay.

MR. HINZE: These are historical seismicity.

MS. BAUER: I'm not sure. I don't think that was looked at. I'm not sure -- I couldn't answer for the applicant.

MR. HINZE: I saw no reference to it in the ESP or the SER. It will be interesting to look because they do have some four points or whatever in South Carolina. Newbury County I believe. I don't know where Newbury County is. I've looked on maps and can't find it. It's a potential important source of information.

MR. MUNSON: Is he postulating a different source zone geometry for Charleston?

MR. HINZE: No, these are just events. These are historical events from newspaper accounts, diaries, anecdotal information, etc. You've heard him speak about this and he's done, I thought, a pretty comprehensive job on this.

MR. MUNSON: From what I understand what he did, he is looking for perhaps events that weren't in the original catalog that needed to be updated. The applicant did do that as part of their update of the hazard. They looked at newer events. You're talking about historical events.

MR. HINZE: Yep.

MR. MUNSON: They assumed that the historical catalog was up to date, was adequate for this PSAG that they did so that isn't something that we open for each application.

MR. HINZE: I don't know if one needs to do that for the entire southeastern United States but it worried me when I saw some in South Carolina and that may be proximal. One of the things that would be very interesting to determine is whether any of the triassic ground faults show up as seismicity on his events.

Mike, it's a defense by offense, if you will, because I don't think it's a problem. I think it's just a matter that you have to acknowledge that it's been taken into account.

MS. BAUER: That open item was resolved based on the information provided by the applicant. This is just another slide showing fill liquefaction for both the historic 1886 event and the prehistoric event so you can kind of see the distribution east and west of the site.

The next section on Section 2.5.3 for surface faulting we had one open item. Open item 2.5-10 dealt with injected sand dikes that were observed by the applicant in a trench near the site. We asked the applicant to provide more documentation and further description of those dikes to ensure that these sand dikes were not seismically induced. This is based on the fact that we do have liquefaction and paleoliquefaction features in the region.

This item was resolved. The applicant did provide additional documentation of the field work that was done in the area. That documentation basically allowed us to conclude that, or at least allowed us to close out this open item based on the fact that these features were associated with disillusion features and not seismic in origin. Also that they are pre-quaternary in age.

MR. HINZE: Has that ever been tested by drilling? Drilling into the Utley limestone where you have sand dikes that there is particularly excessive dissolution of the Utley limestone?

MS. GONZALEZ: Has there been something on that, Gary? You're shaking your head.

MR. STIREWALT: This is Gary Stirewalt with NRC. Yeah, Bill. Those particular dissolution features were, in fact, associated with dissolution of the Utley and it's confined pretty well strateographically.

MR. HINZE: Great.

MS. BAUER: I guess I wasn't sure exactly what you meant by drilling down. There was also, if I remember correctly, just two to three features that were found. With that I will move to the geotechnical open items. Okay. For 2.5.4 there are several open items related to the insufficient amount of field and lab testing of the subsurface materials. The applicant relied quite heavily on previous data from Units 1 and 2 site which were collected in the 1970s.

Those have a lot of variability between the new data at the Units 3 -- essentially Units 3 and 4 sites and Units 1 and 2 sites. To resolve this the applicant performed additional field and lab tests -- performed additional field and lab investigations and they reported this as part of its LWA.

That was sufficient to close all of these open items. This table just shows the additional testing that they did as part of their LWA. There is quite a significant amount of borings that they performed which is more than needed for the ESP but they were provided for the LWA so that was more than sufficient to address these open items.

The next open item is related to the shear wave velocity profile of the site. The applicant did not provide enough measurements of shear wave velocity within the Blue Buff marl and the lower sand units. Also the applicant relied on shear wave velocity measurements from Units 1 and 2 sites of the backfill.

They did not actually perform any shear wave velocity measurements of their proposed backfill for the Units 3 and 4 site. To resolve this the applicant performed additional shear wave velocity measurements for the backfill in the Bluff Marl and lower sand. That's open item was closed as a result of this data.

MR. HINZE: Do I understand correctly, though, that there are lower shear wave velocities from down-hole than from the continuous measurements in the hole? Is that right? Does someone have an explanation for that?

MS. GONZALEZ: Can I defer that question to either Jim or Carl?

MR. CONSTANTINO: Yeah. I think I understand you saying at deeper depths there are shallower --

MR. HINZE: The shear wave velocities from the down-hole work tend to be lower.

MR. CONSTANTINO: Tend to be lower than the SASW measurements but there is more variability in the SASW measurements.

MR. HINZE: To integrate out.

MR. CONSTANTINO: I'm not sure if they integrate out.

MR. HINZE: Is the source then of this lower -- also my understanding is that there were -- that the lower values were lower than the previous investigations. Is that correct?

MR. CONSTANTINO: There were some readings that were lower than we had expected, especially below the Blue Buff marl if I remember. Very few, though.

MR. HINZE: I guess what I want to get at is the measurements themselves. How much integrity do we have with the shear wave velocity measurements? Are you satisfied that the shear wave velocity measurements are --

MR. CONSTANTINO: Are good enough?

MR. HINZE: Pardon?

MR. CONSTANTINO: Are good enough?

MR. HINZE: Yes, compatible. If there is a difference from methodology or with time, then you've got to be a little bit concerned about -- sorry?

MR. CONSTANTINO: There are differences in methodology. That is, the SASW tends to give you different mean profiles than the down-hole would give you. Or down-holes tend to be a little lower.

MR. HINZE: What is that true?

MR. CONSTANTINO: The down-holes are really integrating over a long depth, whereas the SASW we do not. It's more of a surface wave phenomenon that you run a long line out at the surface so you extrapolate down to deeper depths and you tend to get different results. The SASW if you are trying to get very deep depths you have a tough time with the SASW.

You need really big shakers to get enough signal down which means you have to measure long distance. If you go too far out this material is the same as this material.

MR. HINZE: We heard earlier this morning that SASW was going to be used to look at the fill material. I think one of the rules we have always used is we need at least two methods, different methods, to make sure that we are getting results in the ballpark. If you look at the scatter in the typical data, a classic example the Yucca Mountain site, there is quite a bit of scatter between the two methods or the three methods if you use the cross-hole.

The cross-hole is fundamentally different and has to be much higher because you tend to measure over a short distance in a horizontal direction. Down-hole you are measuring and integrating the depth. The SASW is really a different kind of measurement.

What we tend to do in the site response analysis is use all that data to try to incorporate that uncertainty into a variability aspect of the probabilistic site response calculation. At the very least we want at least two methods, two different fundamentally different methods to measure velocity.

I guess my question again is you are satisfied that these differences between the methods and the time represent the methodologies, the physical principles of the fundamentals of the methodologies and not the measurements themselves.

MR. CONSTANTINO: We've spent quite a bit of time looking at SASW.

MR. HINZE: That's what I'm asking.

MR. CONSTANTINO: Especially recently, in the last five years trying to understand the discrepancies and making sure that the calculation picks that up. That's really an important issue. One of the complicated factors here is the fact that we are talking about a backfill that at the time all of us came up we didn't know anything about, yet they were being used in calculation of site response using properties that we didn't know about until the test bed program came along. That was one of the issues that we had to worry about.

MR. HINZE: The lower velocities were also associated with down-hole where you actually had a vibratory source at the surface --

MR. CONSTANTINO: Or we had a suspension --

MR. HINZE: -- that you lowered. Right?

MR. CONSTANTINO: That was the suspension log that was lowered. That tends to give you very local --

MR. HINZE: The source is at the surface, not in the hole.

MR. CONSTANTINO: The suspension log of the source goes with the hole.

MR. HINZE: Right.

MR. CONSTANTINO: But the down-hole you're at the surface.

MR. HINZE: You get lower velocities.

MR. CONSTANTINO: I think we have enough data now. We are pretty confident in what the velocity profiles are, especially those that contribute a lot to the computation of the GMRS at the surface.

MR. HINZE: And you fell confident that you have the methodology to evaluate the fill material once that is put into place? How do I say that? Can't you say yes?

MR. CONSTANTINO: We have a test bed program. We put in place, as you've heard other people talk about, a compaction program whose goal is to essentially ensure uniformity of the material coming in.

That is a lot of material to be placed and the details of how you place it, how you make sure densities are correct, and how do I make sure that material is equivalent to what is in the test bed where I know what the velocities were is all part of this program. If we do a good job on that, then you would say yes, we are confident what we are going to see in the backfill is what we assume in the calculation.

On top of that we've done a range of problems on the assumed profiles to look at assumed velocities through the backfill to try to get a handle on how significant that is. I think we have a good handle on site response. And coming from across the river, Savannah River site, where we have done this for 20 years gives you a little bit more confidence.

MR. HINZE: Thank you.

MS. GONZALEZ: This figure just compares the original ESP velocity data with the additional data that was collected. The additional data is shown by the pink curve and the original data is the blue curve. As you can see they are very similar. The applicant also performed a sensitivity analysis to show that the original ESP data was adequate to be used in the site response analysis. That open item is closed as a result of this.

Open item 2.5.19 was related to the shear modulus reduction and damping curves. For the site response analysis the applicant relied on generic EPRI, shear modulus reduction and damping curves, as well as curves developed for the nearby Savannah River sites.

They didn't develop an of their own site-specific curves based on data tested at the sites. To resolve this open item the applicant performed rhythmic column and torsional shear tests and developed its own site-specific shear modulus reduction and damping curves. This just shows their shear modulus reduction curves that they developed for different units. The next slides shows the damping curves.

Using these curves the applicant performed a sensitivity study and the results show that the EPRI and Savannah River site curves remained adequate for use in the site response analysis so they didn't have to update. We do their entire site response.

The applicant's site response analysis and liquefaction analysis assumed that the upper 88 feet of material had been removed so there is just a permanent condition requiring that this layer be removed because of its susceptibility to liquefaction. That is permanent condition one.

All 12 of the COL action items were resolved through the applicant's inclusion of additional information as part of the LWA or Revision 4 of the SSAR. They were resolved with this additional data. That's everything.

MEMBER RAY: With the additional data and the permanent condition.

MS. GONZALEZ: Um-hum.

MEMBER ARMIJO: I may be the only one that doesn't understand what permit condition 1 says. Can you explain that? Improve the soil -- "This issue improves soil above 88 feet below the ground surface." I don't know where I am.

MR. CONSTANTINO: From the Blue Bluff Marl on up.

MS. GONZALEZ: Yeah.

MEMBER RAY: Go down 88 feet and then you go back up.

MEMBER ARMIJO: Eliminate everything from the top of Blue Bluff Marl to the ground.

MR. CONSTANTINO: Okay. All right. I understand that. Thank you.

MR. HINZE: Can I ask a very quick one

just as a matter of knowledge?

CHAIR POWERS: You can.

MR. HINZE: Considering the suggestions that have been made about New Madrid and the aftershocks as a possibility of an explanation of the current seismicity, is there any suggestion that the current seismicity in the Charleston seismic zone follows one of our laws regarding aftershocks? Is there any reason to believe that what we're doing is we don't see really a seismic source zone but we have seen an isolated earthquake here and what we are seeing now is the aftershocks.

MS. GONZALEZ: There is a lot of paleoliquefaction data and not just from the Charleston event from 1886. Maybe Laurel can explain this in more detail but there are more events.

MS. BAUER: I would say there is more -- there's a lot better data even for New Madrid than there is for Charleston.

MR. HINZE: And the aftershock sequence would not be applicable

MS. BAUER: I mean, I think it's pretty highly debated.

MR. HINZE: I understand. Thank you.

CHAIR POWERS: I propose that we will now break for lunch and come back and continue the presentation.

MR. ARAGUAS: We have about another six slides.

CHAIR POWERS: I think we'll break for lunch. We will resume at 1:30.

(Whereupon, at 12:24 p.m. off the record for lunch to reconvene at 1:30 p.m.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

1:29 p.m.

CHAIR POWERS: Let's come back into session. Christian, you are going to continue. We are going to move to emergency planning now?

MR. ARAGUAS: Correct.

CHAIR POWERS: Bruce, are you the one?

MR. MUSICO: Yes, I'm the one. Good afternoon.

CHAIR POWERS: Are you responsible for this?

MR. MUSICO: I'm at fault and I feel sorry for anybody that had to read through all 365 plus pages.

CHAIR POWERS: Anything you write pales in comparison to the geological characterization.I

MR. MUSICO: I'll tell you, I was supposed to be on this morning and I didn't get on to right now but I appreciate --

CHAIR POWERS: This is morning in some places.

MR. MUSICO: -- because I learned about

liquefaction and I got to see some beautiful slides. That meant a lot.

Emergency planning, Section 13.3.

CHAIR POWERS: Your's pale. You've got to dress up these slides.

MR. MUSICO: Okay. Anyway, I'm Bruce Musico. I'm a senior emergency preparedness specialist within the Office of Nuclear Security and Incident Response, NSIR. I am the responsible reviewer for Section 13.3, the emergency plans that were submitted in support of the Vogtle ESP application.

This application, as you can see on the first slide, is unique in that it's the first emergency planning review under the Part 52 licensing process. It's the first example of an application that's been submitted that has a complete and integrated emergency plan including a submitted off-site emergency plans. And so the review that we did for this application is basically the same review that we'll be doing for the COLAs, the combined license applications, coming in.

Under the Part 52 ESP licensing process applicants are allowed to submit complete and integrated emergency plans and there are other options they can come in with but this is the first one in which they came in with the complete and integrated emergency plan compared to the first three early site permits in which they submitted major features of emergency plans. Again, this is unique and this is characteristic basically of the future COLA applications that we are going to be seeing.

CHAIR POWERS: You should provide Southern Company with remuneration for the training they have provided here?

MR. MUSICO: To provide me?

CHAIR POWERS: Yeah. Have they given you an opportunity?

MR. MUSICO: Actually I consider this a tremendous benefit not just as far as my personal learning curve. That is the Southern as well as the citizens around that plant because in essence the NRC has here re-baselined the review of the entire emergency planning program for the Vogtle site.

If any question was brought up to the utility or otherwise to the state, they can point to the safety evaluation report and then get a good baseline evaluation, comprehensive evaluation, of the existing emergency plan and see that the NRC approves it, or will approve maybe. Okay. I'll be careful what I say. We have moving targets here.

Now, unique to this as well under the Part 52 licensing paradigm is that this provides an example of the very first submission of ITAAC, Inspections, Tests, Analyses, and Acceptance Criteria, the ITAAC. As you are aware, the emergency planning program is basically the only program area that has ITAAC associated with it.

I believe that was pursuant to the Energy Policy Act of 1992 and then follow-up acts. That is significant in this regard and, again, it's the first set of ITAAC that we've seen under the Part 52 licensing process.

The initial SER with open items that was issued was dated August 30, 2007 and issued September 14, 2007. We identified 13 EP open items and 3 COL action items. Southern did a real good job of explaining the closure of those open items and got some of the detail of what they were so I won't get involved too much in those details unless you ask.

In essence all 13 EP open items were closed and we'll get into that in a minute. The advanced SER, which you're looking at now, there are no EP open items. There are no longer EP COL action items which were transformed into seven EP permit conditions.

Next slide. Okay. As I said, Section 13.3 of the Vogtle SER with open items -- Section 13.3 is the emergency planning -- was issued with a total of 13 open items all of which were closed, resolved, and three COL action items which were actually removed or changed to permit conditions. The one open item I'm going to focus on a little bit is open item 13.3-4. That one deals with probably one of the most thorny issues that we had to deal with, emergency action levels, or EALs as we call them.

This presented a very problematic area in our review in that in doing the early site permit application review we were faced with having to deal with parallel dependent licensing actions in essence consisting of our separate NRC endorsement review of Nuclear Energy Institute, NEI 07-01 which deals with EALs for advanced passive reactors, primarily the AP1000s which we have here, as well as the ESBWR. That is a work in progress. The EAL, the final EAL scheme, was not yet resolved which is being utilized in this application so we had to have a mechanism for accommodating that moving target.

In addition to that, to make it more interesting, connected to NEI 07-01 again is the

AP1000 DCD, design control document. It is undergoing a parallel review by the NRC in a rulemaking proceeding in which we currently have in existence I believed Rev. 15 of the DCD, but we've also received Rev. 16 Technical Report 134 which supplements that.

I believe we received Rev. 17 of the DCD but the rulemaking associated with that, again, is not yet complete. When that is complete that will help populate NEI 07-01. Again, these two have been incorporated as part of the EALs associated with the emergency plan that we are reviewing. In short we have two moving targets that we have to accommodate in our current review of an early site permit. We have done this through the process of proposing permit conditions.

MEMBER BONACA: Portions of the emergency plan is common to Units 1 and 2.

MR. MUSICO: Yes, that's correct.

MEMBER BONACA: How do you control changes? I mean, there will be changes taking place in the emergency plan because of Units 1 and 2 and also may apply to Units 3 and 4.

MR. MUSICO: That's correct. In fact, we actually asked an RAI with respect to the implementation of this proposed emergency plan. The proposed emergency plan in ESP is for Units 1, 2, 3, and 4.

As Southern said this morning, that emergency plans are focused on the site, not necessarily a particular unit but a site emergency plan or onsite plan accommodates the individual reactor units. Vogtle is not unique in that there are other plants that we have emergency plans for that have multiple reactor units. for example, Salem Hope Creek has three units. Palo Verde I think has three.

MEMBER BONACA: Do they have to resubmit this information at the COL stage or --

MR. MUSICO: No. There is a process by which they would revise the existing emergency plan for Unit 1 and 2 to then implement or put in place those aspects of the proposed emergency plan dealing with Unit 3 as it comes on line and then dealing with Unit 4 as it comes on line. That particular process is through 10 CFR 50.54(q) in which we are approving their proposed emergency plan for Unit 3 and 4, not 1 and 2.

Then at the time when they want to actually implement it or put it into place, they would have to go through a 50.54(q) process to show us that there is no decrease in effectiveness of the on-site emergency plan if they expand it to include Unit 3 and then Unit 4. We have an existing process in our rule that accommodates that.

MEMBER BONACA: Thank you.

MR. MUSICO: Okay. Where was I? The permit conditions. As Southern said this morning, they are numbered two through eight. Two through seven reflect three sets of permit conditions. These six permit conditions actually reflect, I believe, two of the three former SER with open items, the former COL action items. What we originally had as COL action items we just changed to permit conditions and these are the six permit conditions that we identified.

Two and three, as you can see, deal with Unit 3 and Unit 4 with respect to NEI 07-01 when that endorsement review is done. Then permit condition 4 and 5 pertains to Vogtle Units 3 and 4 as a result to reflect the final rulemaking that's associated with AP1000 DCD.

Then six and seven essentially parrots what is in Appendix E, 10 CFR 50, Appendix E. It's kind of a catch-all but it covers such requirements as the final set of emergency action levels must be reviewed and agreed with with the state and local governmental authorities. It has to be preapproved by the NRC.

It also has to reflect the on-site as-built aspects of the plant so there are a lot of moving pieces here and we think we have captured them all in these six permit conditions. We have something else to supplement that sort of belt and suspenders in that we actually identified an ITAAC as well to accommodate EALs.

When these were developed and when the review was ongoing our determination of what is necessary at this time for EALs and how to accommodate these moving targets, these parallel dependent licensing actions in the review that's ongoing right now we have to struggle with the procedural mechanisms or the licensing mechanisms and we worked with the Office of General Counsel closely and it was decided to go with the permit conditions as far as the EALs were concerned.

The final permit condition dealt with the TSC location. This was interesting in that the AP1000 certified design calls for the TSC to be located in the annex building close to the control room and Westinghouse identified it as a Tier 1 information item which means it's a higher level of assurance that if you want to change it you have to submit an exemption I believe.

What Westinghouse is doing here, and this is one of the ongoing aspects of the rulemaking associated with the AP1000 DCD is that Westinghouse has proposed a change for the TSC location from a Tier 1 location to a Tier 2* information item in the certified design and these are defined in Appendix D of Part 52 as far as what Tier 1, Tier 2, Tier 2* is.

Tier 2* basically means that an COLA applicant would not have to submit an exemption request with the application to change the TSC location. They merely request the NRC to approve a change. In this case the COLA actually was the vehicle -- would be the vehicle to request that change. The rulemaking was to preclude the necessity of subsequent or perspective COL applicants from having to submit an exemption request with their COL application.

What we have to eal with here is that it is still an ongoing rulemaking process so we have a permit to accommodate that with a COLA. The COL application will have to resolve that. Again, for this ESP application we had two moving targets. We had NEI 07-01 and our ongoing endorsement review of it. Then we have the rulemaking for the AP1000 DCD.

Just as a side note we are currently reviewing the combined license application for Vogtle so we have the added benefit of having to deal with three moving targets, the NEI 07-01, the AP1000 rulemaking, and the incomplete nature of the ESP application which we are dealing with so we've got some moving targets that we are trying to accommodate.

MEMBER RAY: On that point of the TSC the SER also -- I'm trying to find it here. It's a substantial thing to have to find your way through -- does express a view about the acceptability of what you understand to be the intended location of the TSC.

MR. MUSICO: Yes. Would you like me to comment on that?

MEMBER RAY: Yeah, because that would seem like here you are expressing an opinion about something that, as you yourself have described, is still a work in progress and is proceeding.

MR. MUSICO: Yes. Yes. The description that you are referring to was the staff's analysis with respect to lessening the guidance that is contained in NUREG-0696 that calls for the TSC to be located approximately two-minute walking distance from the control room.

For those that are aware of the history behind emergency planning and post Three Mile Island, TMI, the concept of having a technical support center was initiated after that and it was found that at TMI the control room was over-burdened with too many people coming physically into the control room to try to help support the operational crew. The concept of requiring a technical support center in essence to back up the control room with technical support so the engineer --

MEMBER RAY: Look, trust me, maybe the other members aren't as familiar but I'm really familiar with that. The point I'm trying to make is it says, "From a support and functional standpoint the staff finds the applicant's proposed TSC location is acceptable subject to a demonstration of adequacy during the full participation exercise." Then that refers back to the ITAAC that you mentioned.

It just seemed odd to me given the explanation that you were just now going through and all of the value of having the ability of people from the TSC to go in and talk face to face in the control room and the rest of that, the NRC is located there as well, that you would reach this kind of conclusion at this point here. I guess I'm wondering how that came to be given the permit condition the way it's worded.

MR. MUSICO: Well, I thought that the basis for accepting the change in the TSC location was clear in the safety evaluation report but obviously it wasn't as clear as it could have been.

MEMBER RAY: The arguments in favor of locating it close are strongly made. The arguments for why it doesn't need to be so close are a little less clear.

MR. MUSICO: The arguments for having it close were based on guidance that was issued in 1981, NUREG-0696 1981. TMI occurred in 1979 so the guidance was put out shortly thereafter. That guidance was based to a certain extent on the necessity of having face-to-face communications between plant managers, technical staff where if they needed to they could walk to the control room and have face-to-face conversations with the operators.

What I said in the justification for allowing some flexibility with the location of the TSC was to accommodate the number of years that have passed and the increase in technological improvements and communications and various other factors that I cited there as reasonable basis for allowing more flexibility.

The two-minute walking distance, first of all, it's not a requirement. Secondly, I believe it says approximately two minutes. We had previously considered this issue when we were working with the development of a second document.

I believe it was SECY 05-0197. I believe that was the one which dealt with this particular issue. We have also dealt with it recently in the context of the AP1000 certified design as the basis for allowing the change from the Tier 1 location for the TSC to Tier 2* --

MEMBER RAY: Okay.

MR. MUSICO: -- in the context of Technical Report 107 which I don't believe is out yet. This paraphrases the basis that is provided in Technical Report 107 to the Westinghouse DCD Rev. 16 and Technical Report 134.

MEMBER RAY: Okay. Let me just summarize by saying tomorrow we are going to discuss a completely different subject where a similar sort of thing. We have a requirement and then we find in specific cases we have good reason to not -- I shouldn't say we have a requirement. Excuse me. We have an expectation, let's say. We have some statement about what should be the case in this case relative to the proximity between the TSC and the control room.

Later on we decide for good reasons that you refer to here that we can do something different. It becomes a precedent. I guess all I'm saying is this is the point at which that precedent is created. There may be other stuff in the pipeline that will sanction other locations and the use of sophisticated communication technology and do away with the need for face-to-face communication and all of that but this is the place where it actually is happening it seems to me.

MR. MUSICO: I agree with that on its face in that absent anything else that would establish a precedent. But in the process of going through this analysis in the context of the Westinghouse Technical Report 107, it was brought to my attention that we have previously approved a location of a TSC located 15 minutes from the control room. I don't recall off hand what plant that was for. I can get that for you if you would like.

MEMBER RAY: No, no. I mean, that's the sort of thing that I guess I'm troubled by is that we often think we have a requirement and then we find it over and buried in some other proceeding somewhere.

We haven't enforced it and that then becomes a reason to not enforce it for anybody. That is the thing that I guess I'm just mentioning to my colleagues on the committee here.

This is more than just "we'll deal with it later" kind of an issue. I think there is a conclusion reached here that it may be perfectly fine but it's a conclusion different than what the conclusion was before. It may be the second time we've done it but we're doing it now and I just want to make that explicit.

MR. MUSICO: That was realized when we were going through the review. In short, if you want to sum it up, the short response is times have changed. Technology has improved for communications lessening the need to have someone physically that close to the control room.

Now, there are other considerations that came into play, one of which I believe I mentioned, and I can't get into it but it has to do with the security aspects post-9/11 with respect to the location of the TSC. That's a separate issue. That was a factor in the consideration. That is a good observation that this does, in fact, not set precedent, reinforce that precedent. We recognized that when we did it.

MEMBER RAY: Okay. I'll make one last comment and then I'm finished. The general reference to improve communications I think we can all understand and agree with. What it specifically means, though, for this TSC where do you expect that to be dealt with? What communication are we going to have that make it okay to move the TSC a little further away from the control room? It's not in the next county I realize.

MR. MUSICO: It's in the next section back, I believe, a few sections back, in that the communication capabilities are fully described with respect to what is available on site. Radios, telephones, and various other mechanisms for communications.

MEMBER RAY: But that is not -- that doesn't fall in the category -- I thought you were talking about more modern sophisticated things than telephones and radios.

MR. MUSICO: Well, cell phones.

MEMBER RAY: And cell phones.

MR. MUSICO: That's a consideration. At the time when that guidance was in effect I was around then.

MEMBER RAY: As was most of us. I actually built two TSC so I've painfully went through that.

MR. MUSICO: I found myself in the position not too long ago where I was talking to one of our relatively new hires who is a nuclear engineer. He was doing emergency planning with us. We just hired him and I was getting into this long conversation about Three Mile Island as if he was there at the time.

I went back to my cube and I realized he wasn't even born at that time. I felt kind of silly. The point I want to get to is that at that time I was involved in emergency planning, writing some of the initial plans at many plants and actually conducting exercises and drills in the TSC and other facilities.

At that time one of the most complicated communication tools that we had was a fax machine. There weren't too many people that new how to operate it. I was one of those. We had to get a technical person or a secretary to come in and determine if the paper needed to be face down or face up and then what do you do.

That was the state of technology at the time in 1981 when this two-minute walking distance was initially conceived. A lot of time has gone by. Things have changed. Technology has improved substantially. Cell phones are a big part right now and that was taken into consideration. The point I was trying to make is that there are many considerations and taking them as a whole they supported being less rigid on that guidance. It's not a requirement, it's a guidance.

CHAIR POWERS: Let me ask you a question about cell phones.

MR. MUSICO: Pardon?

CHAIR POWERS: Let me ask a question about cell phones. I have spoken to people worried about evacuations and the coordination of activities among multiple agencies in connection with evacuations. What they find historically there is a great deal of trouble with people and coordination from agencies because the radio frequencies don't match. They said, "Well, that's less of a problem now because we have cell phones." Then they find out in recent evacuations that the cell phone usage is so high during one of these that they are practically inoperable.

MR. MUSICO: Saturated.

CHAIR POWERS: Saturated usage. Is that a consideration when you invoke cell phones?

MR. MUSICO: A consideration when what?

CHAIR POWERS: When you invoke cell phones does it improve communication?

MR. MUSICO: I didn't get into it in that level of detail. The existence of cell phones was just a redundant form of communications, just another layer on the available communications.

CHAIR POWERS: I guess what I'm asking you is how good is that?

MR. MUSICO: How good is that?

CHAIR POWERS: Yes. If you've got a TSC population why wouldn't you have saturated cell phone service?

MR. MUSICO: I'm not sure how to answer that but the cell phone is not the primary communication tool that is utilized. Again, it was just a factor to consider the distance but there are multiple redundant communication links that would exist between the TSC and the control room and the NRC that if one went down, others would be available.

In the worse case you may not be two minutes away, you may be four or five minutes away but you are still relatively close. I would find it hard to believe that all the communication links between the TSC and the control room would fail at the same time.

I guess an answer could be that our review standard NUREG-0654 in which we do these reviews was written in 1980 and cell phones essentially weren't around then so that is not one of our review criteria but that falls under the category of things have changed and technology has advanced.

MEMBER RAY: Okay. I thought you had something in mind other than cell phones as the technology changed but this is probably not the right place to have this debate. I just wanted to call attention to the fact we are in agreement, it appears, that this is a point in time which this was previously thought to be an important attribute is now viewed differently. I just think we need to acknowledge that and move on.

MEMBER MAYNARD: I agree with Harold. There are some other improved technologies for communications you really haven't brought up. I think we need to be careful counting on the standard cell phone because that system is going to get saturated.

There are abilities to have those isolated and cut off to where if you make prearrangements I know the state and local governments usually have a way to get priority on the cell phones but that has to be done ahead of time. You just have to be careful about relying on cell phones unless you have some special arrangements in place.

MR. MUSICO: Right.

MEMBER RAY: There are some other communication devices at some of the plants that have been implemented that is kind of a combination of the radio and cell phone but it's kind of on their own system and it's dedicated to them. There are some technologies out there but I think you've got to be careful with just cell phone. I agree with Dana. I think during an emergency that is going to get -- the standard system is going to get saturated to the point it's not usable.

MR. MUSICO: Right. I agree with that. I don't want to -- I didn't try to emphasize that cell phones were this solution to a communication problem. It was cited merely as an example of an additional redundant communication capability. There are dedicated communication lines between the facilities that would be available.

MEMBER RAY: That was true in 1980 but, again, I think you have explained what your thinking is and we'll have to ponder it.

MEMBER MAYNARD: Could I ask a question so I understand? What is really being approved on the location of this? I mean, they have identified moving it out but not necessarily a defined location for it.

MR. MUSICO: They have generally defined where the location is going to be.

MEMBER MAYNARD: Does that have to be there or this approval is no good?

MR. MUSICO: The approval is applicable to where they say it's going to be. It's going to be between the Units 2 and 3 power blocks and we are asking for some more information with respect to the exact location.

MEMBER MAYNARD: I'm just trying to understand what is being approved. At what point would they have to come back, the licensee or the applicant, the COL, have to come back for additional approval if they wanted to locate it in a different location?

MR. MUSICO: Well, if they wanted to locate it at a different location in the COL application, they could propose a different location. These ESP basically says the proposed location between the Units 2 and 3 power blocks is acceptable for the reasons that are cited in the SER.

MEMBER MAYNARD: What I'm really trying to get at is it considered a proposed location because it's still got to go through the amendment process for the Tier 1/Tier 2 is is this just something that is proposed that means different things to different people? Is this something we're thinking about or is this something that they are really trying to get this pinned down to once they go through the amendment process?

MR. MUSICO: It's the latter. This is the actual location that they are going to put it. The amendment process they would come in with deviation? Departure -- departure from the AP1000 DCD pursuant to a Tier 2*. They are departing from that and say, "We want to have it at a particular location. We have identified that location in the early site permit application and the staff previously found that acceptable."

MEMBER MAYNARD: That answers my question.

MEMBER RAY: I apologize for having been late, Mr. Chairman. Therefore, you may have addressed this fully and you just need a brief answer. It was stated in your first slide that it was the first complete EP review under Part 52. Did you indicate why that was the case? In other words, was it the applicant who wished to have the emergency plan fully reviewed in the ESP?

MR. MUSICO: Yes. Yes. This is an early site permit. As you know, there are two of the options that they can come in with, major features of the emergency plan which the first three EPS applicants came in with.

They had the option under our Part 52 licensing process, Subpart A, to come in with a completely integrated emergency plan. Southern chose to propose a completely integrated emergency plan to get prior approval of the proposed emergency plan for Units 3 and 4 in order to get finality at the earlier states.

MEMBER RAY: Thank you.

MR. MUSICO: Okay. Moving right along, in addition to the -- with respect to the EALs, in addition to the permit conditions we also have identified an ITAAC. Again, that is Inspections, Tests, Analyses, and Acceptance Criteria. If you look at our ITAAC table you will see there are four columns, these four bullets that represent the four columns. The first one merely parrots what's in the regulations pertaining to the emergency classification EAL scheme which is 5047(b)(4).

The second column deals with the NUREG-0654 guidance evaluation criteria D.1 which applies to that. Then the applicable ITAAC, the Inspections, Tests, and Analysis 1.1.2 says an analysis of the ELA technical bases will be performed to verify as-built site-specific implementation of the EAL scheme. Then the Acceptance Criteria is that the EAL scheme is consistent with Reg Guide 1.101 and that related to NEI 07-01.

The latter two bullets correlate to the permit conditions with respect to EALs. It just provides additional assurance.

CHAIR POWERS: Doesn't Reg Guide 1.101 already exist?

MR. MUSICO: Reg Guide 1.101 already exist, yes, but Reg Guide 1.101 there are revisions that come out. I think Revision 5 is the latest that's out. Let's say there could be a Revision 6 that would endorse, would include the endorsement of this document.

We utilize Reg Guide 1.1 to endorse and to approve various aspects of emergency planning. It's just updated as things are approved going forward. That is the vehicle by which the NRC will likely endorse NEI 07-01 EAL model for guidance.

MEMBER MAYNARD: Just from an administrative standpoint these reg. guides do get revised.

MR. MUSICO: Yes.

MEMBER MAYNARD: Is there a need to pin it down any better, the latest Reg Guide, the latest revision, or is it the revision that was in effect so many months before application?

MR. MUSICO: The applications when they come in they usually cite which regulations and guidance that they are based on. They are based on -- I think there is actually a rule that says they have to be based on the guidance or regs that are in effect six months prior to submission of the application.

In this case the frequency that the NUREGs are updated is not that frequent. For example, 0696, which deals with facilities and equipment, the last update was 1981. 0654, which is the primary guidance document that we utilize to evaluate, complete, and integrate emergency plans, that is 1980. There was a small supplement to it. Actually there were three supplements to it and an addenda but essentially that's a 1980 document that we're using.

We looked at -- we did look at them closely with respect to the extent that they would support this new licensing process under Part 52 because these NUREGs were written in support of the Part 50 licensing process.

We were concerned will they accommodate and support and satisfy the requirements under the Part 52 licensing process and our conclusion was that they would with certain clarifications to accommodate variances in the rules that have occurred over time as well as the procedural nuances associated with the timing of actual construction of the plant. Hence, ITAAC, for example.

It is a very good tool with respect to accommodating various aspects of the as-built plant that we won't know until they build it but we are going to give them 100 percent operating license before the plant is even built so we have these procedural tools to accommodate that. We have ITAAC, we have permanent conditions, we have COL action items and various other procedural mechanisms. That's it. Any questions?

MEMBER RAY: There was a statement in the SER. I'll just read it here. It says, "The staff does not agree with the statements that all EAL levels that are not yet fully developed will be developed before a COL is issued and that no EAL ITAAC are required." You go on to explain why that is and I don't find fault with it. I guess I just want to find out a little bit more about was there some disagreement on this point?

MR. MUSICO: No. Well, there is a disagreement with respect to the statement that they made that all the EALs could be defined before the COL application came in. If you look at the slide that's up there, you can see the second bullet, the small bullet right at the end, says, "The plan shall identify parameter values and equipment status for each emergency test equipment status." That's as-built dependent because in many cases they would not know what the specific equipment is going to be.

MEMBER RAY: I agree with your rationale. I just wondered if there was some other rationale that was still in dispute.

MR. MUSICO: No. I'm a little unsure what you're asking about.

MEMBER RAY: Is there still an outstanding disagreement?

MR. MUSICO: No, there is no.

MEMBER RAY: To your knowledge?

MR. MUSICO: There's not.

MEMBER RAY: Okay.

MR. MUSICO: When I brought that to their attention they agreed with that and made the correction.

MEMBER RAY: Okay. Fine. Similar in here and, again, I'm having trouble finding things as quickly as I would like but, anyway, it indicates that the new TSC which will serve all four units can accommodate emergency at any or all of the units. Can you say anything about what you did to make sure that all parts of that was true? That is to say, assuming a seismic event or a site-related event of some kind where all the units are placed in emergency status?

MR. MUSICO: Well, yes. Southern can, I'm sure, speak with respect to all.

MEMBER RAY: I've already asked them but go ahead.

MR. MUSICO: Okay. Well, we have the procedural tools to ensure that the TSC will be adequate after it's built. We have the ITAAC. If you look at the detailed ITAAC the ITAAC specifically addressed certain functional capabilities that are necessary in the technical support center.

Then to ensure that everything works the way it should, including possibly exercising dual accidents at multiple units at the same site, we are going to have an exercise that will demonstrate the ability of the emergency plans to accommodate an accident at one or more units. We have ITAAC that identified the capabilities that would need to be in place at the as-built TSC and then the exercise would facilitate the demonstration that everything works as it should.

MEMBER RAY: Okay. I don't mean to be picky but one or more isn't the same thing as all.

MR. MUSICO: Well, it would be one and four.

MEMBER RAY: Okay. Well, that's fine then if that's what you mean. Okay. Thanks.

MR. MUSICO: Anything else? Thank you.

MS. COFFIN: I just wanted to sort of add to assuming that -- this is Stephanie Coffin, AP1000 projects branch chief. On the discussion of the technical support center and its location and, Bruce, I would like you to correct me if I'm wrong, but when we're looking at moving that location from where it was, say, in the original Rev. 15 design, it's not just time distance between that and the control room.

There also can be very strong advantages to having a common technical support center and that may offset -- you know, you need to look at the whole picture and having a common TSC to support certainly the two units 3 and 4, or all four units should that come to pass, can be a very strong tool and helpful tool in emergency planning for the site.

MR. MUSICO: Right. I made that argument in the justification for approving the change that you were citing.

MEMBER RAY: Yes, you did. As I said before, I built two TSCs and the reason was, another one on the same site, the opposite conclusion so people change, times change, opinions change.

MR. MUSICO: Let me just add to that as well as far as precedence. What we are seeing is that subsequent COL applications that are coming in are likewise proposing common TSCs so this appears to be a trend.

MEMBER RAY: I can think of a lot of good reasons for it. It's just at the time that we did it, when I was doing it, the weight of concern was proximity and the capability to support which were different units but on the same site, different TSCs. Like I said, I don't want to get back into ancient history, and it is ancient history, but the point is I'm just trying to figure out why our opinions change. We have different people and they think maybe this would be better. If you have something more specific, I would like to know what it is.

MR. MUSICO: There is which I can't get into because I'm not involved in it but when you consider security-related aspects associated with the new reactor license applications, you may see criteria that addresses the TSC location and that was, in fact, a factor.

Not a determining factor but a factor in the consideration of allowing the TSC to be located farther out than two minutes so it might assure you with respect being comfortable with this change in TSC location when you see the arguments made with respect to the security aspects associated with the TSC which I'm not involved in. Again, it's a factor.

MEMBER SIEBER: There were exemptions granted right after 0654 was issued that allowed variations in that because if you took advantage to that there was always some comp measure, for example, better information about what's going on with the control.

It seemed to me the most important of the characteristics of the TSC was the protection of the people that were in there. If you couldn't put them in a shielded radiologically secure place, then you had to move to the best place you could that was reasonably close to the control room.

MR. MUSICO: Right. That's a separate but related guidance requirement.

MEMBER SIEBER: That's more important because that is part of your license.

MR. MUSICO: Well, it's as important because if it's not habitable they can't support the control room. However, if you can't communicate with the control room, you can't support them as well.

MEMBER SIEBER: You should have multiple means to do that.

MR. MUSICO: Well, Vogtle will be fortunate in that they will have multiple TSCs on site where they have the availability of a backup TSC. In other words, the former TSCs to back up the new TSC.

MEMBER SIEBER: We had that, too. Everybody I think in the early days approached that in a different way because the plants were built before the concept of TSCs were out there.

MR. MUSICO: That's correct, and that's why we had TMI action items associated with 5034(f).

MEMBER SIEBER: Right.

MR. MUSICO: Thank you.

MR. ARAGUAS: Okay. That brings us to the conclusion of the ESP presentation. For this slide here what I have identified are just the conclusions that are called out or some of requirements that are called out in Part 52 for review of an ESP. In conclusion the ESP application meets the application standards and requirements of the Act and the Commission's regulations.

The site characteristics, design parameters, and terms and conditions proposed to be included in the permit meet the applicable requirements of Part 52. The staff feels that there is reasonable assurance that the site is in conformity with the provisions of the Act and the Commission's regulations.

The proposed emergency planning ITAAC, as Bruce has discussed, are necessary and sufficient, within the scope of the ESP, to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the emergency plans, the provisions of the Act, and the Commission's regulations.

Lastly, issuance of the permit will not be inimical to the common defense and security or to the health and safety of the public. That concludes the ESP presentations.

MEMBER MAYNARD: Mr. Chairman, are we going to have anymore discussion on the seismic items related to --

CHAIR POWERS: We will get to that in connection with the Limited Work Authorization.

MEMBER MAYNARD: Limited Work Authorization. Okay.

CHAIR POWERS: We will probably in that discussion come back to conclusions because I'm not sure I'm ready to buy this yet.

MEMBER MAYNARD: If we are leaving this totally, I'm not sure --

CHAIR POWERS: We never leave anything totally.

MEMBER MAYNARD: That's fine with me.

MR. ARAGUAS: Do you want to just jump into the --

CHAIR POWERS: Yeah, the Limited Work Authorization. Only at the NRC would somebody have to submit an application to pen sand.

MR. ARAGUAS: Let me bring up the appropriate staff for this presentation. Okay. That brings us to the LWA presentation. Before we get to the technical discussion I thought it would be a good idea to go through and just a refresher on the LWA rule that we have at hand and what Southern has taken advantage of.

With that, the final amended LWA rule was issued October 9, 2007. The rule became effective in November of 2007. The LWA process allows for applicants to perform limited construction before the COL was issued and I'll cover what those limited activities are and how that correlates with what Southern has requested.

The new definition of "construction," which is what the LWA rule attempt to define, or does define, is consistent with the agency statutory authority. Under that, the activities that may be authorized under an LWA include: the driving of piles, subsurface preparation, placement of engineered backfill, concrete, or permanent retaining walls, and installation of foundation.

When an applicant submits an LWA request these are the four items that must be submitted as part of that LWA request. That is the Safety Analysis Report only specific to the items they have requested, the applicable ITAAC, environmental report, and a site redress plan.

With respect to Southern's request, if you recall we mentioned this at last year's meeting but what they submitted originally in August of 2007 was an LWA-2 request. The reason why they did that was the current amended rule had not gone final and so they took advantage of what was already there at the time which was to submit an LWA-2.

On November 30, 2007 Southern Nuclear revised its application to conform to the new rule. What that did for them was under its previous application -- under its previous revision they had submitted an LWA-1 request. With this new rule what that has done is actually said all those activities that you requested under LWA-1 are no longer -- you no longer need approval for.

By amending the application they are able to take advantage of the new rule that says, "Hey, if they want to go and start excavating, they don't need our approval to do that."

So what did the LWA request actually ask for? I'll cover that in a second. These are the areas that I'm going to focus on that actually what they provide as far as the LWA request. As you can see we have touched on Section 2.5.4 which is the geotech area for ESP. They have actually provided additional information with respect to the backfill in that area.

In 3.8.5, which is foundations, they talk about the mudmat and they talk about the waterproof membrane they are requesting to place. And 13.7 because they requesting approval for a limited set of construction activities, they are required to have a fitness for duty program in place so that's what you'll see in 13.7.

For Section 17 for QA they are required to submit a QA Program as part of the ESP. What this does now amends their QA program to expand out to those activities that are being done under the LWA.

That bring us to discuss what was actually requested. They are requesting to place engineered backfill at the site and to construct retaining walls. Those are the stabilized earth walls. They are requesting approval for placement of lean concrete backfill, mudmats, and waterproof membranes.

Now that brings us to the technical discussion. I'll turn it over to Weijun.

MR. WANG: My name is Weijun Wang. I'm a geotechnical engineer. You may remember in the '80s there was a computer company named Wang. It no longer exist.

Okay. I'm going to present the staff review on the Vogtle LWA request for the Section

2.5.4. We have quite a few people involved in this review. Jim George and our consultant Dr. Costantino. They are ready to answer any questions you may have. This slide and the next one give a summary of what the applicant has done for this LWA request. Later on I will discuss those items in detail.

I think everybody can imagine if from ESP to LWA mean you are going to do some real work there so you can imagine we will have more questions related to the material and the foundations. Because of that we issued 26 RAIs. For that 26 RAIs we have three main concerns. The first one is the adequacy for the site investigation.

We have a lot of concern and I will give a little bit detail. The concern is the adequacy of the engineering properties of subsurface materials. The third one is adequacy of backfill specifications. I'm going to talk about why we have a lot of concerns.

For the first one about the borings, you may recall the ESP site investigation there were only 14 borings. The 14 borings did not cover the footprint of AP1000 design. Out of the 14 borings only three borings penetrated into the load-bearing layer which is Blue Bluff Marl. Only three borings.

One boring reached the rock. That is why we have a lot of concern.

For the second concern about the adequacy of the assessment of material, if you can recall in the morning in our presentation we point out the ESP investigation provide very limited field and lab test data which can be used to determine the subsurface and material property.

For example, for the standard penetration test only 58 measurements and the 12 samples which was sent to the lab to conduct laboratory test. The soil property was mainly based on Units 1 and 2 site investigation. That's why we have the second concern.

The third concern is about the adequacy of backfill specifications. In the ESP at that stage there was no details or specification about the backfill. For example, the soils and the engineering properties and all the backfill soil parameters was either assumed or based on the Units 1 and 2 site investigation.

The fourth concern is the site borings. The LWA and the COL the applicant called for additional 174 borings. Among the 174 borings there were 42 borings penetrated into the Blue Bluff Marl and then another eight borings deeper into the lower sand layer. You can see they provide for the site identification information there.

MR. HINZE: Excuse me. What kind of variation are you seeing in the Blue Bluff Marl? Carbonaceous material, etc.?

MR. WANG: Right. I look at the ESP report and for some tests they only have like a 2-3 data points. The variation can be even 20 times the difference there. We feel that if you use like 2-3 points with that kind of variation you will come out with the average value. To me it's not meaningful.

Another example is, for example, the applicant provide the shear spin parameter. We use this parameter 2,000 TFF. The ESP maximum value is only 6,000 something. We base it on the Units 1 and 2 test data. We give you the two examples for the ESP site investigation because they limit the borings and very limited lab tests. For a lot of case the material property they develop I can say is not reliable.

MR. HINZE: Do these 42 borings then give an indication that there is stratigraphic variation in the properties over the site or do they appear to be essentially random?

MR. WANG: For that 42 borings because

they collect more data and they collect more samples and conduct more lab tests so they have more data points for use to determine the Blue Bluff Marl property. There are some issues there but you know for any subsurface material the variation is relative if compared to other material if very huge. There is always some variation because the soil property and also because the tests, the procedures --

MR. HINZE: Are they spatially predictable?

MR. WANG: Based on the additional data we feel pretty confident. We feel pretty comfortable with the average value. We feel very comfortable about it.

MR. GEORGE: I think for engineering purposes I think just to simply a little bit. Blue Bluff Marl is generally speaking a fairly homogenous material. It is over-consolidated silts and clays. It is a silty sandy material. It's very hard and dense. I think for the purposes of engineering --

MR. HINZE: Is it cemented by carbonaceous material?

MR. GEORGE: Yes.

MR. HINZE: Okay.

MR. GEORGE: Yeah, there are a lot of

variations as you look across the site and you take samples and you do laboratory testing. Generally speaking as you look at it from an engineering purpose, it is a pretty homogenous material.

MR. HINZE: Thank you.

MR. GEORGE: I didn't mean to interrupt. Sorry.

MR. WANG: This slide gives you some idea about the site investigation plan, the boring locations. Obviously it's not high definition figure here but if you look at that flat part that is all the locations of the borings. You can see there is definitely a lot more than 42 borings or 14.

CHAIR POWERS: I have a hard time determining where the borings are actually occurring on this slide. My perception is there are a few of them in the immediate vicinity of the proposed footprint.

MR. GEORGE: It's best to take your glasses off and get the drawing up close. Generally speaking the borings are at the center of all the major category 1 and 2 structures. They are also around at the corners and around the periphery of all the major buildings. They cover the footprint as specified in the guidelines for the reg guides. Also there are additional borings in the switchyard area, the cooling tower areas and around the --

CHAIR POWERS: This may set a new standard for a non-communicating slide because that sure doesn't show up. I will defy anyone to point out anything that validates Mr. George's statement on this slide.

MR. GEORGE: There really are other slides that go along with --

CHAIR POWERS: There must surely be a more communicating piece of information.

MR. GEORGE: Like I said, if you look at it real close with your glasses off you will see the points.

MR. WANG: Okay. Here is responding to all the concerns about the engineering properties of the soil. The applicant conduct a lot more tests, both field tests and lab tests. This gives you some idea. The applicant make 742 SPT measurements compared to only like 40 something. They also collect 94 undiscovered samples which means they conduct a lot more laboratory tests to determine the soil engineering properties.

That is just for the Blue Bluff Marl layer. For the deep layer, the lower sand layer, they made 111 SPT measurements and they collect 29 undiscovered samples. They also conduct subsurface soil velocity measurements in six bore holes which we have an open item about the shear velocity measurement issue.

They also did 21 CPT funding for core penetration test so that is based on those numbers. The soil property is more reliable and more realistic other than just based on the few data points. For this slide because we question about the soil properties because they will remove the whole layer, the upper sand layer which is one of our ESP permit conditions. It's not really important.

Our concern regarding the backfill, the applicant provide the detailed information about the backfill like the slide already indicated. The backfill is a type of concrete. The applicant indicate this type of backfill will not be used in Category 1 structure which is a safety-related structure.

The backfill will be used for the seismic category 1 and the structure. Applicant developed the proposed ITAAC. Also this morning Southern already present that ITAAC. I will show you again the next slide. ITAAC will ensure the backfill material will have the properties that meet the design and also meet the value to be used in their design and analysis because for the backfill and the shear -- topography analysis to ensure the soil property will meet the design.

Also the applicant develop two-phased test track program. This morning they already presented that so I probably won't say much about that. This slide is a copy of the backfill ITAAC. These two items, one is the control or the compaction and the second one is about the shear wave velocity measurements so here is some of the design requirements and the criteria. It does not give the details of what kind of tests they will use but define it in the report.

Here we show the details about the test pad program, Phase 1 and Phase 2. Now I come to the --

CHAIR POWERS: What does it mean when you say the backfill will meet AP1000 DCD?

MR. CONSTANTINO: I think there are several different criteria in the DCD. There are 16, I guess. The design considered the range of velocity profiles. One of the issues is the in situ velocity profile forwarded in that range. That's one criteria.

The second criteria would be the minimum required shear wave velocity underneath the base map in situ.

That was one of the purposes of the backfill testing program, the second criteria. Then the third is tell me what the profiles are -- profile is together with the variability and then we would generate dry motion, GMRs at the surface and corresponding SSI calculations. All of that goes together into that program.

MEMBER ARMIJO: How deep do those properties have to be assured?

MR. CONSTANTINO: Basically from hard rock up we need to know the profile and it's uncertain.

MEMBER ARMIJO: For example, the 1,000 foot per second.

MR. CONSTANTINO: The 1,000 foot per second is immediately under the basemat.

MEMBER ARMIJO: From the basemat down to this Blue Bluff Marl or deeper?

MR. CONSTANTINO: Presumably it increases with depth. If I hit 1,000 at the bottom of a basemat I'm pretty confident it's going to be increasing with depth which was one criteria. We really need to know the whole profile down to the top of hard rock which is used as the input to the ground motion response in the SSC.

MEMBER SIEBER: Let me ask another question. The DCD for the AP1000 has certain seismic requirements associated with it. If you build that plant on this site, will those requirements be met by the site characteristics?

MR. CONSTANTINO: The answer is yes.

MEMBER SIEBER: It would.

MR. CONSTANTINO: There is an issue of exceedance that comes about from the site-specific ground motion that has to be resolved but I think everybody is pretty confident it will be met.

MEMBER SIEBER: Maybe you could explain that in more depth.

MR. CONSTANTINO: I think it will come up in the next couple of slides.

MEMBER SIEBER: Highlight it for me when it comes up.

CHAIR POWERS: You won't miss it.

MR. WANG: Okay. Now the conclusions because I already mentioned the applicant responding to the RAIs and they conduct more borings and more testings and provided more detail about the backfill and the ITAAC. They adequately answered our concerns so --

CHAIR POWERS: Your concern is primarily establishing this shear wave velocity in the material itself.

MR. WANG: That's only one of the parameters of our concern if not all. The shear wave velocity requirement is only one of them because for the foundation the consideration we need the parameter for the soil property, engineering property which will be used in the stability analysis.

For example, the composite calculations are not needed for the data processing parameters. We need the shear strength parameter of the soil. The settlement calculation we need the parameters like the unit of weight and the shear modulus in the calculation.

Basically our concern is the borings which means if you choose specific design, you have to compact the borings in accordance to the guidance like 1.1.2. Only if you compact sufficiently enough borings can you get the sufficient samples from the soil property.

CHAIR POWERS: All that you've said I don't believe because you only have an ITAAC on the velocity.

MR. CONSTANTINO: Can I sort of

extrapolate a bit? The idea of the 1,000 feet a second that's in the standard review plan really has going along with it issues of what are appropriate settlements that will occur and what allowable bearing capacities you would expect.

The reason for the 1,000 is that if you see 1,000 for these kind of soil sandy silts which are relatively decently compacted you have high confidence that you are going to have enough bearing capacity. Bearing capacity is not going to be an issue. Construction settlements are not going to be a real issue and that is the basis for the selection of the 1,000. It's the impact on local --

CHAIR POWERS: But when I said the only thing he is concerned about is having the shear wave of 1,000, you immediately corrected me as confused. 1,000 is only an important one or you do not.

MR. CONSTANTINO: There are a whole bunch of corollaries that fit together. One is a minimum shear wave of 1,000 feet a second. There is another aspect of that is what is the associate variability of that velocity across the foundation basemat so we do have AP600 and AP1000. There were a significant number of studies made to look at potential impact of variability properties on the design of the basemat.

CHAIR POWERS: So now I've learned that you are not just concerned about the 1,000 feet per second. You are worried about the variability in that number but you don't ask for that characterization.

MR. CONSTANTINO: If I have 1,000 feet a second, and that is a minimum number.

CHAIR POWERS: I think your ITAAC is not very clear.

MR. CONSTANTINO: The idea of the 1,000 feet a second is an idea which has several colors. It's a minimum number and there are uniformity criterias across the basemat of the building. The ITAAC is supposed to be an ITAAC on compaction process to ensure that you are going to get this minimum of 1,000. In fact, it's going to be higher than 1,000.

I remember the 20 feet there was something like 1,200, 1,100. Now we're down 40 feet. I think the issue of 1,000 brings along with it a bunch of other little corollaries that all go together.

MR. GEORGE: We have the density component of the backfill materials which is also part of the ITAAC. As Southern has stated, they have already pretty much figured out what their soil specification is going to be, 25 percent or less. They understand the gradation requirements they need.

They know what the PI of the material is going to be, unit weight, blah, blah, blah. They know what the max dry density optimum moisture is going to be. They are going to place the material which they did in the Phase 2 test plan. They developed their placement and compaction procedures, equipment types.

The uniformity, I believe, will come and usually comes in these kind of projects from the soil specifications and the placement and compaction procedures. They will have laboratory testing during the program. They will make sure that the material that they sample in place is within the specifications for gradation.

They will place it in a uniform manner, compact it, and they will achieve 95 percent compaction, modified proctor, max dry density. That will give them the uniformity that they are looking for from the Blue Bluff Marl up to the bottom of the basemat which works in conjunction with the shear wave velocity.

To get density you are going to get shear wave velocity. Although I always believed that was a maximum. Dr. Carl Constantino proved to me that you can sometimes have density and not shear wave velocity but it is very rare.

MEMBER ARMIJO: Not the other way around? If you've got shear wave velocity, you will always have the density and bearing capacity?

MR. CONSTANTINO: For these kind of soil treatments, yeah.

MR. GEORGE: The material is a slightly sandy -- slightly silty, sandy material with a fairly low moisture content, fairly low fines. Placed in the proper thickness and compacted with the proper material they will have no problem reaching the 95 percent maximum density. It's not just shear wave velocity. Shear wave velocity is the requirement from the AP1000 but it is also the ITAAC works with density and they work together. That will, I think, assure that --

MS. KARAS: If I could jump in, this is Becky Karas. I'm chief of the other Geosciences and Geotechnical Engineering Branch. When we develop, you know, and review the proposed ITAACs what we are looking for is the most critical parameters, the ones that are typically identified as T01.

In this case things like shear wave velocity and the density, those are the things that as you actually place the backfill, you know, you're never going to get that final assurance until it is actually placed, that it was compacted properly and everything. Those are why those are identified as ITAACs.

There are other properties that are assumed within some of the analyses that we have reviewed and that is why we review things like all of the testing, the soil testing data, the boring data, and all the backfill testing, and some of the stuff that was done during the test pad program. This is really meant to isolate the most critical parameters that we want to be absolutely certain through an ITAAC.

CHAIR POWERS: When I said the parameter you are most concerned about, the shear wave velocity, the speaker corrected me and said no. Now, when you said it, because perhaps you send him his check and I don't, he's saying yes.

MR. WANG: Excuse me. I said 1,000 feet per second shear velocity is one of the parameters we are concerned about but not the only one. That's what I said.

MEMBER ARMIJO: I guess the question is why isn't that just stated in the ITAAC, 1,000 feet per second, bearing capacity, certain density, on and on and on, and get everything you want. I don't understand it.

MR. CONSTANTINO: You're getting a little confused by this --

MEMBER ARMIJO: I sure am.

MR. CONSTANTINO: There are two parts of the ITAAC. One has to do with standard compaction programs which we've used since the Roman times. We know how to place these soils and we know how to compact them and we have target compaction density.

MEMBER ARMIJO: You have a 95 percent --

MR. CONSTANTINO: That is checked on a day-to-day basis lift by lift. The way we operate for any construction process we place a lift and check it. If that lift is not acceptable, we remove that lift and redo it. Each lift is of the order of eight inches. It's compacted to a given target minimum density.

Plus we know from experience that if the density is, in fact, higher we're fine. We have these minimum densities and minimum compaction programs, minimum number of tests per lift, minimum gradation checks per lift. All these are part of the compaction program which is the first half of the ITAAC.

MEMBER ARMIJO: Okay.

MR. CONSTANTINO: At the end of that

process then we check velocity and the correspondence on the velocity is we want to make sure the velocity immediately below the basemat reaches the 1,000 target. We satisfy that 1,000 target, all of the issues together with the compaction ITAAC.

MEMBER ARMIJO: Those two parameters will provide all of the other things.

MR. CONSTANTINO: Everything else goes with that so there is no issue associated with untoward consequences that you would anticipate during the construction process. The building is going to be built after everything is in place.

MEMBER ARMIJO: I understand.

MR. CONSTANTINO: The thing we don't want to have is have everything satisfied, whatever the ITAAC is, and now you place the first 10-foot slab and it settles away. The whole purpose of both the velocity measurements and the compaction program is to make sure that will not happen.

MEMBER ARMIJO: Thank you.

MR. WANG: Okay. That end my presentation. Thank you.

MR. TEGELER: Good afternoon. My name is Bret Tegeler and I work in the Special Engineering Branch.

MEMBER MAYNARD: Somebody's papers are going over the microphone.

MR. TEGELER: Sorry. Before I start, if I could just briefly introduce my colleagues who worked on this SER with me. John Ma to my left is also in the Structural Engineering Branch and Carl Constantino who worked with us as a consultant.

What I'm going to do briefly is just describe what I'm going to speak about and that is first off just provide a brief scope of the LWA which I think you have probably seen but I'll just touch on a couple additional points.

I'll talk about the scope of the Structural Engineering Branch for this Limited Work Authorization. That touches upon three SRP sections. Then I'll summarize briefly the applicant's contents regarding these sections. Then I will describe our evaluation and findings.

As Christian mentioned earlier, the scope involves essentially sort of foundation work, the placement of a concrete mudmat, waterproof membrane, and the mechanically stabilized periphery MSE wall, retaining wall, and temporary drain.

I think Don earlier had a figure of the MSE wall but I have another one right after the slide that will touch upon some of these details. Essentially the MSE wall is constructed as previously described with precast concrete panels with tiebacks approximately 40 feet in height.

The footprint is approximately, just to give you some scale, about 160 feet by 260 feet long. As I said before, the mudmat we placed with two layers sandwiching a polyethylene waterproof membrane. That membrane thickness is about 80 to 120 ml thick. I think it's applied in a couple different applications.

This membrane, as Mitch also mentioned, once it is placed on the basemat will also be run up the MSE wall for a continuous foundation protection, if you will.

CHAIR POWERS: An acre and a half. I mean, it's a acre and a half.

MR. TEGELER: 40,000 square feet.

CHAIR POWERS: That's what I remember.

MR. TEGELER: I won't go into too much the waterproof membrane ITAAC because we touched upon it earlier other than to say that we did review that in this section and I'll get into that shortly. As Christian mentioned earlier, I don't know if he made this point but the applicant did reference the DCD but it was Rev. 15 and that will be a subtle point that will probably come up. There were some associated technical reports that were written to support Rev. 16 and 17 for the extension to the soil sites.

In addition to the external flooding protection function of the membrane, the membrane must also transfer lateral seismic loads from the nuclear island to the supporting soil. I'll also talk about that aspect of it, sort of the mechanical strength, if you will, of the membrane rather than the waterproofing function.

This slide may be a little difficult to -- it's not too bad. Mainly I wanted to point out our exact scope. The applicant is asking to place into the MSE wall which is this sort of narrow wall just outside of the blue line which is the membrane going up the wall. Just inboard of that is essentially the nuclear island foundation. You have a vertical wall here and then you have the basemat which for scale purposes the basemat is five or six feet thick, on that order.

Because we are placing, if you will, these foundation preparation elements, and I'll refer to the mudmat as not the actual foundation but the nuclear island is going to be placed directly on top of the mudmat.

We want to check again to make sure that both the mudmat and the membrane can support the seismic load induced from the site-specific ground motion which I'll say is probably the controlling load on at least the mudmat.

MEMBER SIEBER: I have a question for you. Most power plants, always in the turbine building, sometimes auxiliary building and other places will have a grounding mat made of copper that is a web-type copper that is embedded in the basemat and extends down into the ground. Does this plant have that where the mudmat is? If so, how do they go through the mudmat without destroying it --

MR. TEGELER: Penetration.

MEMBER SIEBER: -- to put the ground mat in?

MR. TEGELER: I'm not aware of penetrations through the basemat.

MEMBER SIEBER: Maybe the licensee knows because if they are going to dig the hole and --

MR. DAVIS: Based on the DCD I'm not aware of any penetration.

PARTICIPANT: Get the microphone.

MR. DAVIS: This is Jim Davis with

Southern Nuclear. In accordance with the DCD I'm not aware of any penetration through the mudmat per the design. I understand what you're talking about. The grounding is typically put in as slab that goes underground.

MEMBER SIEBER: You have to have it or your machinery won't run and your protection won't be right.

MR. DAVIS: Okay.

MEMBER SIEBER: Vogtle 1 and 2 has to have it.

MR. DAVIS: All right. I'm not aware of that detail. I think we can get some people to take a look at it for you.

MR. TEGELER: I will make a note of that as well.

MR. GEORGE: I have also seen the grounding mat outside the basemat.

MEMBER SIEBER: For two reasons. One of the it will corrode. The other one is between a piece of machinery like a pump, big horsepower pump, and the point where the ground is to the ground can be a long distance which has atomic resistance to it. I'm curious how they do that.

MR. GEORGE: You can also tear them up

when you are putting in later buildings.

MEMBER SIEBER: Yes. We've all done things.

MR. TEGELER: I won't spend much time on this slide because I think we have seen similar slides previously. Just before I leave just to point out notice that adjacent to the MSE wall we have the tiebacks there were discussed earlier and those are contracted. That area at least is compacted slightly different so I'll talk about that a little bit and the effect of that on some of the dynamic response.

Okay. As I said earlier, the LWA involves the construction of foundation or foundation elements. The staff reviews the foundation works under essentially SRP Section 3.8.5. However, the loads, if you will, that are used to evaluate stability from sliding and overturning are provided from the seismic analysis models, if you will, that are reviewed under 3.7.1 and 3.7.2. These three SRP sections together constitute really the scope of our review for the LWA application.

For the most part the findings on the LWA will remain -- I guess are intended to be final as part of the SCOL review. There are some minor exceptions, notably the in-structure response which we'll probably get into shortly. We have an RAI on that issue now as part of the SCOL review. Having said that, 3.7.1 and 3.8.5 should be final and we shouldn't have to revisit that part of the SCOL.

Just to follow-on to that the question was asked -- the applicant is referencing a Rev. 15 design. They are going to build a Rev. 17 design ostensibly. What assurance is there in doing that you have somehow negated the findings on the LWA. Our opinion now is that as long as the footprint of the nuclear island doesn't change, which it hasn't so far.

That and, two, as long as there are no -- let me back up. That would be the only condition I could think of in which there would be a change. Minor changes such as connections to optimum shield building or ongoing RAIs, if you will, and some of the modular construction details. Those types of issues should not affect basemat sliding and overturning.

That is why I said your question earlier, hey, DCD is still open and being reviewed. The SCOL is still being reviewed. How can we essentially approve this. The issue for this is as long as the footprint remains the same we should be fine.

In one or two slides I'll be showing the certified design response for the AP1000. That did not change between Rev. 15 and now. The seismic in play is essentially the same.

MEMBER ARMIJO: Just before you go on, you mentioned on that membrane that the coefficient of friction has to be .7. How much margin is it based on data that you have? Is it likely to be .8 or something?

MR. MA: This is in the DCD criteria .7. In reality you don't really need the number. For example, in this case here I will show you later on there is only .45 in the soil so that .45 really governs, not .7.

MEMBER ARMIJO: Okay. It meets the DCD requirement but it really needed for seismic? I got the impression you were very worried about this thing sliding.

MR. MA: Not for Vogtle. For Vogtle the control is in the soil, not at the membrane because the membrane has .7 coefficient of friction but the soil only .45. Therefore the weak link is in the soil, not in the membrane. We want to make sure the membrane which is sandwiched between the mudmat will not create the upper portion of the mudmat sliding against the lower portion of the mudmat.

MEMBER ARMIJO: Right.

MR. MA: That's the reason we require, "Hey, you make sure you have .7."

MEMBER ARMIJO: They work as a unit.

MR. MA: Yes, work as a unit.

MEMBER ARMIJO: Okay. My question was based on data how good is that number?

MR. MA: Based on data they are all either .7 or greater.

MEMBER ARMIJO: Okay.

MR. MA: So far we have same. This will be ITAAC item as well.

MEMBER ARMIJO: All right.

MR. MA: They will have to do it at the site.

MEMBER ARMIJO: Thank you.

MR. TEGELER: Very quickly I touched on the SRP section but just let me quickly expand the description of our scope. 3.7.1 we essentially take the ground motion response factor which is essentially developed under 2.5, SRP Section 2.5. We then take that and compare that to a certified design -- the AP1000 certified design response spectra. I'll show that on the next slide.

We then look at some -- again, we are looking at design parameters and one of those is structural damping assumptions. We take a look at that for the use in the SSI model. Also we look at how the site soil media is characterized in the SSI model.

You have how the site is -- you have an idea what the site looks like essentially based on the bore log information we saw earlier. How do you characterize that in your SSI model? That is something we take a look at in 3.7.2. In 3.8.5, again, that is where we look at -- that is the important piece for this LWA which we want to look and make sure that the nuclear island will not slide or overturn from an SSE event.

This question has already come up so I'll start talking about it now. For the Vogtle site, the site GMRS at the surface exceeds the AP1000 certified design response spectra in essentially two frequency ranges, a low frequency range below 1 Hertz and then a higher frequency range, at least in the horizontal direction maybe over 12 or something like that. I have a plot on the next slide which I can start pointing it to you.

The foundation input and response spectra which is used for a couple things. One, it's a regulatory check that the horizontal motion and the free surface -- I'm sorry. The horizontal motion in the free field at the foundation elevation has to have a PGA value of greater than 0.1g. In the applicant's FIRS for Vogtle it does satisfy that. Then, as I mentioned, we also check to make sure that the supporting media are consistent with the 2.5 information.

This slide hopefully you can make out some of the detail. Let me just walk through the colors because it's a little crazy. The blue curve -- oops. Sorry. Essentially you have two GMRS curves. You have a horizontal direction and a vertical direction.

MR. WIDMAYER: There's a pointer right there. There's a pointer sitting right there.

MR. TEGELER: The top curve, which is blue -- oh. The blue curve is the GMRS and then the AP1000 CSDRS is the red curve. Then the foundation input response is the green. You can see you have a low-frequency exceedance in the neighborhood of .4 to .7 or so Hertz. Then the higher-frequency exceedance -- again, this is all horizontal motion -- of 7 or so Hertz.

As a result of that the applicant also mentioned that there are some soil profile parameters that are slightly outside of the Rev. 16 design basis, if you will. Vogtle performed site-specific soil structure interaction or seismic analysis. That is where we get into now the applicant's 2D models for looking at essentially the suitability of the AP1000 design for the site.

I'll just point out quickly the vertical. We show a slight exceedance in the vertical direction and low frequency. The larger exceedance is above 10 Hertz for vertical.

You've seen this plot. I just put it up here again because essentially your SSI model will account for -- now we're in site-specific analysis phase. The SSI model has to account for the AP1000 nuclear island structure, as well as the supporting media. Essentially those media are characterized with some of the same property Sarah discussed earlier, the damping and shear modulus relationships for each layer as explicitly modeled in the analyses.

MEMBER RAY: Let me be clear. You're looking at this in terms of the nuclear island as a block. You're not looking internal?

MR. TEGELER: Actually, the 2D models that were used they do account for some of the approximate structural features.

MEMBER RAY: Are you reaching any finding in that regard?

MR. TEGELER: No. Again, we are supporting the foundation to make sure that the load being used for stability are reasonable. In doing so the applicant has chosen to use 2D SSI analysis for that. I think the staff position is we find that to be appropriate or adequate for at least sliding and overturning.

Some of the in-structure response issues which we are dealing with on the SCOL side I think we're going to ask for a higher fidelity model, perhaps a 3D model.

MEMBER RAY: That's not part of this so I just want to be sure.

MR. TEGELER: Not part of it but it's in the background because when we talk about these exceedances, I mean, your in-structure response you start -- yeah, you have to -- you have an exceedance so you have to have kind of a path forward on how you are going to address the safety issue there.

I think the only thing -- I think that is essentially what I wanted to point out but just maybe to simply point out again the location of the GMRS is at the surface and that the SSI modeling did account for the full soil island down to, I think, approximately 1,050 feet, something like that.

Okay. 3.7.1, again we are looking at developing the inputs for the seismic analysis. In terms of vibratory ground motion the applicant using approximate method, if you will, for developing the FIRS.

However, when we reviewed the results of that method, it appeared that method resulted in a conservative estimate of seismic demand. As I mentioned earlier, the FIRS did satisfy -- I'm sorry, the foundation input response spectra did satisfy the Part 50, Appendix S requirement.

Critical damping values in the SSI analysis. We found that the values that were used were, I think, sufficient for the purposes of the 2D assessment of the seismic demands. As I mentioned, we also felt that the characterization of the supporting media was reasonable and consistent with what was essentially measured in 2.5 if you will.

Okay. Having described the input parameters to the SSI modeling, if you will, now I am going to go into sort of a description of the SSI models. In short we found that, as I mentioned, the 2D models were appropriate for evaluating this horizontal sliding and overturning demands.

Let me just quickly talk about the structural model, if you will. These SSI models were conducted using SASSI. They were run in SASSI, if you will. Essentially they are 2D plane strain model, if you will, so you have mass a beam elements. The soil was run in a couple different ways to look at sensitivity studies but the soil was characterized in both one dimension and in two dimensions. The models did account -- the affect of the 40-foot embedment is explicitly considered in the SSI.

Uncertainty in the SSI calculations are essentially handled using essentially three runs which cover the upper, the best estimate or mean, and the lower bound soil column properties.

My guess, Carl, maybe you can help me out here, but if you take the transfer functions from the site analysis, what I think you get are approximately 60 different characterizations or there is a randomization done on the full soil column. Then you essentially take the upper, lower bound and mean run through this transfer function. That is the starting point for developing your SSI input. The difference in SSI calculations are done in a deterministic manner as contrast to the site response which I think is done using a probabilistic approach.

The applicant compared -- looked at six locations of the nuclear island and these locations are not arbitrary. These are locations that are actually key locations in the AP1000 DCD. They are points of either heat displacement or peak acceleration associated with an SSE events, or they are locations of critical equipment. The applicant compared their site-specific seismic loading at each of these locations.

Again, you have to remember that the 2D models for -- using 2D models for those comparisons is being looked at as part of the ethical review because some of these things -- some of these locations we think would require 3D models to actually accurately describe.

MR. HINZE: How much uncertainty are you talking about with 2D?

MR. TEGELER: I think most of the uncertainty would be on the in-structure response where the effective radiation damping and coupled modes in the structure you're not capturing even the 2D model. For the purposes of looking at sort of the rigid body motion of the nuclear island we think 2D is probably okay for that. You're not as sensitive to that type of behavior. But for the more local vibration modes I think that is where I think the 3D model is more appropriate.

MR. CONSTANTINO: Can I say something?

MR. TEGELER: Sure, Carl.

MR. CONSTANTINO: This issue of 2D, 3D is something that has gone back to the '70s. That's one advantage of being old is you can remember those discussions. In fact, the 2D runs tend to over-estimate the radiation damping that is in the calculations.

Going back some of the old papers trying to match up 2D with 3D results always led to problems, especially for complicated structures. When we talk about in-structure response spectra, the general consensus is that we are going to be unconservative. Unconservative on some runs could be as much as two-way VPI. For those kind of in-structure response spectra calculations we don't have much confidence in 2D. We would rather do the 3D which was done originally.

MR. HINZE: Get it over with. Is that being required now? Is that an open issue?

MR. CONSTANTINO: As far as I know. Bret, that's an open issue?

MR. TEGELER: Yes. I'll just briefly

touch on our fines for the 2D SASSI models. I already mentioned that we found that the SASSI models are appropriate for the purposes of the LWA. Just as, I'll characterize it as a confirmatory check, but one of the things we were concerned about. John was anyway.

He said, "How right are we or how wrong are we?" We did a quick essentially hand calculation to, I guess, convince ourself that the applicant's estimate of peak seismic demands was reasonable. We essentially took some of the ZPA values, zero period of accelerations, near the center of gravity of the nuclear island using the applicant's SSI results.

Then just conservatively assumed your entire mass was moving with that particular acceleration. When you do that you start -- we found that our results weren't extremely different from the applicant's assessment of their peak seismic base shear. I think that lent confidence in our evaluation, or at least that we were -- that we don't have a safety issue here, that this foundation is not likely to slide or overturn.

MR. MA: In the next three slides I'm going to show you this nuclear island foundation during the SSE will not slide and will not overturn and break into the ground. That is the thing we structural engineers worry the most which happened before several times already. Not in nuclear power plant but in a silo and in other structures.

The first slide I'm showing you the test data for the membrane is equal to .7 coefficient of friction or greater. We obtain this test data from the applicant. The test, which we just discussed before, because the membrane go in between upper portion of the mudmat and bottom portion of the mudmat. We want to make sure the friction force between those two is great enough so it will move in unison.

The second test data from the applicant is the coefficient of friction of .45 for the soil. Therefore, during this movement, sliding if we're talking about the resistant force due to coefficient of friction, then this .45 controls. You will see later on the calculation was based on .45. The third data we got is the bearing capacity of 42 ksf.

Let's go to the next slide. The next slide I'm going to show you, you can see this upper bound estimate and the lower bound as just described by the previous slide. This is the American Society of Engineering requires people to do the three analysis for one case taking care of the variability of soils.

As you can see here, in each case the inertial generated due to the SSE is less than the friction of force which is calculated based on the .45. The friction or resistant force is the total weight of the nuclear island structure modified by coefficient of friction .45. This shows here during the SSE nuclear island foundation will not slide.

Let's go to the next one. The next slide you can see it's during the overturning. During the SSE the structure was rocking. At that time you can see the maximum dynamic bearing pressure on the soil for the nuclear island is 17.95 ksf. For rad waste it's 1.68 ksf for annex. For turbine buildings it's even less.

If we take the highest one, which is the nuclear island 17.95 ksf, if you take that value -- if you take the 42 ksf which in our previous slide that is the bearing capacity during the SSE. Divided by the 17.95 you get a safety factor of 2.34. Just in case my soil colleague messed up or some variation like you mentioned, I have plenty of margin saved here so don't worry about that.

Let's go to the next one. Oh, I'm done.

Essentially we found for these three SRP sections that the applicant did adequately develop the seismic design parameters that did perform adequately the site-specific 2D analyst for evaluating seismic stability or nuclear island stability loads or demands.

As I mentioned, some of the in-structure response will be done as part of the SCOL review. In SRP Section 3.8.5 we found that the applicant demonstrated that the mudmat and waterproofing membrane are adequate to resist sliding and that the foundation is stable during an SSE event. I think that wraps up at least --

MR. ARAGUAS: That wraps up our discussion on the geotech.

CHAIR POWERS: Well, it certainly leaves me confused about what I do now. Maybe you need to tell me exactly what you've done here. You tell me that the site spectrum, peak ground acceleration spectrum is not bounded by the design criterion that we have now. You've gone in and you've looked at some specific things for the plant and you say it's not going to slide and it's not going to turn over. Have I characterized correctly what you've done?

MR. ARAGUAS: That's part of it. I think

with respect with the exceedances, as Bret pointed out, it's not a concern. They demonstrated that because of where those exceedances are with respect to the low frequency and high frequency range.

MR. TEGELER: There's one thing in the background. I think we are going to be looking at the in-structure response as part of the SCOL review. In terms of structural behavior the frequency range of interest is probably lower like say below 5 Hertz, something like that. For AP1000 actually the shield building is on the order of 2 to 3 Hertz because it's sort of fixed-base response.

When we see exceedance, at least for structures, in this range and higher, actually we are really looking -- let me get to my backup slide. What you need to do is actually this is a starting point. This gets you to having to do the site-specific analysis. What the next step is then you do the SSI analysis. That gets you to the in-structure response.

That is where you really want to start comparing where you have a problem. The higher frequency goes away on the in-structure response. I have some backup slides which I can show that. The lower frequency does not. That is probably one of the issues we are going to have to address. Because it's below 1 Hertz, I think, at least my opinion is, anyway, it's below 1 Hertz.

If you look at the fixed based frequencies for the AP1000 nuclear island they are all above 2 to 3. I think it's safe to say it involves 3 Hertz so I don't think this exceedance is going to have an appreciable effect on that design, if you will. Again, we are going to do that review but you have to have in your back pocket right now is do you think this is a real safety issue or not. I think the answer to that is no but we haven't actually done that review yet.

MEMBER RAY: Why do you need to reach that judgment? I mean, it seems --

MR. TEGELER: Reach which one?

MEMBER RAY: That in your back pocket you don't think it's a safety issue. That seems like something that's premature.

MR. TEGELER: I would agree. I think the problem is when the applicant did their 2D SSI analyses you still -- that lower frequency exceedance is still there so the question is --

MEMBER RAY: I understand but why not just let it stand that way without speculating about what the --

MR. TEGELER: We did. We didn't actually address this in the SER. We're all here talking about what is going to be built instead of the question --

MEMBER ARMIJO: Look at it the other way, though. If you felt that there was a significant problem there why in the world would you be approving a Limited Work Authorization?

MR. TEGELER: That's a key point, yeah. Part of it is you have to -- is there an indication here there's a problem. I don't think there is.

MEMBER RAY: I know but to the extent that you base it, as Sam says, on an expectation, then you have a tendency to influence the review that follows. I think we are all just a little concerned about that. I assume that is what the Chairman's concern is, is that we get too far into a buy-in without seeing the money, as they say on Capitol Hill these days. It just seems like it would be better to say, "Well, we have to see."

MEMBER ARMIJO: Well, kind of doing the Limited Work Authorization review, which I think Dana started out with if we should be involved or not, it kind of forces you into the situation.

MEMBER RAY: It's a real concern. I share the point that what makes this different than if it was just an ESP for 20 years period is the Limited Work Authorization.

MEMBER ARMIJO: Right. It kind of gets you into this thing you say, "There may be a problem there and I had better look at that before I grant an LWA."

MEMBER MAYNARD: I'm not overly concerned with the Limited Work Authorization as much as the legalities of what we are being asked to review. It gets back to the ESP. Are we being asked to approve an early site permit or an approved design where the site characteristics exceeds the certified designs. I'm a little confused if --

MEMBER RAY: Why isn't there a permit condition on this like there is on other things? I mean, I'm sitting here writing notes about the permit condition on the location of the technical support center. By comparison a minor thing. Why isn't there a permit condition that says, "Well, you've got to demonstrate that the in-structure responses are consistent with a certified design."

MR. CHOKSHI: This is Nilesh Chokshi. On an ISG when the site-specific spectra exceeds the certified design, in the Section 3.7.2 there are specific things you have to do. The principal behind this if you ever show that the design loads exceed the site specific, you can show it by doing calculations so your design is bounded for the site-specific loads and that is the goal. They did a sample of six points to show that the design loads are still within the certified design -- less than certified design. Am I correct?

MR. TEGELER: That's true. There are just some exceedances even within the six points that led to the problem of --

MEMBER RAY: I'm just concerned about trying to solve the problem here. We ought to recognize the existence of an issue it would seem to me.

MEMBER SIEBER: Well, I think Otto is right, though. When you approve the early site permit, all you are doing is saying I have collected enough information to know about the site so I can build something.

MEMBER RAY: I agree.

MEMBER SIEBER: When you get to the COL you say, "I've got this early site permit and I've got a DCD for a plant. Do they match?" You tend to say, I think, and correct me if I'm wrong, that it looks okay. I look at the blue line and I see a little book there and it's about the red all along and it seems to me like it doesn't match. That's not today's decision. Maybe you can tell me again why you think this is going to be okay. Maybe later on say what do you do when you get to the COL point and they don't match.L

MR. ARAGUAS: Let me address the first portion and be clear with respect to what is going on at the ESP and LWA. With the ESP you are not actually approving the Westinghouse certified design to be placed on the Vogtle site. You are establishing site characteristics. We are doing a review to verify how they were established is adequate.

MEMBER SIEBER: Right.

MR. ARAGUAS: At the COL stage is when you are actually doing the comparison and say, "Hey, can they put this Westinghouse AP1000 at the Vogtle site." What makes this application unique is they have asked for the LWA.

The LWA is essentially a chunk of the COL so with respect to the activities that they are asking for, we have to say that those things they've asked there are no safety issues and, therefore, to do that you have to rely on specific portions of the design, as Brad pointed out, the seismic load to be able to do those calcs to show that there nothing overturning.

There is not going to be any sliding but you only focus on those aspects with respect to what they ask for in the LWA. You don't go any further and compare any other site characteristics that may not have any bearing on the LWA they are asking for.

MEMBER SIEBER: Digging a hole is a simple thing.

MR. ARAGUAS: Say it again?

MEMBER SIEBER: Digging a hole is a simple thing and it doesn't necessarily reflect that -- you could dig a better hole and you would change the seismic characteristics. It doesn't restrict you from the Limited Work Authorization for issuing an ESP. On the other hand you may get to a point in time where you're stuck and can't do anything else.

MR. ARAGUAS: I guess what I would point out with this is one of the things that is pretty clear in the ruling, I think, and the applicant comes forward with a request, is that they proceed at their own risk. If something doesn't match well with the COL, they have to resolve that. The COL would not be issued.

MEMBER RAY: Okay. Still the question remains, and particularly to me it's more important now that there has been these expressions of expectation and all, do you or don't you say something about this relative to the AP1000 in this ESP?

MR. ARAGUAS: For the LWA you have to. Going back to --

MEMBER RAY: No, no, no. I mean with regard to what remains to be done. That's what we're talking about. You're not proposing any permit condition.

MR. ARAGUAS: You shouldn't have to. To get to your question about why there is not a permit condition because you treat this -- you have that certainty that's okay.

MEMBER RAY: Why is the permit condition on the TSC then? I mean, what it says is you've got to reconcile the fact that the AP1000 says right here, "TSC is proposed to be different in the ESP configuration." You've got to reconcile that and that's a permit condition. Nothing is said here on the seismic side.

MR. ARAGUAS: I think what we're saying is it's not required and we should be able to make those findings now and not depending on some future action so going back to what we talked about with respect to --

MEMBER RAY: Right.

MR. TEGELER: I was just going to say my view is that that exceedance has to be addressed. The question is when. My model has been, "Hey, they are not putting in the nuclear island right now. They have asked for an update." Actually the DCD what they want to put in hasn't been approved yet.

We are looking at the DCD and we are also looking at the site specific analysis. We have an RAI right now that is going to actually change the in-structure response to withdrawn from these terms. It's a little premature to even make that evaluation because you don't have, I think, the technical basis to do that.

MEMBER RAY: At this point I'm just asking a very limited small question here about the permit condition. If you guys don't think it's necessary, that's enough. It's inconsistent to me but, okay.

CHAIR POWERS: On your specific question I think I understand. There are two things that are unique in this early site permit. One is that they are providing a complete and integrated emergency plan. Part of the emergency plan includes the TSC. Since it's complete you've got to say something about that until you do that.

MR. ARAGUAS: Okay.

CHAIR POWERS: The other thing that was unique is rather than providing a plant parameter envelope they invoked a specific plan. Now, we've got a major headache. I would dearly love to write a letter to the Commission saying, "Go ahead and approve this for the specific plant."

I can't do that. I can write a letter that says, "Yeah, they have characterized this site. We know all about it. It's a wonderful site. I can't think of a better place to put a nuclear power plant." I don't know which one is going to be put there. It's certainly not going to be the certified design for AP1000. I looked at the '80s many years ago that some plant could be built there. That I can say. I think that is what I end up having to say.

MR. ARAGUAS: I don't think we would ask for anything different because the LWA isn't actually asking for approval to build that plant at that site. It's asking for approval of specific limited construction activities which require you to look at a subset of the design.

CHAIR POWERS: And I can say on the LWA what they are planning to do if one could is yet hypothetical sort of by design in that it wouldn't turn over or slide around.

MR. ARAGUAS: That's all you could say.

CHAIR POWERS: That's about all I could say.

MR. ARAGUAS: I think that is all we would ask you to say.

MS. COFFIN: This is Stephanie Coffin and, believe me, we have struggled with trying to draw bright lines around what's the finding rulemaking for an ESP, what's the finding rulemaking for the LWA, and what's the finding we need to make for the COL. Drawing bright lines is not always very easy but we are doing the best we can. I think it's very important to note that for the LWA the applicant is doing this at their risk.

Being good engineers I think that if Brad and his team had not saw a likely success, I think that would have been an issue he would have raised. We are not making the final now that it's completely clear and definitely a goal for the COL. Just as good engineers if we saw problems that look unresolvable, I think we would be telling you a different story here.

We are walking a fine line saying the only finding we need to make today is that they can put in that fantastic dirt and they can make those mudmats and all the finding that we make for the LWA but we do see that there is a success path and there is some discussion here today about that.

MR. ARAGUAS: Just to elaborate on Stephanie's point, the original request that we had before us was to actually place rebar. We went back to Southern and said, "Look, we can't get there with rebar at this point because of the fact that there has been a change in the basemat design in Rev. 16.

That is something that at this point we can't approve as part of this LWA. Maybe somebody else's LWA they could approve that but currently where we are right now because of the fact that Rev. 16 -- Rev. 17 is not done, that was removed.

MR. THOMAS: I would like to add something here if I could. Brian Thomas. I'm the Structure and Engineering Branch Chief. Let's not forget that what Brad alluded to when he spoke about the footprint, the basic design of the AP1000, certified design Rev. 15, Rev. 15 to Rev. 16, the basic structural design, substructure, foundation, super structure, does not change -- does not go through any major changes.

Essentially your design load does not go through a lot of changes. As a result of that, the seismic demand that we are addressing we don't really see a major impact on that. Also let's not forget the construct of this mudmat. This is basically an enhancement to the site that provides a basis for distribution of those loads, if you will, to the soil.

It also provides a working surface, if you will. It also deal with some of the -- in providing that foundational load distribution pedestal, for lack of a better term, you have to be evaluated from the standpoint of will it help facilitate in the overturning, you know, preclusion of sliding and so forth.

In all of that within those evaluations basically take into consideration that the basic design does not change and then we do feel very assured that it's a safe design in the LWA at this point in time.

Yes, we need to go forward and do some further evaluation for the remainder of the SCOL, but with respect to authorizing them to go forward and perform these limited activities at the site, we don't see any impact on seismic design, seismic demand, nor on the overall design of the structure.

DR. LaPAY: Dr. LaPay with Westinghouse. I would like to make some clarification comments to what has been said here and what you said before is what Westinghouse assures and it's in our DCD, that when you do a plant specific evaluation, when you do that and compare those six locations, you must show that you do not change the design, you are within the envelope.

We found when we did that the only area of exceedance was in the low frequency. We didn't let it just sit there. We went further and we identified what was there. The only area that was potentially there was sloshing. Looking at the frequency of sloshing they are either below or above that peak. There was nothing there that would affect design.

Now, when we do the 3D analysis, we don't expect anything different. We'll get similar type results. Carl is laughing but I'm sure of it and he is, too.

MEMBER ARMIJO: If that's the case why isn't the red line different?

DR. LaPAY: No, no. The red line is our ground response, or certified design response spectra for the ground is really based on Reg Guide 160 right there. They have done their site-specific SSE where they found for this site they had those exceedances. We wouldn't have anything higher. Then when you do a response spectra, a lot of times you can't get rid of those peaks down there. It's like you'll see the ground response spectra all the time. Right, Carl?

CHAIR POWERS: I wanted to write a simple letter. You want me to write a complicated letter.

MR. ARAGUAS: I would like a simple letter.

CHAIR POWERS: You ain't getting one.

DR. LaPAY: What I just said is in the submittal to Vogtle in the appendix of their submittal. If you want to know exactly, I forgot what appendix it is, Appendix E.

MR. TEGELER: Just to go back, again, I want to be careful not to talk about exceedances not just at the site grade elevation. We have to talk in-structure exceedances and this is just one example. I just quickly wanted to point out just for our discussion that even though you have that exceedance, this is at a point right at the 99 foot elevation which is approximately site grade or plant grade, if you will, in this case.

You can see even though we put all that energy into the seismic system or sill structure model that a lot of it gets damped out. Again, these are 2D models so I don't want to -- they are more for comparative purposes but you can see that the design -- the Westinghouse design we've got here, I think this is sort of an envelope, if you will, of the hard rock cases.

You can see Vogtle their response at this particular location is considerably lower but we still have this exceedance. The question is what do you do about that? We are going to -- our plan right now is to review this as part of the SCOL. As Stephanie mentioned, is that exceedance a problem or not? I think the staff's judgment is it's not a problem.

It may affect some sloshing mode but we're going to have to take a closer look at that. I don't think it's a structural problem. Nonetheless, it would have to be addressed using probably more refined models. I think that's the point I wanted to make. I didn't get a chance to show this during my talk.

MEMBER SIEBER: Isn't the issue of sloshing motion something that leads to a structural problem?

MR. TEGELER: It can. The DCD has actually done a considerable amount of work on that issue we which is actually being reviewed now.

MEMBER SIEBER: Hopefully in the end they will wed.

MR. TEGELER: Right.

DR. LaPAY:: This is Dr. LaPay again just to comment. The sloshing modes as we've seen are away from that whether below or above. That was our broad spectra anyway. We did not anticipate any problem and it wouldn't be a structural problem, the sloshing. We've looked at pressure in that and it wouldn't be -- we don't anticipate that the sloshing mode would even enter in that range.

MEMBER SIEBER: So that is a commercial decision at this point.

DR. LaPAY: You can call it that.

MEMBER ARMIJO: That could be a problem. You would have to make some structural modifications.

DR. LaPAY: In what?

MEMBER ARMIJO: Wherever the load brakes.

DR. LaPAY: If exceedance is up around the structural mode, we would have a lot of them but, no, we do not anticipate any structural affects at all from what we see.

CHAIR POWERS: None of this helps me a bit in writing my letter.

MEMBER SIEBER: Does that help?

CHAIR POWERS: Not at all.

MEMBER SIEBER: Okay.

CHAIR POWERS: I'm going to declare a break and I'm going to walk around the block here for about 15 minutes and we will come back and conclude.

(Whereupon, at 3:57 p.m. off the record until 4:13 p.m.)

MR. ARAGUAS: We have one remaining speaker and he'll talk about his review of Southern fitness for duty program.

MR. SHROPSHIRE: Good afternoon. My name is Alan Shropshire. I'm a security specialist with the Office of Nuclear Security and Incident Response and I reviewed the applicant's FFD, Fitness for Duty. The first thing that we did was when they sent in the application is determine if they were going to be working on safety-significant structures. The LWA application did, in fact, state that they were and we determined that they were.

We determined that they needed to put a program in place. They had a choice where they could go with a full program under Part 26 which is what required in operating reactors, or they could go under Subpart K. Why that is significant is on March 31 Part 26 was issued and implemented Subpart K.

The two biggest part that were added to 10 CFR Part 16 was Subpart I which was managing fatigue.

That's more applicable to operating reactors. Then they added Subpart K which is Fitness for Duty Program for construction. It was effective April 30, 2008, 30 days from the date that the rule was issued.

It specified that an ESP holder issued an LWA to install foundations, including concrete, for SSCs has to have a fitness for duty program. It goes on to name the types of personnel that have to be included in that program.

The interesting part about Subpart K is that it is much less prescriptive than the normal part 26. They can have a random testing program or they can have a fitness monitoring program. The applicant has come in and decided they were going to do a random testing program and they are going to test 50 percent of the population per year which is what NRC does currently and that is accepted at operating reactors as well. In essence they are putting a pretty full program in place for their Fitness for Duty Program.

During the review process, as I said, we established the applicant's eligibility to implement a program under Subpart K. We systematically assessed each and every one of the sections of Subpart K to see if they were in compliance with those parts of the rule. We focused on how big the random sample was going to be, their testing methodologies, how they are going to protect people, and their privacy characteristics and things like that.

We also wanted to make sure they conformed with all of the standards of laboratories through DOT and HHS and the different laboratories that are established at this point for fitness for duty programs.

The key basis for our acceptance of their program. As I said, they have a program that is going to test 50 percent of the construction staff on-site that work on these structures. They describe the very comprehensive behavioral observation program. Their language is very consistent with the rule and how they are going to implement their laboratories and their testing procedures and the privacy matters and audits and things like that.

One of the big overriding factors is the fact that they already operate several reactors and they have programs in place. I know they are very familiar with what they are doing and how well they run this program so we were comfortable where they were at.

As for the Office of Nuclear Security and Incident Response, we are working on an inspection program that we will go down and look at their program before they ever put this in place to make sure that everything is consistent. Like I said, there are some things in Subpart K that are going to have to be looked at such as sanctions. That is one of the big questions, how they are going to implement those differently than an operating reactor.

Any questions?

CHAIR POWERS: I mean, basically, they know what they're doing. They are doing it now.

MR. SHROPSHIRE: Yes.

CHAIR POWERS: They have a high confidence.

MR. SHROPSHIRE: Very high confidence.

CHAIR POWERS: There may be some new features of Part K that have rough spots in them but nothing major here.

MR. SHROPSHIRE: Exactly. My biggest question mark would be on what they are going to do for sanctions against someone who violates their policy. An operating reactor you are suspended for 14 days. You come back and if it happens again, you are gone for five years.

I don't know if what they are planning is for a construction site when you have somebody show up who has been drinking all night, or whatever the situation, you send them home. He comes back the next day, he's sober. Does he go back to work? I don't know what their plan is.

MEMBER ARMIJO: A lot of these people would be craft people, subcontractors, stuff like that. Not necessarily the populations that they have been using over the years.

MR. SHROPSHIRE: And some of these are going to be specialists. They are going to come in and they are going to be doing a specific function. You suspend them for 14 days and it's knocking you back a peg trying to get this done.

CHAIR POWERS: What it does is it puts a lot of emphasis on the behavioral observation part of the program. Okay. thank you.

MR. ARAGUAS: That wraps up our discussion on Fitness for Duty and we have one last technical slide that I can sum up very quickly. We wanted to point out on this slide that the applicant did provide a revision to its Quality Assurance Program, the QA manual. When they did that they provided us consistent with industry template which is NEI-06-14A.

That was previously reviewed by the staff and approved by the staff April 25, 2007 in accordance with SRP Section 17.5. In going forward and doing the review of Southern's QA manual, it was a pretty straightforward review just to make sure their program was consistent with the NEI template.

CHAIR POWERS: And it was.

MR. ARAGUAS: And it was. That brings us to our conclusion. I won't read them to you again but they are very similar to the ESP conclusions. The only difference, the only bullet that you won't see there is with respect to drawing conclusions. Only site characteristics or terms and conditions because that's only applicable to the ESP. That's it.

CHAIR POWERS: Thank you. Appreciate your effort.

Let me ask first for comments. Jack.

MEMBER SIEBER: Well, overall I think that the applicant has satisfied the requirements for an ESP: and the staff's questions satisfactorily. I'm still drawn to the issue about how the site characteristics match as stated but not in the application reactor design.

On the other hand, I agree with Otto's conclusion that you license one thing at a time and fight each problem as you come to them. With regard to satisfying the requirements of the ESP application and the Limited Work Authorization, I think that the requirements have been satisfied.

CHAIR POWERS: Bill, I'm going to come back to you.

Sam.

MEMBER BONACA: I agree with Jack that the requirements for the ESP and the Limited Work Authorization have been satisfied. I also think that the staff did the right thing in looking beyond the narrow requirements to approve the limited work authorization and check to see that there was a success path that that plant actually probably would work.

Not concluding anything and not doing anymore than that but I think it would be very bad for the Commission or the staff to approve a work authorization for a plant that later got into serious problems. I think they did exactly the right thing. That's all I have.

MEMBER BONACA: I voice Sam's conclusions. I think that it is sufficient justification for work authorization and it would work. There is not a problem there.

MEMBER MAYNARD: I agree with what has been said. I think it's important with the Limited

Work Authorization and also with the ESP that at least the statements made we need to identify a couple of unresolved issues or if there is an item outstanding.

I just don't want our letter or their conclusions to say that this site is okay for the AP1000 because we have demonstrated that. As far as being able to build a plant there, I think that can be done. The Limited Work Authorization I think that is fine, too, again, as long as it's preceded with the known risk that there is an issue that needs to be resolved.

One other thing that I would point out, I noted in the applicant's presentation they talked about a little bit of reliance on Unit 1 and 2 experience but, to me, there is a significant difference there. Unit 1 and 2 was set down on the Blue Bluff Marl and Units 3 and 4 are on a fill. I think that is different.

CHAIR POWERS: I'm looking for you to help me on the emergency plan and any other comments that you would like to make.

MEMBER RAY: Well, I think on the emergency action levels and on the TSC thus forming the seventh permit conditions, at least it is my recommendation that we find that what has been proposed is acceptable and meets the requirements for the ESP.

I prefer your characterization, Dana, of the situation with regard to the seismic issue because although I certainly share the view that if somebody thought that there wasn't a success path that it would be incumbent upon the NRC to say so. Now even though it isn't an issue being presented, I don't think -- I'm more concerned by the potential for a bias in the review that is yet to be conducted that would result from expressing an expectation that there is a success path.

Now, to me having modified two existing plants to meet much higher seismic requirements as I have done, I think there is a success path even if there is some modification required. Therefore, I, too, share that view. On the other hand the analysis has to be done and it should, I think, be done with a backdrop of some expected outcome and so I would just caution against that and that is why I prefer your way of framing the circumstance. That's it.

CHAIR POWERS: Bill, I'm looking to you to help me focus with some words. By the way, the magnitude of words we're looking for is a well-crafted paragraph, not a miniature encyclopedia. We do not need an encyclopedic account of what the staff has done.

MEMBER RAY: It would probably be too short rather than too long.

CHAIR POWERS: That's what I was getting at.

Bill.

MR. HINZE: Well, I thank the Committee and you for the opportunity of being involved in such an interesting and challenging problem. I think that the staff has done an excellent job, very comprehensive, very insightful in their review. However, as some of my comments would be indicated today, I think if I may violate my own concerns, it is generally acceptable.

I do think that there are a few places where this could be improved upon just to make certain that all of -- that there are no holes. I have mentioned some of those today and I will provide you with a written report that specifies some additional ones.

As I understand it my marching orders is that I will, No. 1, give the Committee a status of the 22 open items that we have for seismic and I assume the 12 COL items if you would like that as well. I will not be borisome by repeating everything that is said in these.

I also will try to bring together the information on the seismic zones that fall within the Vogtle region and speak about what the status of Vogtle is at the present time and why that has changed since the EPRI-SOG 86 if I understand where I'm going.

CHAIR POWERS: Okay. Yeah, the amount of historical information that we need probably is a little more in this area because general familiarity our primary audience will have on this subject. I'm giving you latitude to say a little more.

MR. HINZE: I've got some of that material in the report that I prepared for you last time.

CHAIR POWERS: From Don. Yeah.

MR. HINZE: I'll be extracting those and upgrading those.

CHAIR POWERS: Yeah. Still we want it to be adequate but we don't want to pad the report. We have to understand our target audience includes commissioners that will not have as much background on this as perhaps we have. Some of them have just come on board.

MR. HINZE: In contrast to Harold, I would rather be -- I'll try to be a little bit more detailed and feel that you can use your black pen to cross out things as you see fit --

CHAIR POWERS: And I can.

MR. HINZE: -- in terms of your knowledge of what --

CHAIR POWERS: That probably is a good bias. There is no restriction on the length of each paragraph.

I think we will prepare a letter that certainly complements substantially both the staff and the applicant on the quality of their characterization of this site. I think we will make it clear that we cannot attest that the site characteristics are bounded by any certified reactor that we now know.

I think the limit about work authorization is something that the safety aspects are understood by us and we can support that going forward. I think we will probably come in favorably on this first submission of the complete integrated emergency plan. It is my suspicion that we will comment favorably on the Fitness for Duty and the Quality Assurance plan. That is my expectation. I mean, that is my expectation in the sense that is the draft position we carry forward to the Committee.

We come now to the issue of what will be presented to the Committee. What do we have for time there?

MR. WIDMAYER: Two hours.

CHAIR POWERS: We have two hours.

MR. WIDMAYER: That's for both the staff and the applicant.

CHAIR POWERS: The whole shooting match. That is the total clock time. You've had the benefit of a substantial fraction of the Committee attending at least a portion of this. Still, one has to be prepared for questions from the uninitiated.

We do have a Committee now that has a lot of new members so if I'm going to caution you to bias us in the area of brevity and background, you cannot be too summaried. Half the Committee has never seen this site before. They haven't been through the first round. I think you have a certain obligation that you did not exercise this time on site description.

You are going to have to tell the Committee, "I've got two units operating on this site. It is, indeed, located near the Savannah River site." That opportunity did not need to present here but you have presented it in the past and you will need to bring it forward simply because the full Committee has some members that are not -- that have not seen this before and recognize that.

I would treat the ESP fairly comprehensibly at the expense of the LWA. One or the other of you treat the LWA. Don't both of you treat it. I don't think I would hesitate at all to emphasize what is new and different about this whole thing. In fact, you are bringing forward a complete and integrated emergency plan. That is unusual. That has not been done in the past that you have a Fitness for Duty plan. I wouldn't hesitate to bring forward those things.

I would tend to treat the resolution of the outstanding issues in a purely summary fashion saying we had these and we treated them. Again, your seismic characterization of this site deserves more emphasis than the meteorology or the hydrology just because it's visible and everybody knows about it and what not. The others tend to be more for the cognoscenti than the full Committee.

MR. ARAGUAS: Would it be appropriate just to remove the discussion on the meteorology and just keep it to a simple, "We had an open item and we resolved the open item in meteorology?"

CHAIR POWERS: I think you could do that, especially for that one. You could deal with the hydrology. One or the other of you deal with the hydrology that says, "We've built the model." I came away with the impression that both the applicant and the staff had tortured the model beyond the bounds established by the Department of Justice and had succeeded in convincing themselves that they understood the hydrology of that site fairly well.

I think you can do that fairly effectively and quickly and then get to the seismic part. Then I would do the full-blown song and dance on seismic force. Then I would not hide at all the seismic spectrum issue that came up in the LWA.

And, again, recognize that half the Committee has never -- half the Committee cannot find Vogtle on a map. That's just the facts of life that you'll have to do a little more background and still get to the salient points that you want to make. If I think you're not getting to the salient points, the Subcommittee will prompt you with questions to get to the point. Don't hesitate to give a little bit of background.

Christian, you might want to give background on the whole concept of an ESP because at least some of the Committee have never been to one.

MR. ARAGUAS: Okay.

CHAIR POWERS: Okay. Any other comments?

MEMBER BONACA: I think I second exactly what you're proposing. You may want to even lists all the pieces of information that they had to fill in the ESP and check out or whatever the review. It is important to the members the extent of material that is there --

MR. ARAGUAS: Absolutely.

MEMBER BONACA: -- and the items they have covered already.

CHAIR POWERS: You will not go long providing background at the expense of detail in your response. I think you can afford to be fairly summary in saying, "Okay, we resolved these issues." If somebody wants to know how you resolved it in some detail, I'm sure they are capable of asking.

Background and perspective is more important for new members that have not been sitting in the Subcommittee meeting on details on the resolution of issues. When you talk about shear wave velocities, don't say why you are looking at shear wave velocities. I don't think you need to get into where you took the bore holes and things like that.

MEMBER MAYNARD: They might be ready to explain what some of the terms are in seismic assessment.

CHAIR POWERS: Yeah, they may tell you there's an issue and somewhere Annie gave me a beautiful picture of a liquefaction event. If you are going to bring up a liquefaction event, show that. It's a lovely picture of a liquefaction event. You just get into trouble on these things of people who have not seen it before and they will ask a question. You are trying to do it with your hands against the screen and it never works.

Okay. My best shot of advice on what to do, I will leave it to you and the applicant to decide how to split the time. It will be two hours of clock time. I think you can anticipate -- let's see, are we second or third?

MR. WIDMAYER: Second.

CHAIR POWERS: Second. They've got lots of energy at that point. Second right after the coffee break. Dead meat. Okay. Anything else that we can help you with? Well, thank you very, very much. As has been the norm on these things, I am humbled by the magnitude of effort that you guys have gone to and the technical quality of the presentations both by the applicant and the staff. You did a hell of a good job and a lot of work. We do appreciate your efforts.

At this point I will adjourn the Subcommittee.

(Whereupon, at 4:41 p.m. the meeting was adjourned.)

Southern Nuclear
Vogtle 3 & 4 ACRS Meeting
December 3-4, 2008

Early Site Permit

Jim Davis
ESP Project Engineer
Southern Nuclear

SOUTHERN COMPANY

Agenda

- Introduction
- Schedule
- Early Site Permit (ESP) Overview
- Limited Work Authorization (LWA) Overview

Introduction

- Southern Nuclear is pursuing an Early Site Permit (ESP) in accordance with 10 CFR 52 Subpart A-Early Site Permits
- In addition Southern Nuclear is seeking a Limited Work Authorization (LWA) in accordance with 10 CFR 50.10

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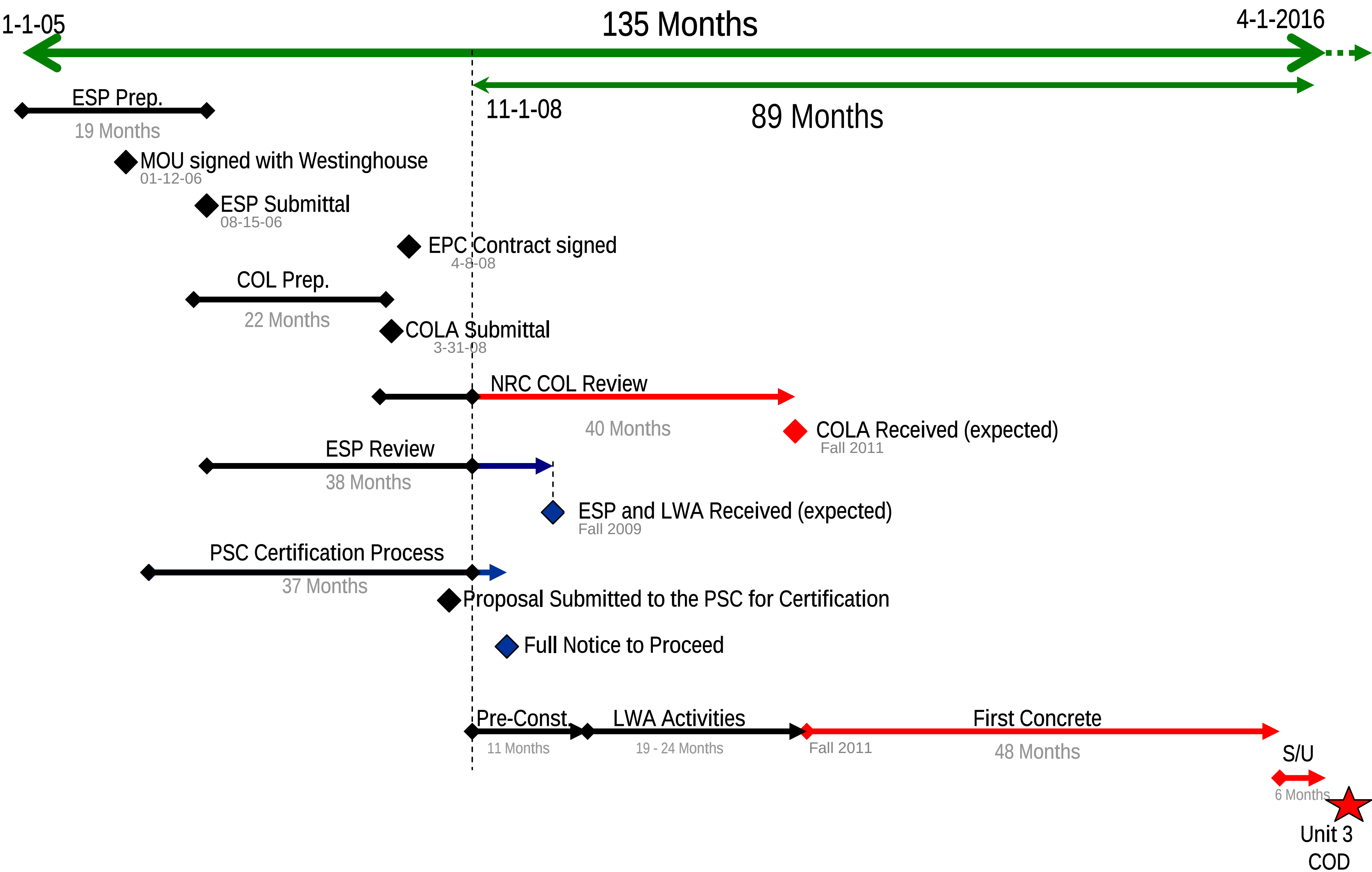
Introduction

- An ESP grants approval of a site for one or more nuclear power facilities separate from the filing of an application for a construction permit or combined license for the facility
- The requested LWA will allow a limited scope of safety-related construction activities to proceed at applicants risk as long as a site redress plan is included.

VEGP ESP Level of Detail

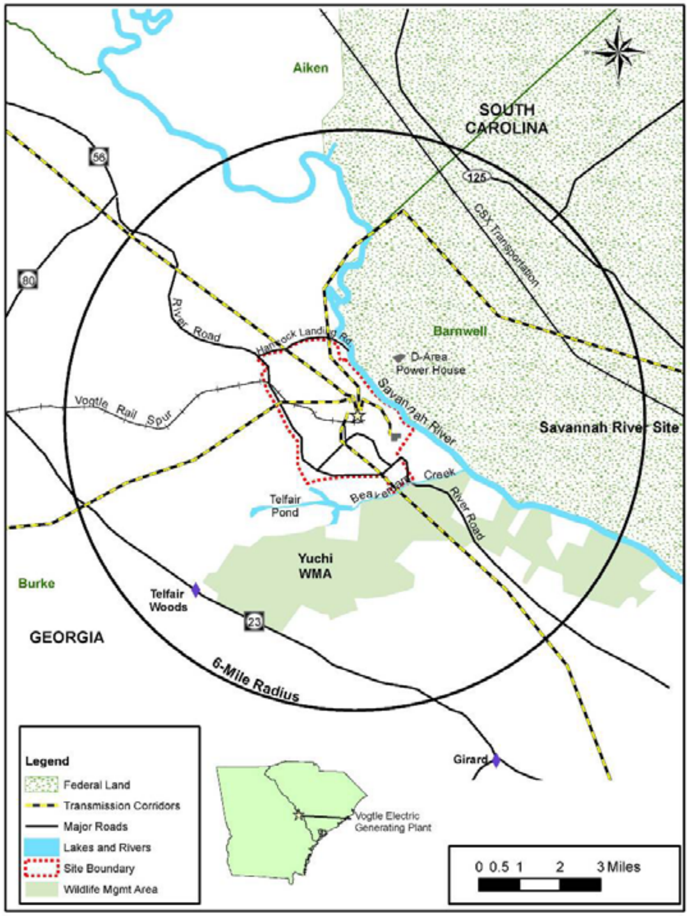
Example	Other ESPs	VEGP ESP
Reactor Type Power Output	Options Listed	Two Westinghouse AP1000's at 1117 MWe Each
Plant Layout Cooling Water Design Intake Design	General Information Provided	Detailed Conceptual Design and Layouts Provided
Water Consumption And Discharge Flow	Envelope Approach	Plant-Specific Numbers Provided
Normal Effluents and Accident Doses	Envelope Approach	Plant-Specific Numbers Provided
Emergency Plan	Major Features	Complete & Integrated Plan
Limited Work Authorization	None	Requested for specific activities

Vogtle 3&4 Schedule



Vogtle Site Location

The, 3,169-acre existing 2 Unit site is located on a Coastal Plain bluff on the southwest side of the Savannah River in eastern Burke County Georgia. The site is directly across the river from the Department of Energy's Savannah River Site (Barnwell County, South Carolina). It is about 150 river miles from the mouth of the Savannah River and approximately 26 miles southeast of Augusta, Georgia.



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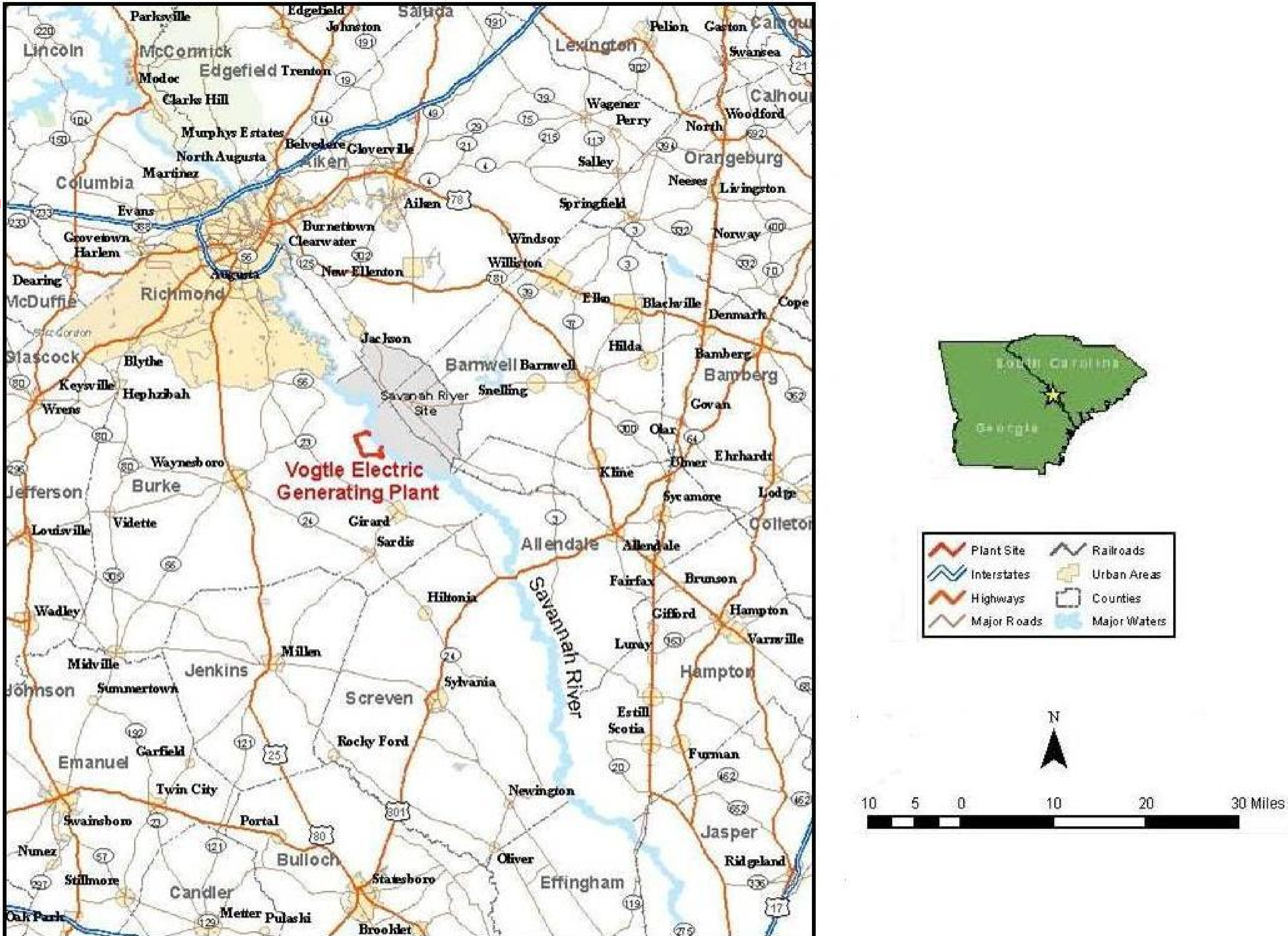
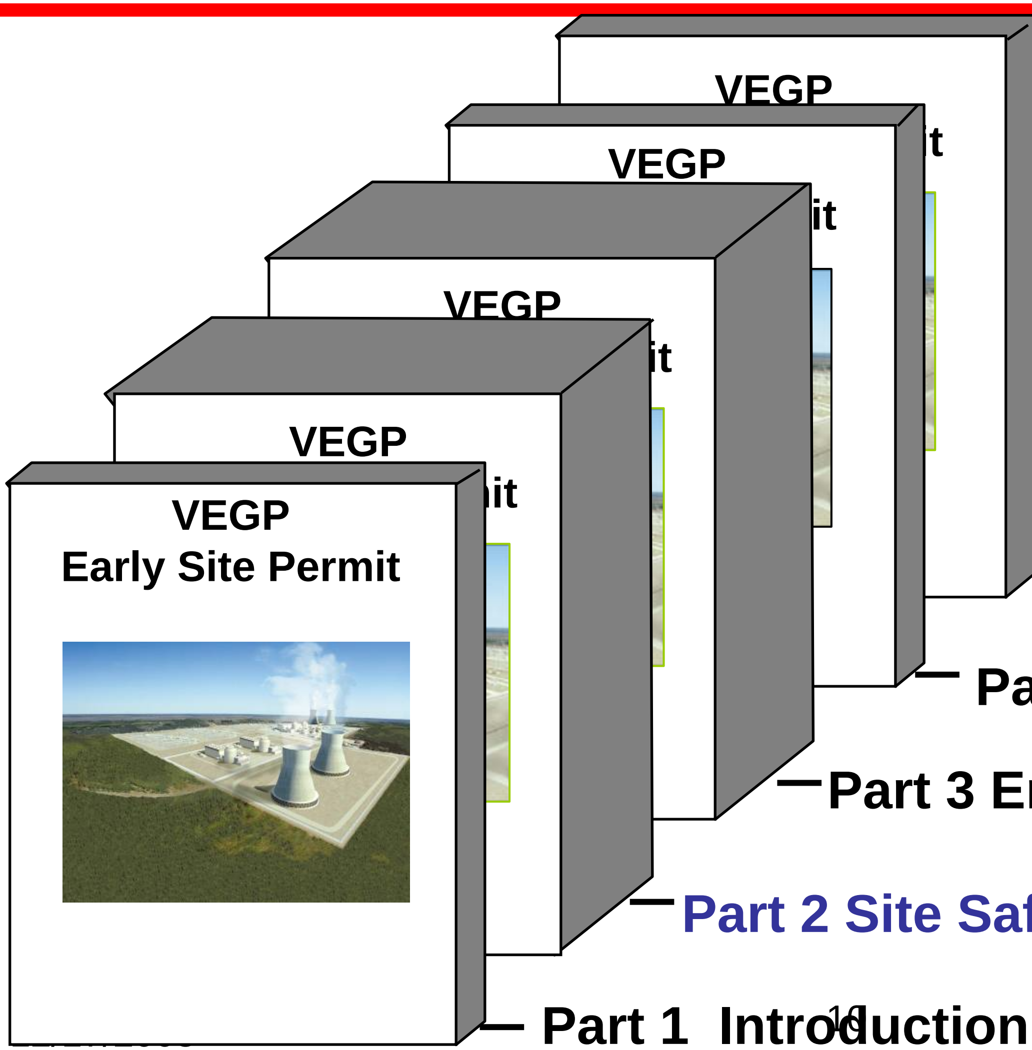

Vogtle Electric Generating Plant
Savannah River Site
Savannah River
South Carolina
Georgia
Plant Site
Interstates
Highways
Major Roads
Railroads
Urban Areas
Counties
Major Waters
N
10 5 0 10 20 30 Miles
Lincoln
McCormick
Edgefield
Saluda
Lexington
Calhoun
Columbia
Aiken
Orangeburg
Richmond
McDuffie
Glascock
Barnwell
Bamberg
Jefferson
Burke
Allendale
Colleton
Jenkins
Screven
Hampton
Johnson
Emanuel
Bulloch
Candler
Effingham
Jasper
Parksville
Edgefield
Johnston
Pelion
Gaston
Swansea
Modoc
Trenton
Clarks Hill
Wagener
Perry
Woodford
Murphys Estates
North
Belvedere
Gloverville
Salley
North Augusta
Martinez
Neeses
Livingston
Aiken
Springfield
Evans
Burnettown
Windsor
Norway
Grovetown
Harlem
Clearwater
Williston
New Ellenton
Augusta
Dearing
Elko
Blackville
Denmark
Cope
Jackson
Hilda
Bamberg
Blythe
Barnwell
Keysville
Snelling
Hephzibah
Wrens
Govan
Olar
Waynesboro
Ehrhardt
Ulmer
Kline
Sycamore
Lodge
Louisville
Vidette
Girard
Sardis
Allendale
Fairfax
Brunson
Wadley
Hiltonia
Gifford
Hampton
Varnville
Luray
Millen
Midville
Sylvania
Summertown
Estill
Scotia
Garfield
Rocky Ford
Furman
Twin City
Newington
Swainsboro
Portal
Nunez
Oliver
Ridgeland
Stillmore
Statesboro
Metter
Pulaski
Oak Park
Brooklet

Early Site Permit (ESP) Contents



Part 5 Emergency Plan

Part 4 Redress Plan

Part 3 Environmental Report

Part 2 Site Safety Analysis Report (SSAR)

Part 1 Introduction

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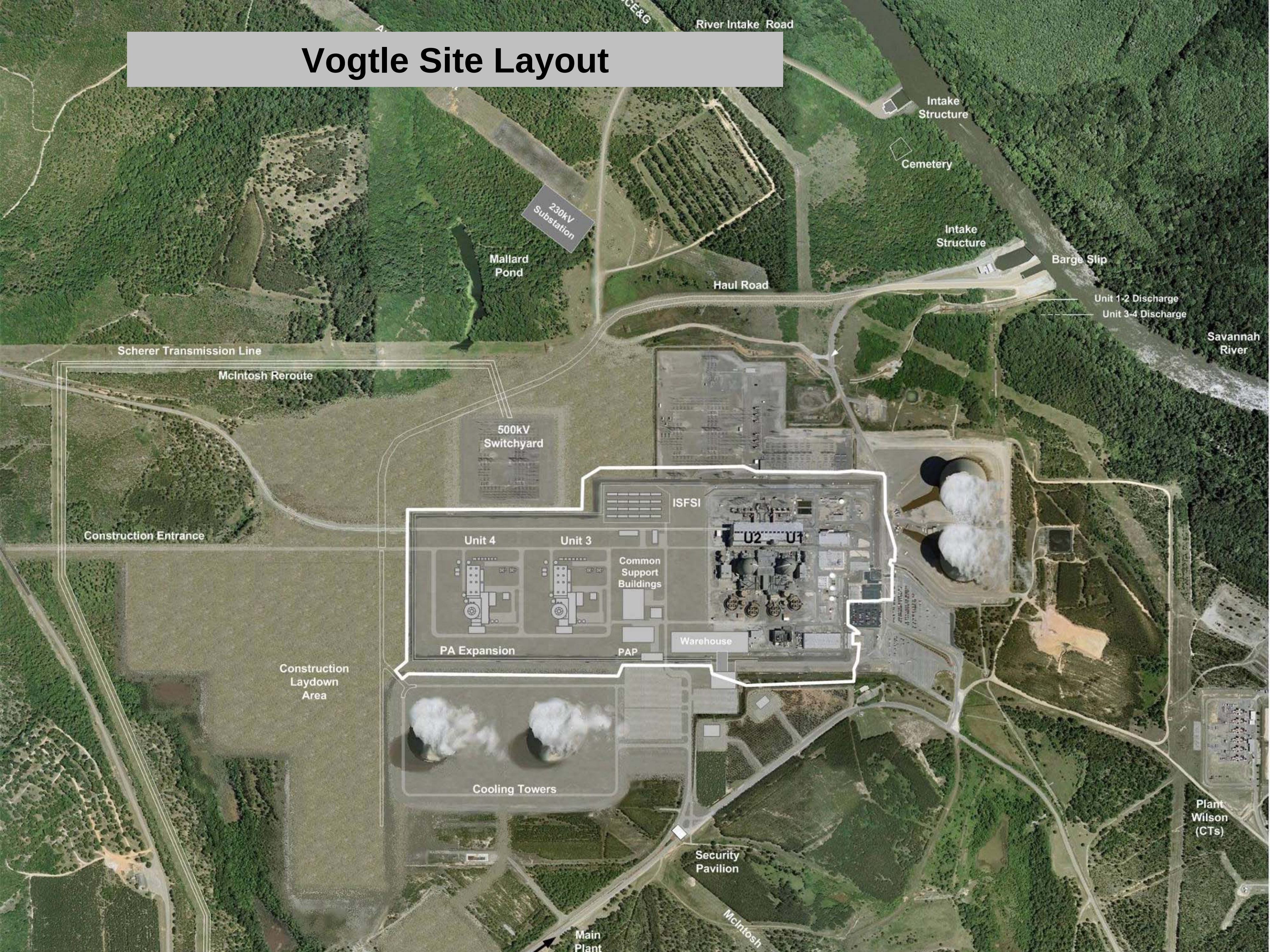
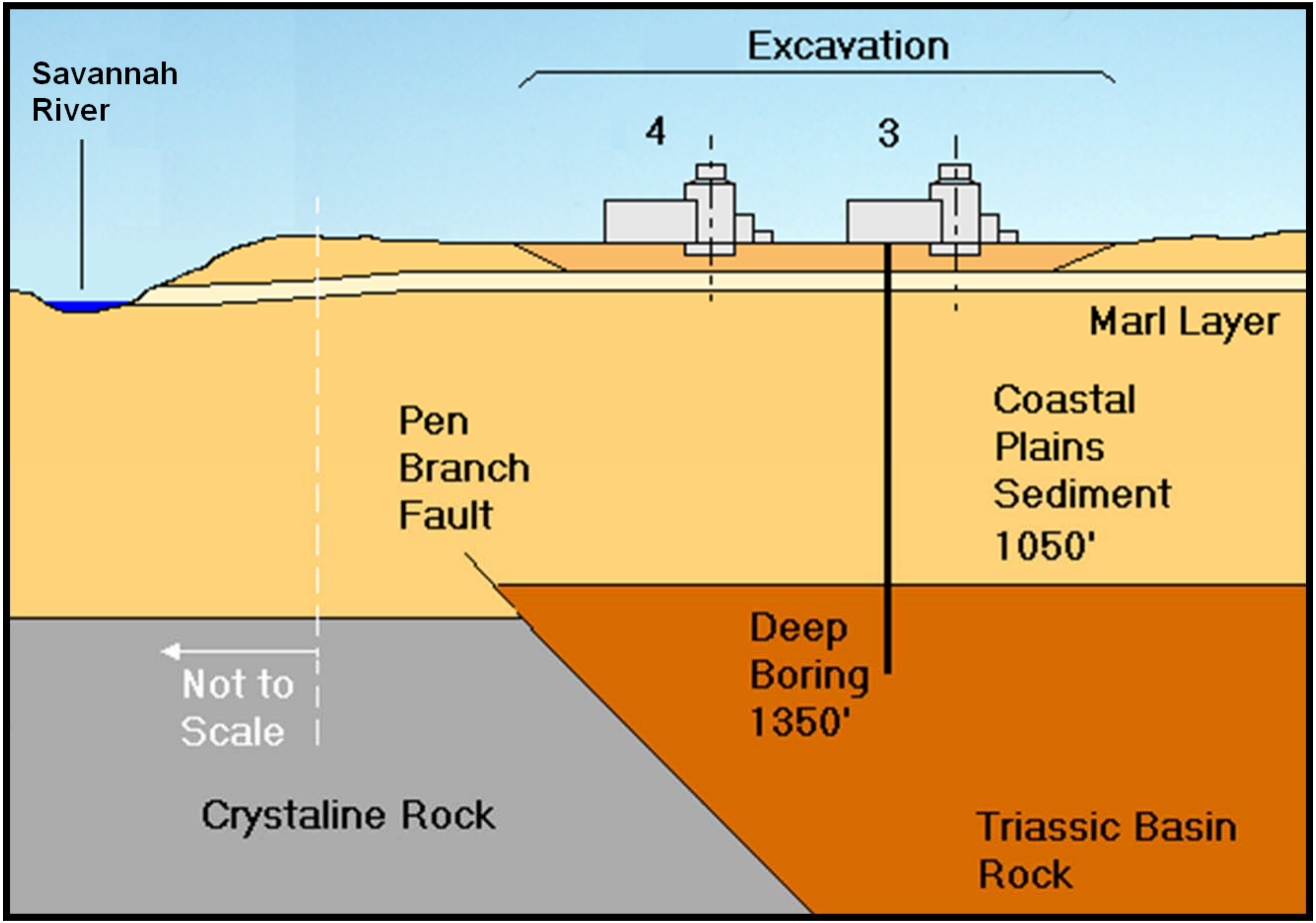
Part 2 Site Safety Analysis Report

Chapter numbering follows FSAR format and addressed selected chapters:

- 1 Introduction and General Description
- 2 Site Characteristics
  - 2.1 Geography and Demography
  - 2.2 Potential Hazards
  - 2.3 Meteorology
  - 2.4 Hydrology
  - 2.5 Geology and Seismic
- 3 Design of Structures, Components, Equipment, & Systems
  - 3.5.1.6 Aircraft Hazards
  - 3.8 Design of Category I Structures
- 11 Radioactive Waste Management
  - 11.2.3 Liquid Radioactive Releases
  - 11.3.3 Gaseous Radioactive Releases
- 13 Conduct of Operations
  - 13.3 Emergency Planning
  - 13.6 Industrial Security
  - 13.7 Fitness for Duty
- 15 Accident Analyses
- 17 Quality Assurance

Vogtle Site Layout





Site Soil/Rock Profile with Backfill

ESP Requests for Additional Information (RAIs)

Section	Subject	RAIs
2.1	Geography and Demography	12
2.2	Potential Hazards	18
2.3	Meteorology	16
2.4	Hydrology	10
2.5	Geology and Seismic	64
3.5.1.6	Aircraft Hazards	1
11	Liquid and Gaseous Releases	16
13	Emergency Planning	48
15	Accident Analysis	1
17	Quality Assurance	3
	RAIs	**189**

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SER Open Items

Section	Subject	OIs
2.3	Meteorology	1
2.4	Hydrology	4
2.5	Geology and Seismic	22
13	Emergency Planning	13
	Total	**40**

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LWA RAIs

The addition of the LWA request resulted in an additional 26 RAIs for the following subject areas:

- Site Investigation Information
- Engineering properties of subsurface materials
- Backfill requirements and engineering criteria

LWA and Preconstruction Overview

- Overview
- Pre-Construction Activities
- LWA Construction Activities
- LWA Schedule

Application Submittal - LWA

- Initial LWA-1 Request – ESP Revision 0, August 2006
- LWA-2 was included in ESP Revision 2, Supplement 1, August 2007
- Updated LWA Request to new rule 10 CFR 50.10 - ESP Revision 3, November 2007

Preconstruction Activities

Construction Does Not Include:

- Changes for temporary use of the land for public recreational purposes
- Site exploration
- Preparation of a site for construction of a facility
  - Clearing of the site
  - Grading
  - installation of drainage
  - Erosion and other environmental mitigation measures
  - Construction of temporary roads and borrow areas
- Erection of fences and other access control measures
- Excavation

Preconstruction Activities

Construction Does Not Include (Continued):

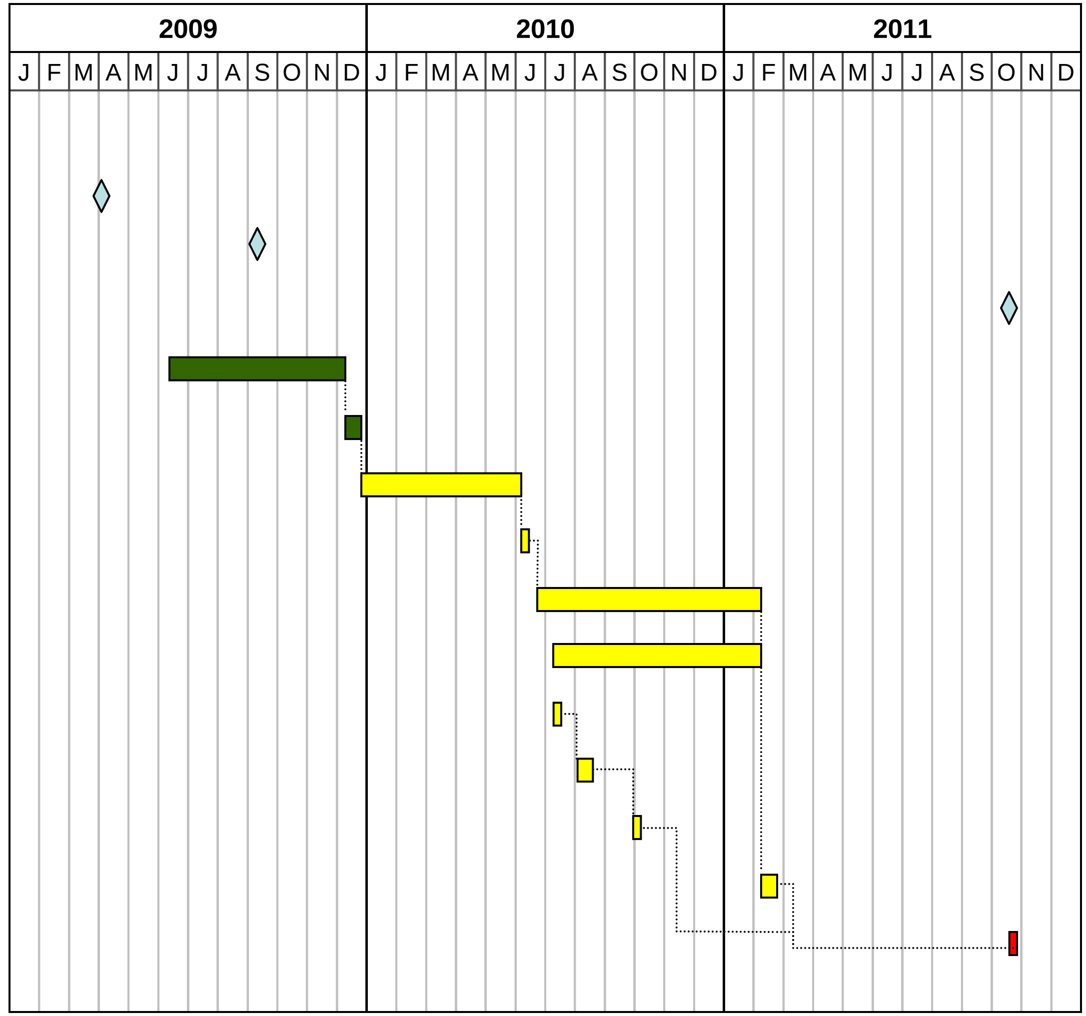
- Erection of support buildings for use in connection with the construction of the facility (Construction equipment storage sheds, Warehouse and shop facilities, Utilities, Concrete mixing plants, Docking and unloading facilities, Office buildings)
- Building of service facilities
- Paved roads
- Parking lots
- Railroad spurs
- Exterior utility and lighting systems
- Potable water systems
- Sanitary sewerage treatment facilities
- Transmission lines;
- Procurement or fabrication of components or portions of the proposed facility occurring at other than the final, in-place location at the facility

LWA Construction Activities

- The SNC LWA request is for the full extent of activities allowed by regulation and the site redress plan encompasses all such activities. Examples of VEGP LWA activities that SNC has identified include the following:
  – Engineered Backfill
  – Retaining Walls (mechanically stabilized earth walls)
  – Lean concrete backfill
  – Mud Mats
  – Waterproof membrane
  – FFD
  – QA
  – PI&R

Vogtle Projected Construction Schedule
Activities Associated with LWA Request

Activity Description	Finish Date	Duration (weeks)
PSC Approval	4/2009	0
ESP Approval	9/2009	0
COL Approval	Fall 2011	0
Excavate power block	12/09	27
Perform geological mapping	12/09	3
Backfill to base of NI	6/10	24
Survey for MSE wall installation	6/09	1
Construct MSE wall to grade	2/11	30
Backfill to grade for Unit 3	2/11	30
Place first mudmat	7/10	1
Apply membrane to mudmat and wall	8/10	2
Place second mudmat	10/10	1
Apply waterproof membrane to wall	2/11	3
Place first concrete for Nuclear Island	Fall 2011	1



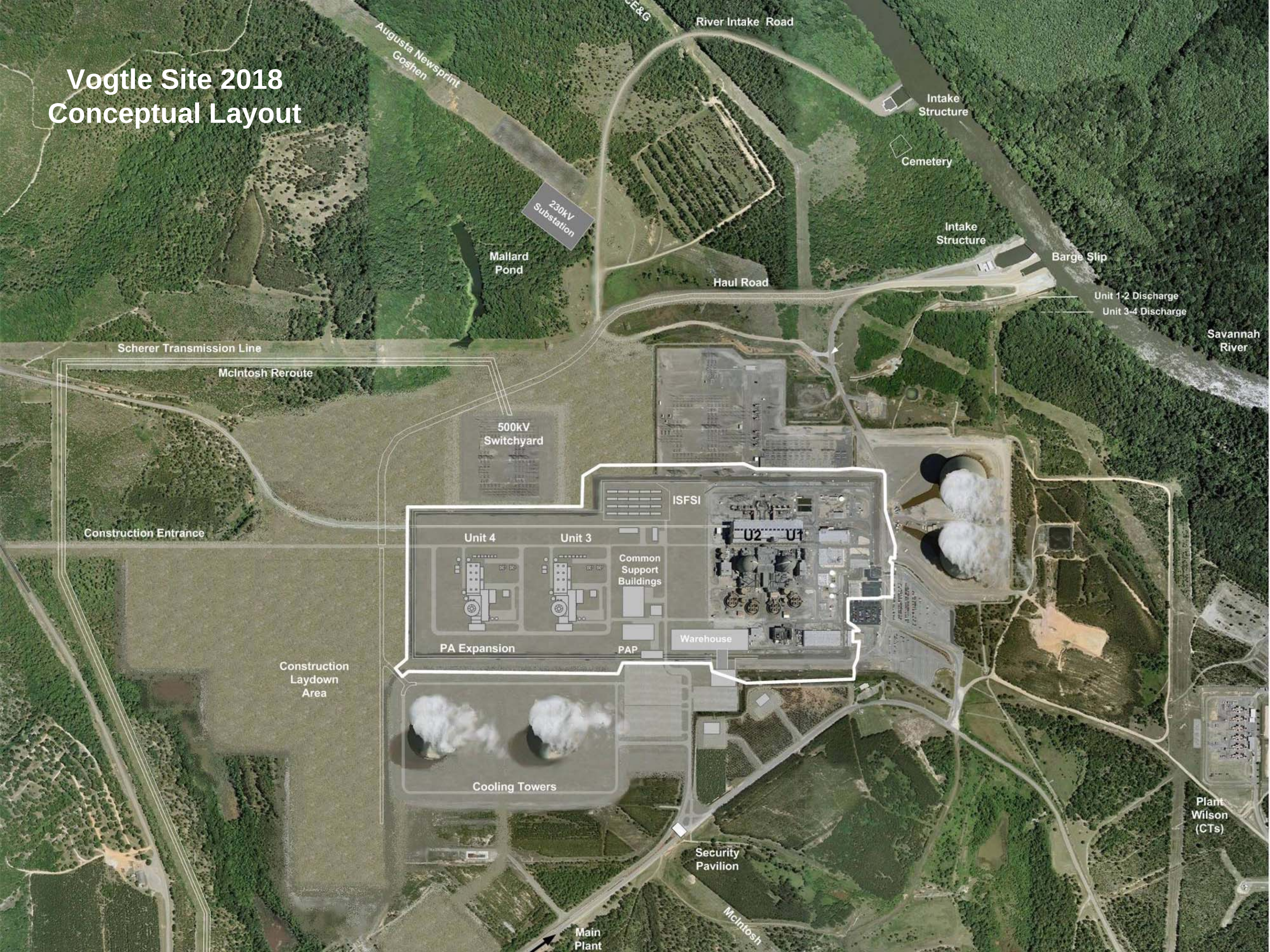
NOTES

All activities shown are for Unit 3. Unit 4 activities lag the Unit 3 activities and have a similar duration.

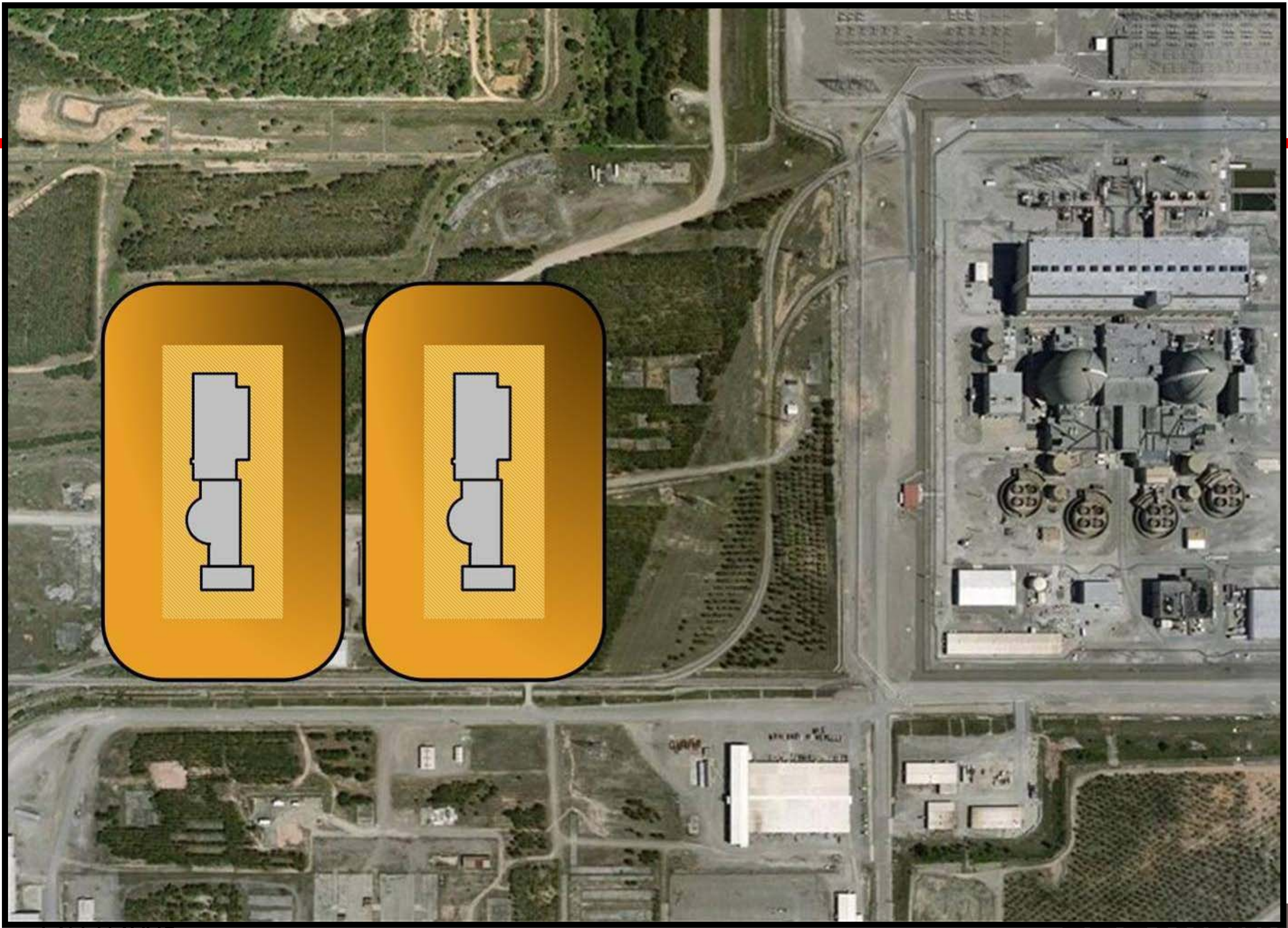
Schedule shown is based on LWA date of November 1, 2009 and COL date of June 30, 2011.

LEGEND

- Pre-Construction Scope
- LWA Scope
- COL Scope


Vogtle Site 2018
Conceptual Layout
Augusta Newsprint
Goshen
SCE&G
River Intake Road
Intake Structure
Cemetery
230kV Substation
Mallard Pond
Intake Structure
Barge Slip
Haul Road
Unit 1-2 Discharge
Unit 3-4 Discharge
Savannah River
Scherer Transmission Line
McIntosh Reroute
500kV Switchyard
ISFSI
U2
U1
Construction Entrance
Unit 4
Unit 3
Common Support Buildings
Warehouse
PA Expansion
PAP
Construction Laydown Area
Cooling Towers
Security Pavilion
Plant Wilson (CTs)
McIntosh
Main Plant

Preconstruction Activities - Dewatering and Excavation



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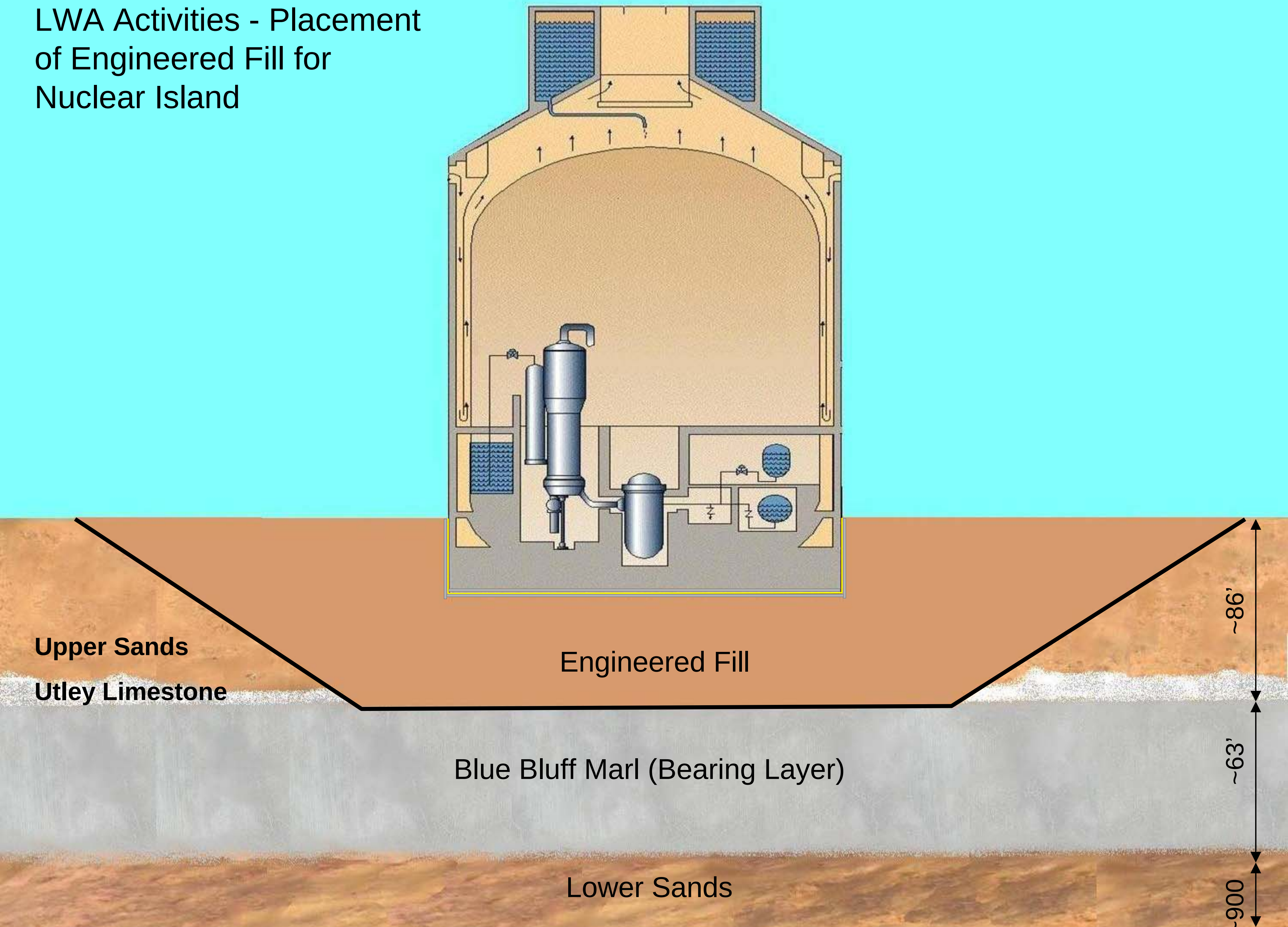
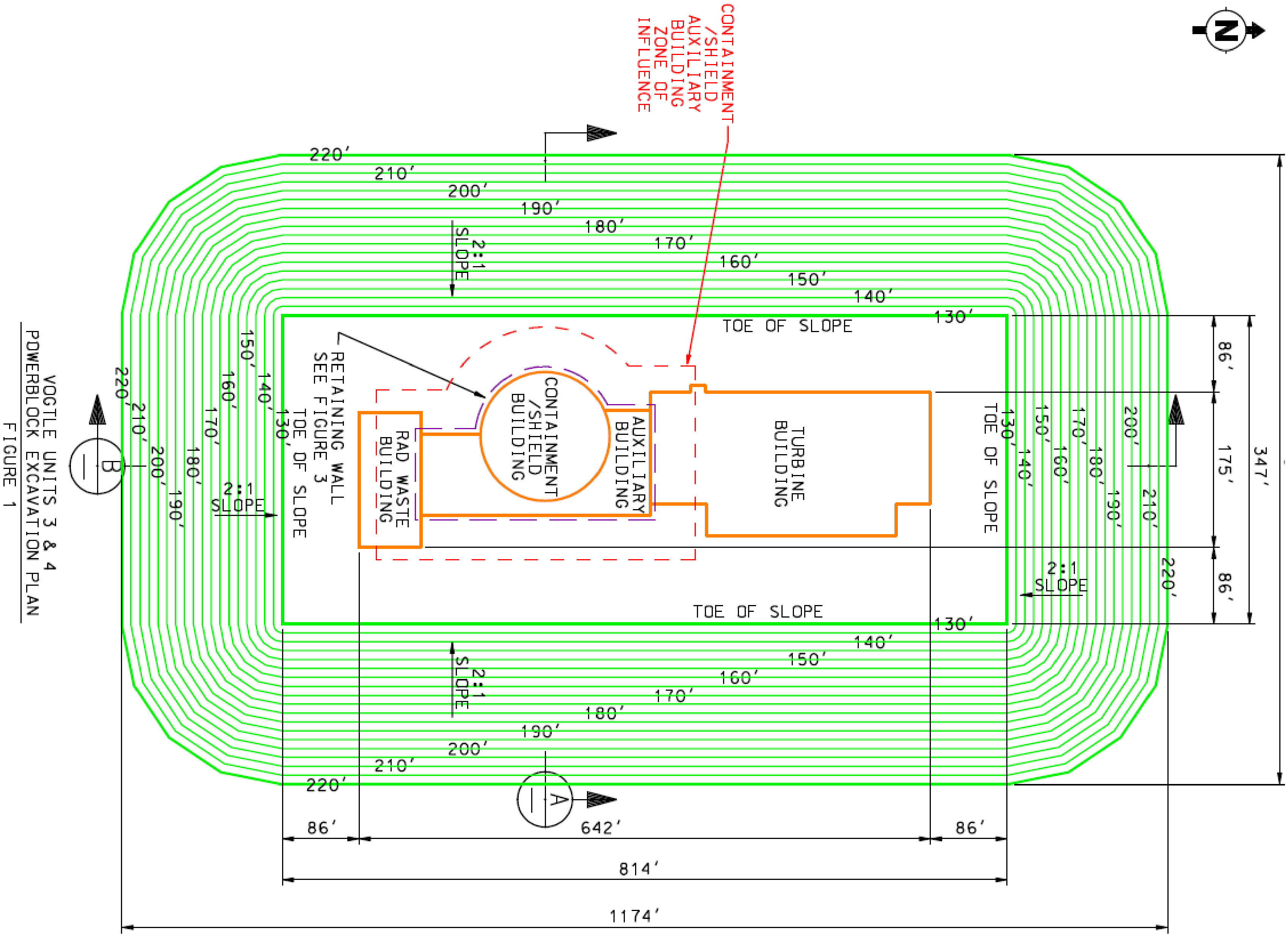
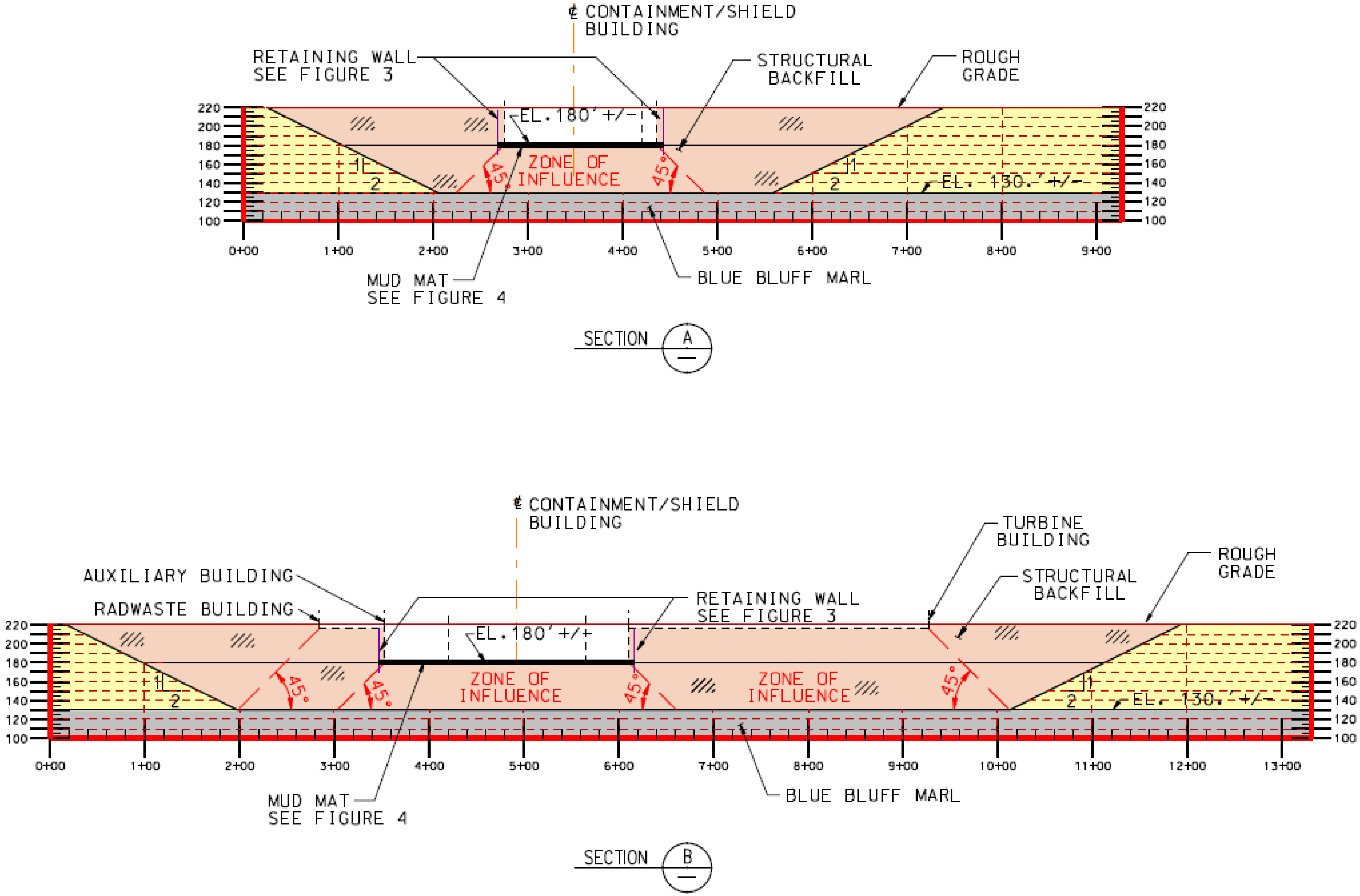
LWA Activities - Placement of Engineered Fill for Nuclear Island




VOGTLE UNITS 3 & 4
POWERBLOCK EXCAVATION PLAN
FIGURE 1
CONTAINMENT /SHIELD AUXILIARY BUILDING ZONE OF INFLUENCE
CONTAINMENT /SHIELD BUILDING
AUXILIARY BUILDING
TURBINE BUILDING
RAD WASTE BUILDING
RETAINING WALL SEE FIGURE 3
TOE OF SLOPE
2:1 SLOPE
A
B
N
220'
210'
200'
190'
180'
170'
160'
150'
140'
130'
86'
175'
347'
642'
814'
1174'



VOGTLE UNITS 3 & 4
POWERBLOCK EXCAVATION SECTIONS
FIGURE 2

MSE Wall Test Section - July 2008

12/17/2008

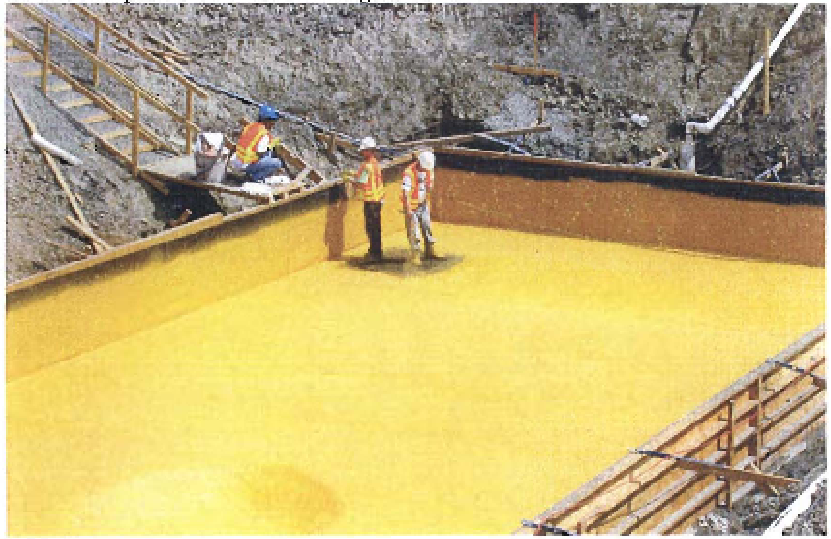
Example MSE Wall near Atlanta Airport

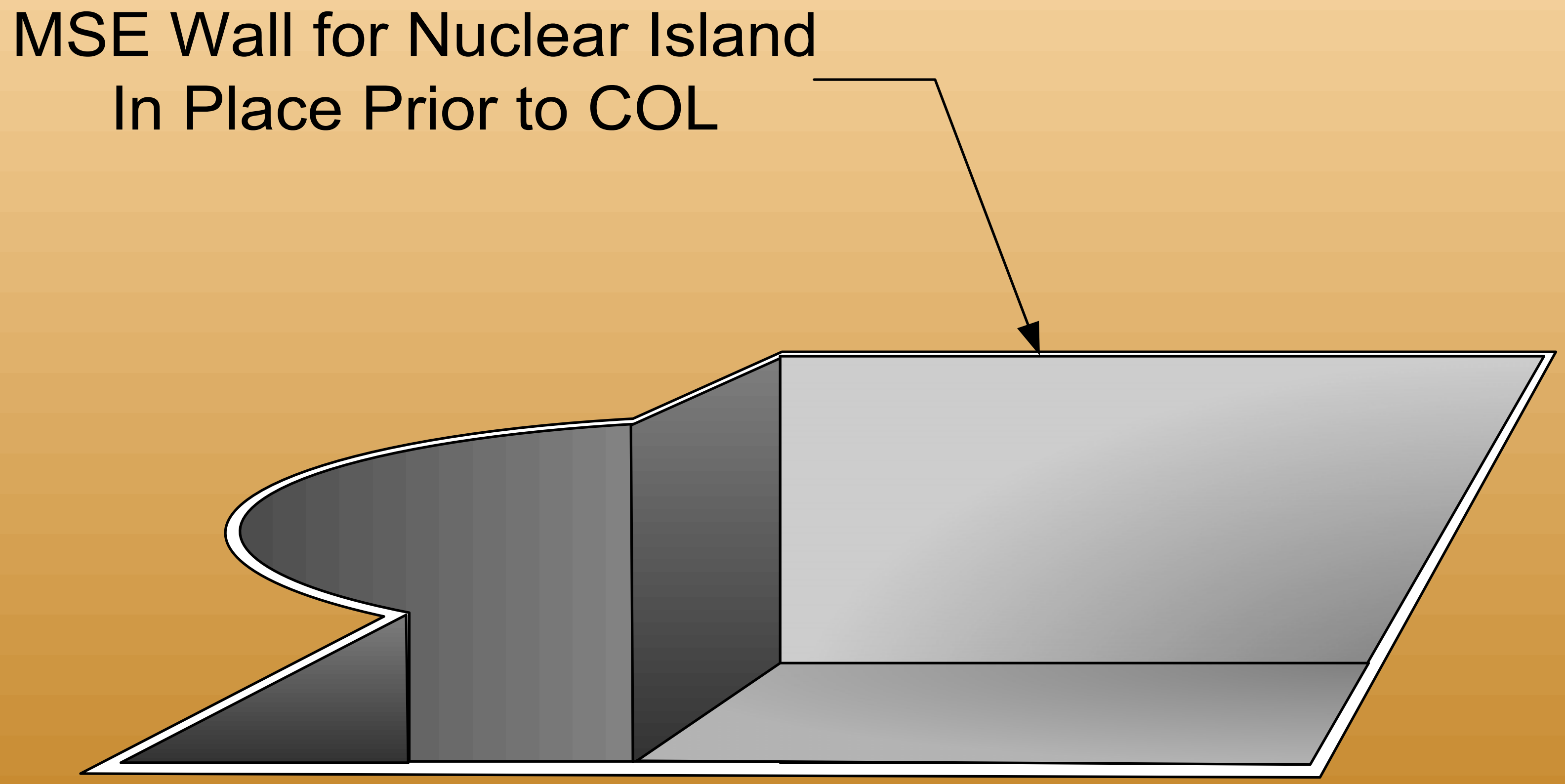
Waterproof Membrane

Above. Application of the 1st coat of Integritank (yellow) on to the geotextile. The walls are sprayed first, followed by the slab, particularly at smaller sites, to ensure the material is cured at the applicators' entrance and exit points.

Installation

Below. Completion of 1st coat of Integritank.





Nuclear Island Foundation at Receipt of COL

Questions

Presentation to the ACRS Full Committee

Safety Review of the
Vogtle Electric Generating Plant
Early Site Permit Application and
Limited Work Authorization Request

December 4, 2008

Purpose

- To provide the ACRS an overview of the staff's safety review and conclusions on:
  - The Vogtle Electric Generating Plant (VEGP) Early Site Permit (ESP) Application
  - The VEGP Limited Work Authorization (LWA) Request
- Address the Full Committee's questions

Meeting Agenda

Early Site Permit Application Review:

- Remaining Schedule Milestones
- Key Review Areas / Resolution of Open Items
- Advanced Safety Evaluation Report (SER) Conclusions

Limited Work Authorization Review:

- VEGP LWA Request Summary
- Review of LWA Activities
- LWA Conclusion
- Discussion / Questions

Remaining Milestones

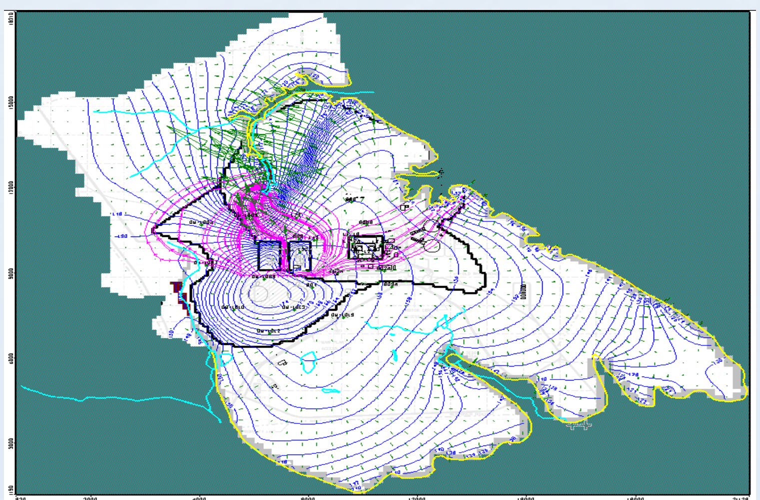
- ACRS Final Letter Assumed – 1/2009
- Final SER Issuance – 2/5/2009
- Mandatory Hearing – 3/23/2009
- Commission Decision Assumed – Summer/Fall 2009

Key Review Areas for ESP/LWA

- The staff completed its review of the following areas for the ESP:
  - 2.1 - Geography and Demography
  - 2.2 - Nearby Industrial, Transportation, and Military Facilities
  - **2.3 - Meteorology (1)**
  - **2.4 - Hydrology (4)**
  - **2.5 - Geology, Seismology, Geotechnical Engineering (22)**
  - 3.5.1.6 - Aircraft Hazards
  - 11 - Doses from Routine Liquid and Gaseous Effluent Releases
  - **13.3 - Emergency Planning (13)**
  - 13.6 - Physical Security
  - 15 - Accident Analyses
  - 17 - Quality Assurance
- Resolution of all Open Items **(Bold)** discussed in the Advanced SER

- The staff completed its review of the following areas for the LWA:
  - 2.5.4 – Stability of Subsurface Materials and Foundations
  - 3.8.5 – Foundations
  - 13.7 – Fitness For Duty Program
  - 17 – Quality Assurance Program

Section 2.4: Hydrology



Section 2.4 Hydrologic Hazard Analyses

- Floods induced by rain, dam break, hurricane, and tsunami.
- Low water impacts
- Ice impacts
- Water use impacts
- Groundwater flow and contamination transport analyses

2.4 Hydrology

- Section 2.4.8: Cooling Water Canals and Reservoirs (**OI 2.4-1**)
  - Issue: Do canals or reservoirs are used as any external water source for safety-related cooling water?
  - Resolution: Staff confirmed that safety-related cooling water is provided not from canals and reservoirs, but from groundwater wells. Based on aquifer characteristics, staff determined that the aquifer has sufficient capacity for initial filling and occasional makeup of two proposed water storage tanks - **Closed**
- Section 2.4.12: Groundwater (**OI 2.4-2**)
  - Issue: Predict future hydrogeological conditions to determine the safety of proposed facilities from groundwater-induced loadings.
  - Resolution: The applicant provided additional field hydrogeologic data (e.g., the unconfined aquifer characters, a refined recharge and hydraulic conductivity maps). NRC staff analyzed the groundwater regime with a post-construction setting and the provided data, and confirmed that a maximum water table elevation (165 ft msl) is far below the site grade (220 ft msl) - **Closed**

2.4 Hydrology (Con't)

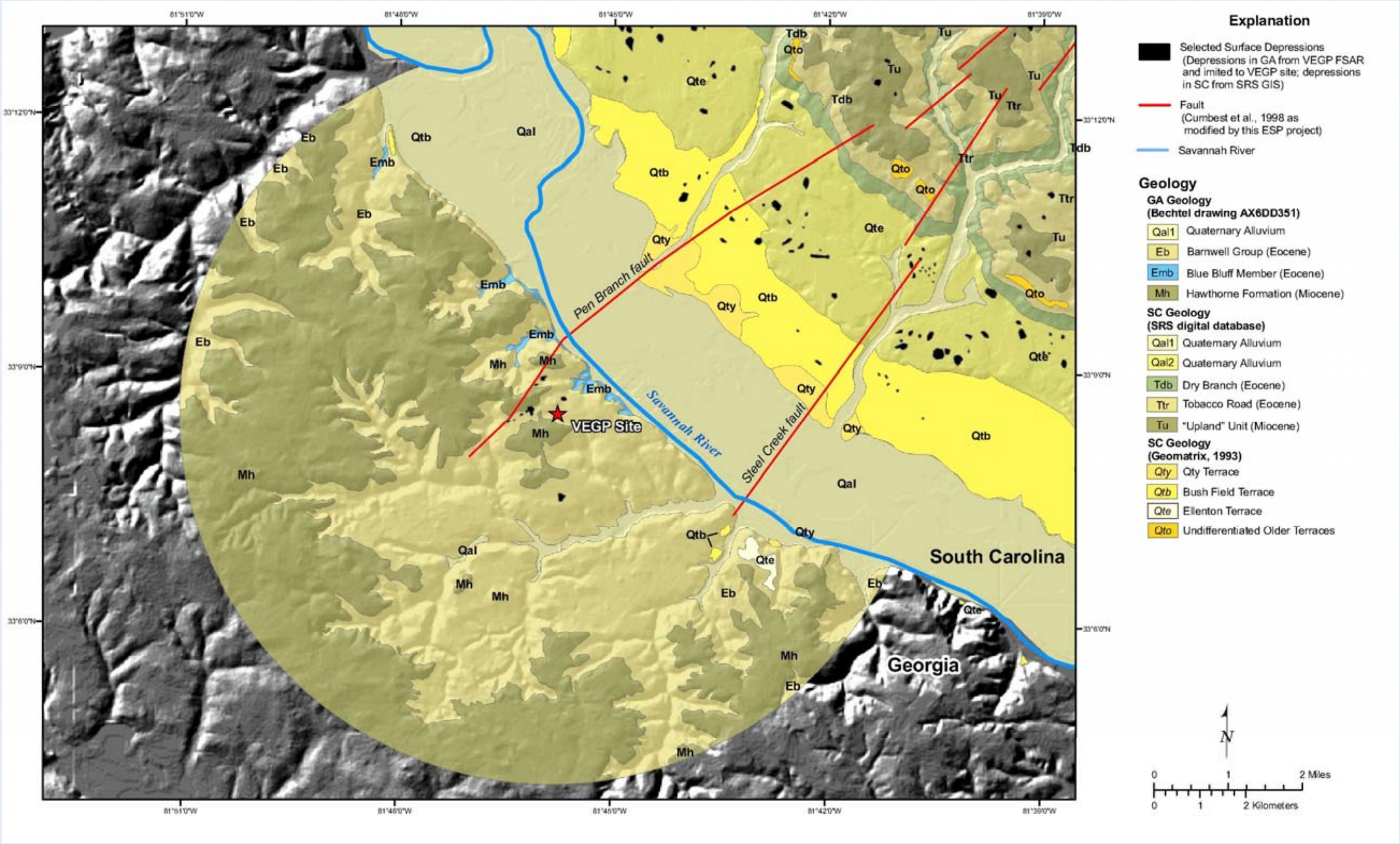
2.4.13: Accidental Releases of Radionuclides In Ground Waters

- **OI 2.4-3**
  - Issue: Consider the potential change in flow direction within the Water Table aquifer and all feasible groundwater pathways.
  - Resolution: The applicant provided additional field data; Analyses by the applicant and the NRC staff examined post-construction settings, and alternative pathways (four alternative pathways), considering an adequate number of combinations of release locations and feasible pathways - **Closed.**
- **OI 2.4-4**
  - Issue: Specify the nearest point along each potential pathway that may be accessible to the public and considered all alternative conceptual models for radionuclide transport analysis.
  - Resolution: (1) The pathways into which these releases occur leave the site boundary before entering the Savannah River; The NRC staff completed an independent analysis of the different groundwater pathways and confirmed that releases to the accessible environment met the requirement of 10 CFR Part 20, Appendix B - **Closed**.
  - COL Action Item 2.4-1: No chelating agents will be comingled with radioactive waste liquids and that such agents will not be used to mitigate an accidental release, or do the transport analysis with chelating agents.

Section 2.5: Geology, Seismology and Geotechnical Engineering

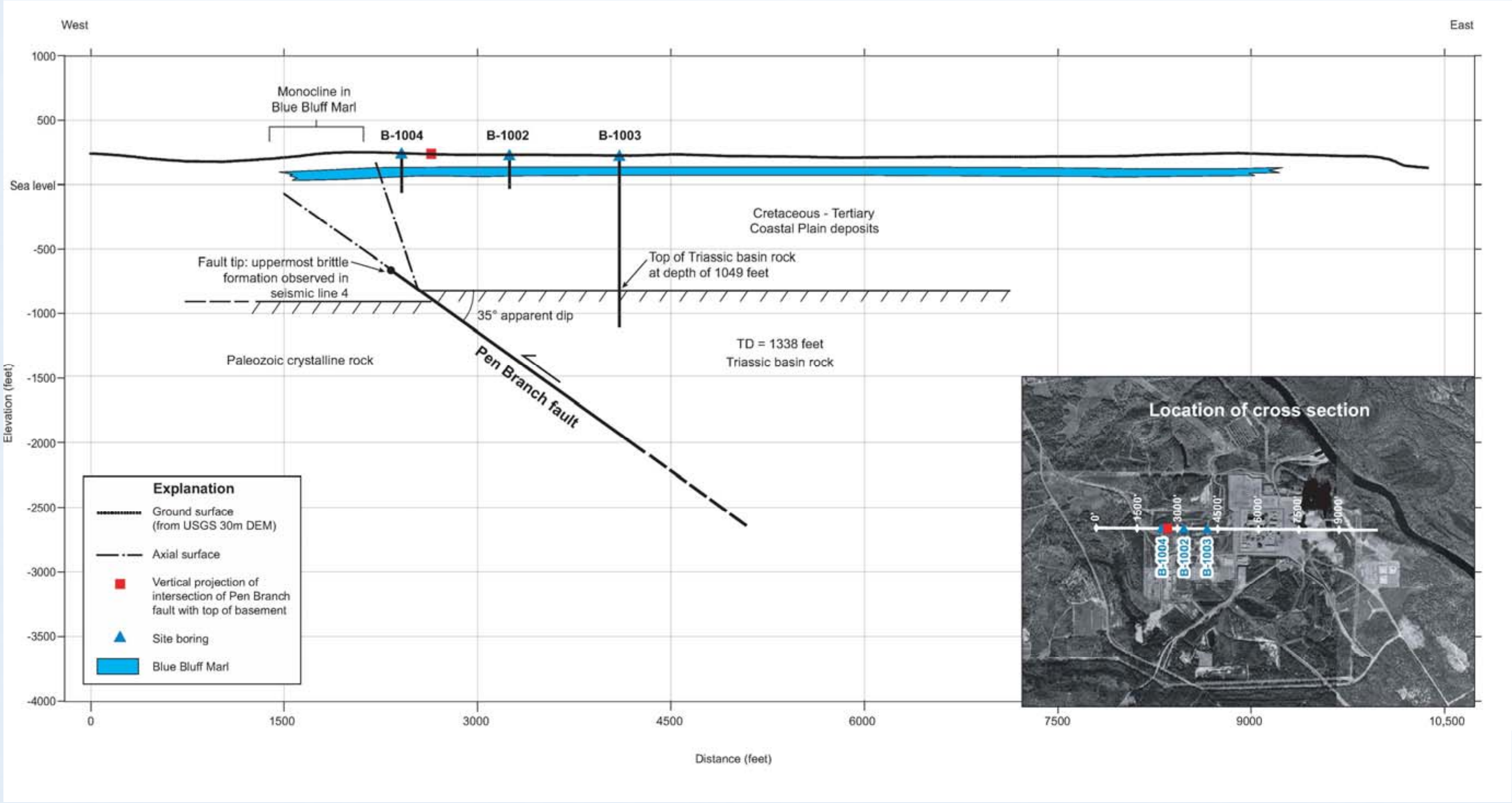
- Section 2.5.1 Site and Regional Geology
- Section 2.5.2 Vibratory Ground Motion
- Section 2.5.3 Surface Faulting
- Section 2.5.4 Stability of Subsurface Materials
- Section 2.5.5 Slope Stability

2.5.1 Basic Geologic & Seismic Information



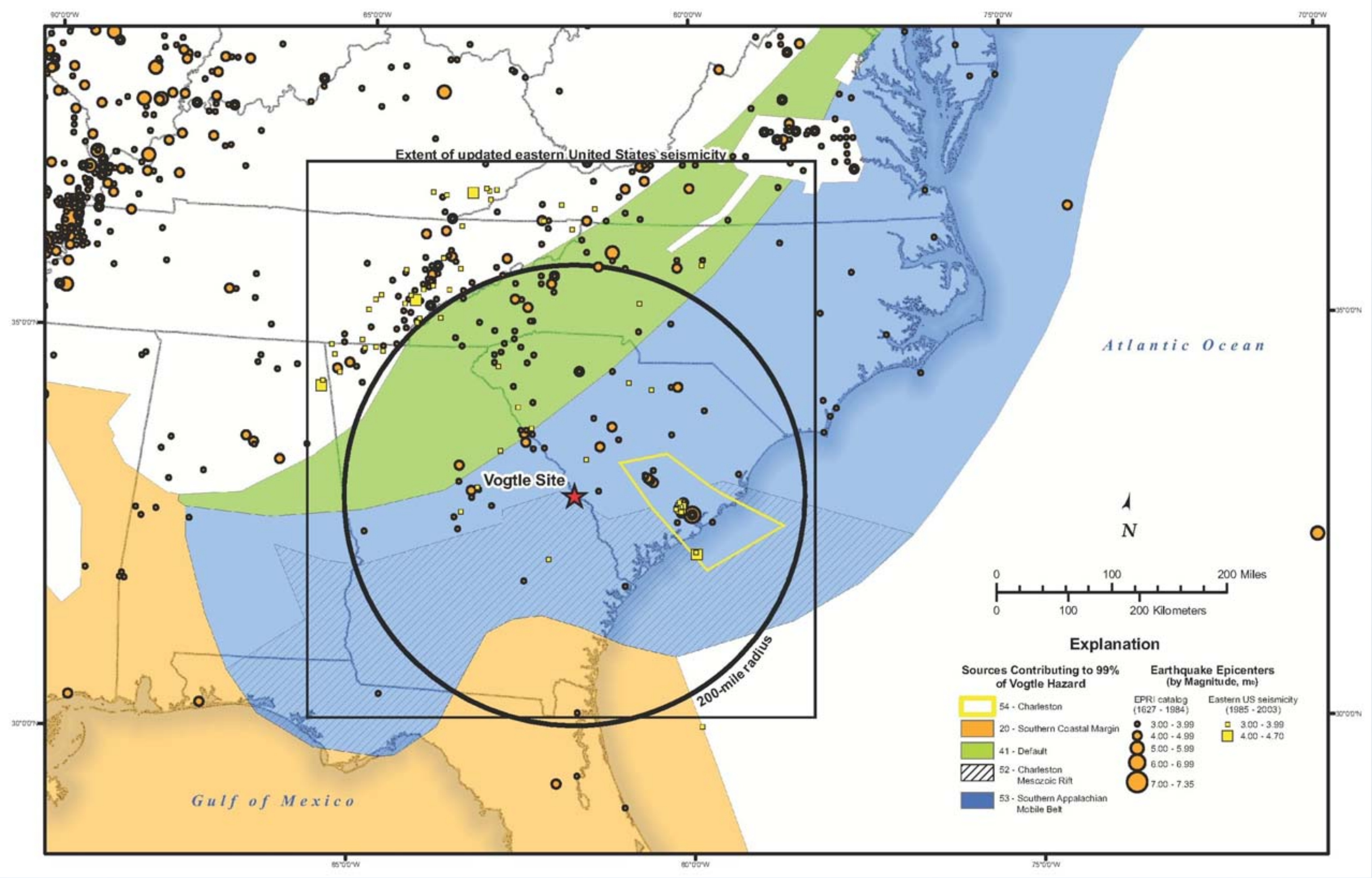
Geology in the ESP Site Vicinity

2.5.1 Basic Geologic & Seismic Information



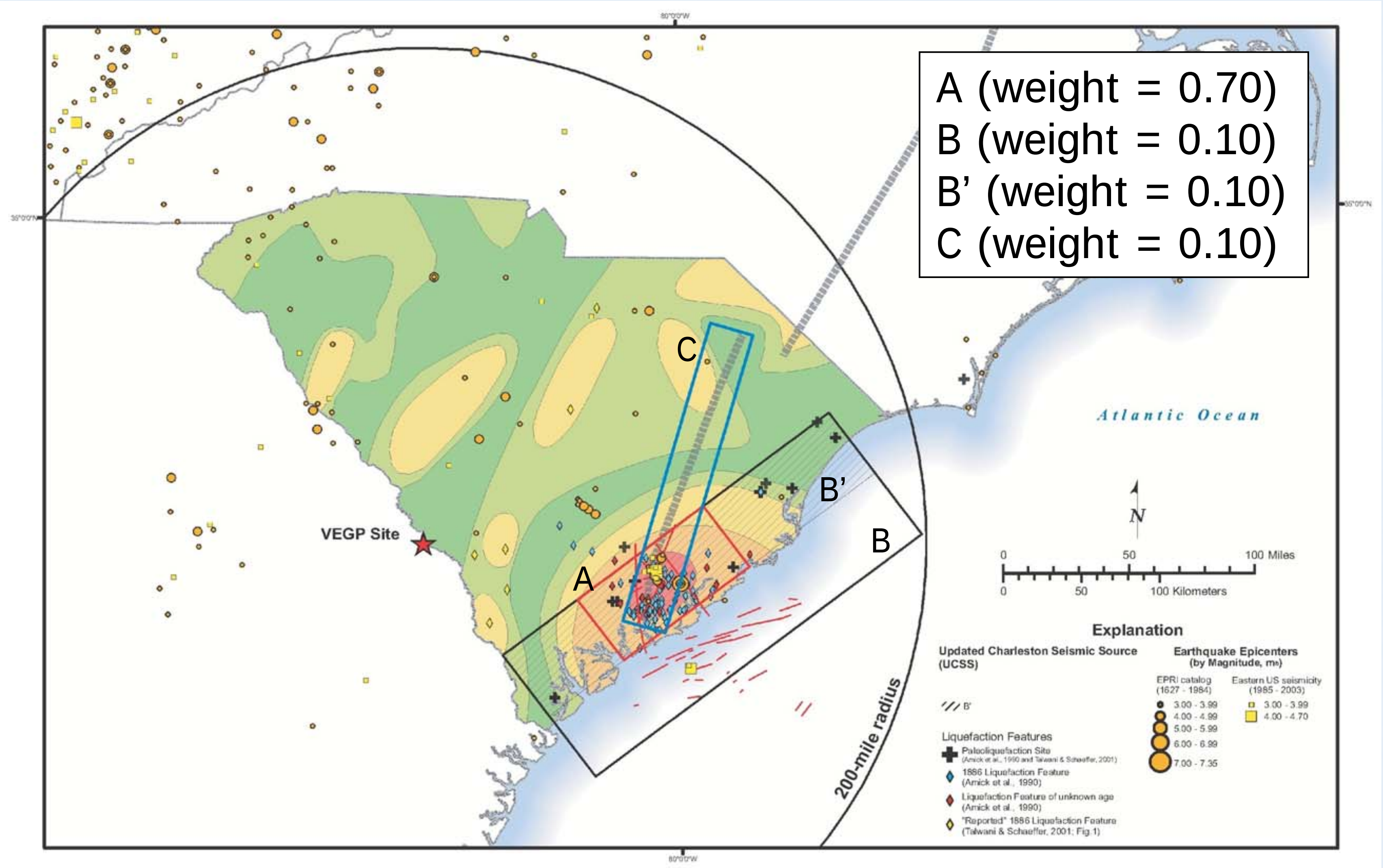
E-W Cross Section: Pen Branch Fault beneath VEGP site

2.5.2 – Vibratory Ground Motion



Example of EPRI Team Source Zones

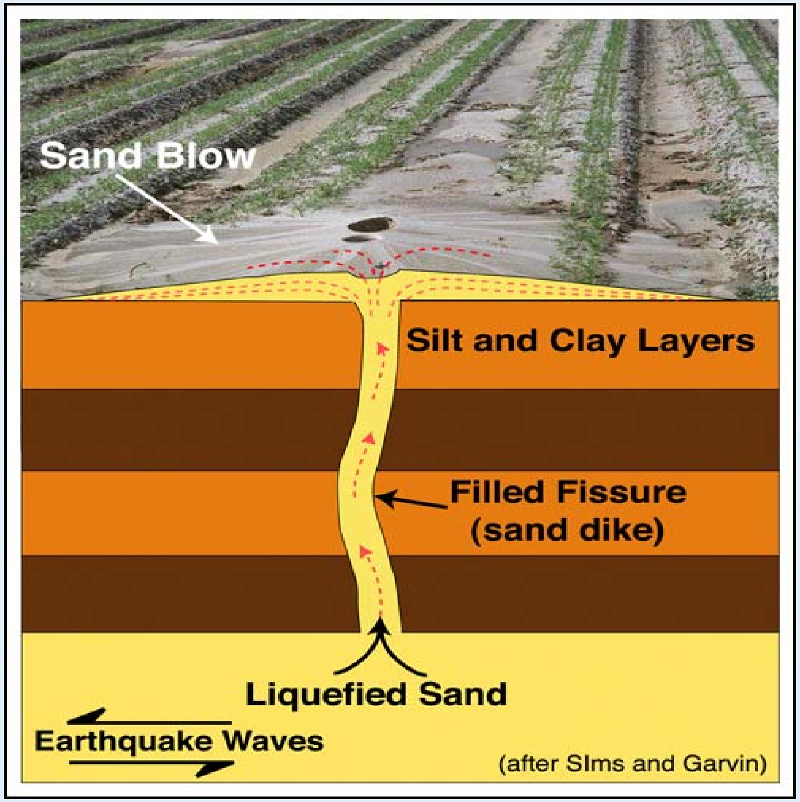
2.5.2 Vibratory Ground Motion

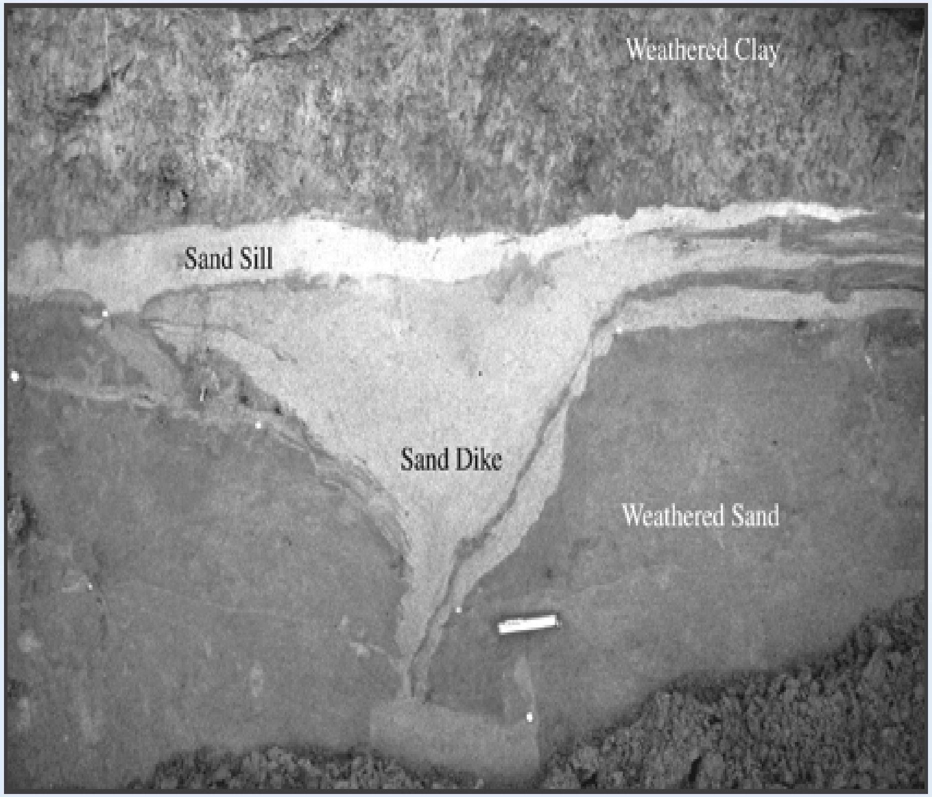


Updated Charleston Seismic Source

Charleston Update

- Charleston update based on liquefaction features from historic and prehistoric earthquakes
- Liquefaction features occur in response to strong ground shaking





Geology and Seismology

- **3 Significant Open Items addressing:**
  - **Dames and Moore EPRI-SOG Team source model**
  - **Eastern Tennessee Seismic Source Zone model**
  - **Presence of Injected Sand Dikes in site area**

2.5.4 Stability of Subsurface Material and Foundations

- **Engineering Properties of Soils and Rocks**
- **Site Explorations**
- **Geophysical Surveys**
- **Liquefaction Potential**
- **Static Stability**

2.5.4 Stability of Subsurface Material and Foundations

- **12 Open Items addressing the adequacy of:**
  - **Field and Laboratory Testing of Subsurface Materials**
  - **Measurements of Shear Wave Velocity**
  - **Development of Soil Degradation and Damping Ratio Curves**
- **Permit Condition added to require removal of Upper Sand Layer**
- **12 COL Action Items -** Resolved

2.5.4 Stability of Subsurface Material and Foundations

Site Investigations	ESP	LWA
Borings	14	174
CPTs	10	21
Test Pits	0	8
Observation Wells	15	0
P-S Velocity Logs	5	6

SER Section 13.3: Emergency Planning

- First complete EP review under 10 CFR Part 52
- Complete & Integrated Emergency Plan (ESP)
  - Included FEMA review of State/local plans
- First-of-a-kind EP Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) (30 ITAs/106 ACs)
- SER with Open Items (13 EP Open Items, 3 COL Action Items)
- Advanced SER (no EP Open Items, no EP COL Action Items, 7 EP Permit Conditions)

SER Section 13.3: Emergency Planning

SER Open Item 13.3-4 (EALs)

- NEI 07-01 EALs (AP1000 & ESBWR) (ongoing NRC endorsement review of NEI 07-01)
- AP1000 DCD EALs apply to Units 3 & 4
- Related Westinghouse amendments to AP1000 DCD (ongoing NRC AP1000 DCD review under docket 52-006)
- EAL resolution via 6 Permit Conditions (2 through 7)

SER Section 13.3: Emergency Planning

Permit Conditions:

- Emergency Action Levels (EALs)
  - 2 & 3 – NEI 07-01
  - 4 & 5 – AP1000 DCD Amendments (Units 3 & 4 TSC)
  - 6 & 7 – Full EAL set based on as-built plant, State/local agreed, & NRC approved (10 CFR Part 50, App. E.IV.B)
  - ITAAC 1.1.2 – EAL scheme consistent with RG 1.101
    - RG 1.101 is expected to endorse NEI-07-01
- Technical Support Center (TSC)
  - 8 – TSC location (AP1000 DCD, Tier 2* amendment)

SER Section 13.3: Emergency Planning

Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC):

- Planning Standard (10 CFR 50.47(b)(4))
  - A standard emergency classification & action level scheme, the bases of which include facility system and effluent parameters, . . .
- EP Program Element (NUREG-0654, evaluation criterion D.1)
  - An emergency classification & EAL scheme must be established . . . The specific instruments, parameters or equipment status shall be shown for establishing each emergency class, in the in-plant emergency procedures. The plan shall identify the parameter values and equipment status for each emergency class.
- Inspections, Tests, Analysis (ITA)
  - 1.1.2 – An analysis of the EAL technical bases will be performed to verify as-built, site-specific implementation of the EAL scheme.
- Acceptance Criteria (AC)
  - 1.1.2 – The EAL scheme is consistent with Regulatory Guide 1.101 [which is expected to endorse NEI 07-01 following staff review, including AP1000-related ITAAC]

Presentation to the ACRS Full Committee

Safety Review of the
Vogtle Electric Generating Plant
Limited Work Authorization Request

December 4, 2008

Vogtle LWA Request

Requested Activities:

- Placement of engineered backfill
- Retaining walls
- Lean concrete backfill
- Mudmats
- Waterproof membrane

2.5.4 Stability of Subsurface Materials and Foundations

LWA Key Issues

- Adequacy of borings at the site
- Geotechnical engineering properties of the subsurface materials, especially the Blue Bluff Marl and Lower Sand Stratum
- Backfill Specifications

2.5.4 Stability of Subsurface Materials and Foundation Interfaces

LWA Key Issues – Backfill ITAAC

Design Requirement	Inspections and Tests	Acceptance Criteria
Backfill material under Seismic Category 1 structures is installed to meet a minimum of 95 percent modified Proctor compaction.	Required testing will be performed during placement of the backfill materials.	A report exists that documents that the backfill material under Seismic Category 1 structures meets the minimum 95 percent modified Proctor compaction.
Backfill shear wave velocity is greater than or equal to 1,000 fps at the depth of the nuclear island foundation and below.	Field shear wave velocity measurements will be performed when backfill placement is at the elevation of the bottom of the Nuclear Island foundation and at finish grade.	A report exists and documents that the as-built backfill shear wave velocity at the nuclear island foundation depth and below is greater than or equal to 1,000 fps.

2.5.4 Stability of Subsurface Materials and Foundations

Section 2.5.4 Conclusions

- Adequacy of borings
  - Performed substantially more borings
- Geotechnical Engineering properties of subsurface materials
  - Significant additional site investigations provided sufficiently detailed information
- Backfill Specifications
  - Test Pad measurements of backfill properties
  - ITAAC to verify compaction density and shear wave velocity

Scope of Review for Chapter 3

SRP 3.7.1-Seismic Design Parameters

- Vibratory Ground Motion
- Critical Damping
- Supporting Media (pertaining to SSI modeling)

SRP 3.7.2- Seismic Systems Analysis

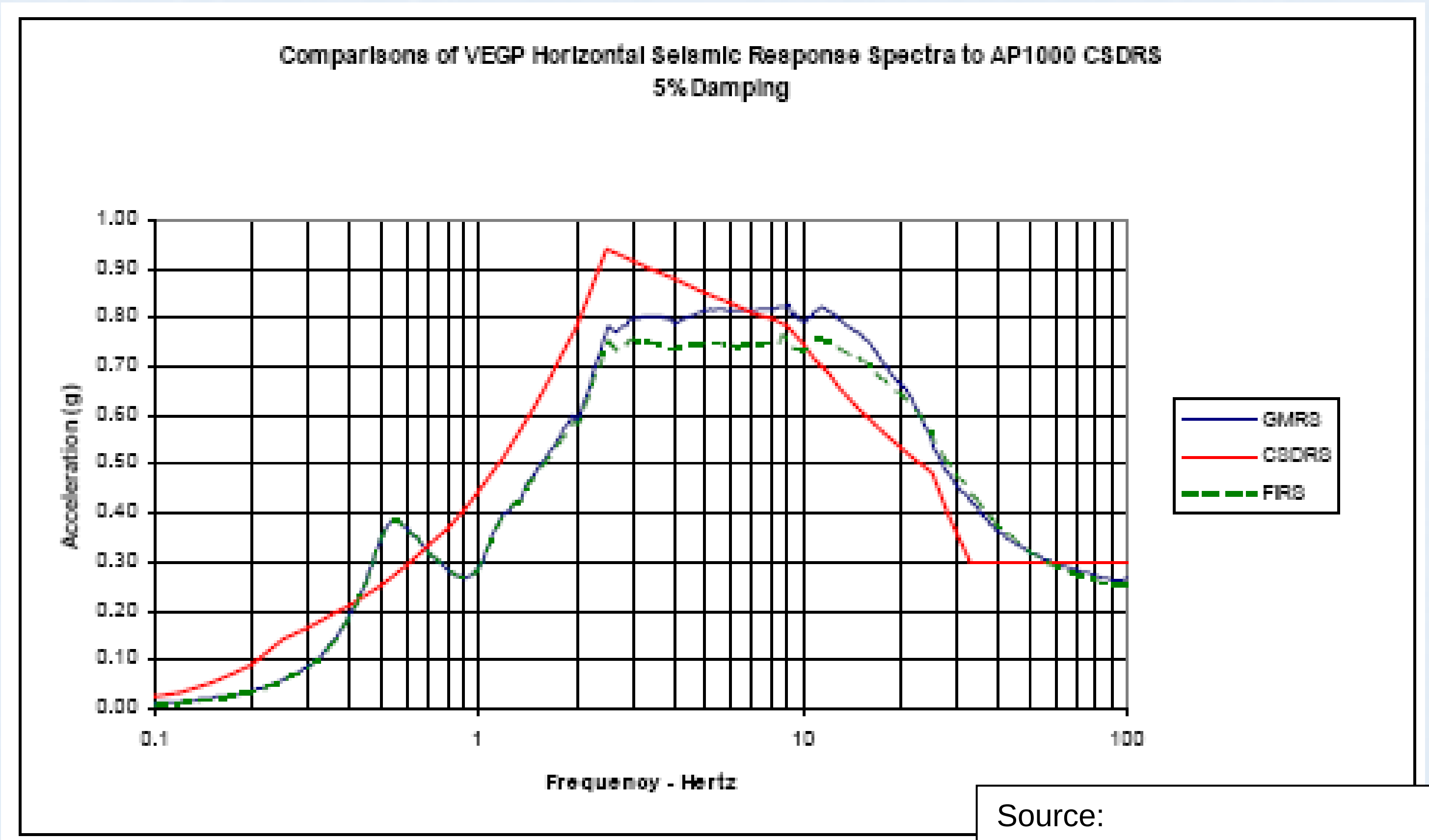
- Seismic Model Description
- Soil-Structure-Interaction Analysis

SRP 3.8.5-Foundations

- Foundation Stability
  - Sliding
  - Overturning

SER Section 3.7.1
Seismic Design Parameters

Comparison of Vogtle Horizontal GMRS and FIRS with AP1000 CSDRS



Source:
SSAR Appendix 2.5E, Figure 3-4

SER Section 3.7.1
Seismic Design Parameters

Technical Evaluation/Findings

Vibratory Ground Motion

- Approximate method was used for developing the FIRS. Review indicates that the method results in a conservative estimate of horizontal seismic demand.
- The FIRS defined as an outcrop motion in the free field satisfied the minimum PGA value of 0.10g (10 CFR Part 50, Appendix S)

Critical Damping

- The critical structural damping values used in SSI analysis were consistent with damping values provided in RG 1.61.

Supporting Media

- SSI modeling assumptions properly account for site characteristics such as depth of soil over bedrock, soil properties, soil layering characteristics and groundwater elevation.

SER Section 3.7.2
Seismic Systems Analysis

Technical Evaluation/Findings

Seismic Model

- The use of 2D SASSI models is acceptable for the evaluation of sliding stability and bearing pressure demands.

Soil-Structure-Interaction Analysis

- Staff compared the analysis results (e.g., ZPA values near the NI center-of-gravity) with the AP1000 DCD soft soil case and found them to be similar.

- Maximum seismic base shear forces are acceptable based on staff simplified independent calculations.

SER Section 3.8.5 Foundations

Summary of Application

- Test data of waterproofing membrane indicate a coefficient of friction of 0.7 between the membrane and the concrete mudmat.
- Test data indicate a coefficient of friction of 0.45 for soil immediately below mudmat.
- Soil test data indicate a bearing capacity of 42 ksf.

SER Section 3.8.5 Foundations

Technical Evaluation/Findings

NI Structure Stability Analysis

- Staff reviewed the maximum horizontal seismic forces and maximum friction forces below the basemat.

Maximum NI Seismic Forces

Reaction	Vogtle Lower Bound	Vogtle Best Estimate	Vogtle Upper Bound
Seismic Shear NS	78.3 E3 kips	82.5 E3 kips	89.0 E3 kips
Seismic Shear EW	88.9 E3 kips	89.8 E3 kips	95.8 E3 kips
Friction Force	117.3 E3 kips	116.7 E3 kips	116.4 E3 kips

- The NI structure will not slide during the SSE, because the frictional force is greater than the inertial force.

SER Section 3.8.5 Foundations

Technical Evaluation/Findings (Continued)

Bearing Capacity

- The maximum dynamic bearing pressure on soils for the NI, radwaste, annex, and turbine buildings are 17.95 ksf, 1.68 ksf, 7.20 ksf, and 2.54 ksf, respectively, during the SSE.

- The minimum factor of safety with respect to a failure of the dynamic soil bearing capacity during the SSE is 2.34 (42 ksf divided by 17.95).

Summary Findings

SRP Section 3.7.1 Seismic Design Parameters

- Adequately developed seismic design parameters.
- Met the applicable regulatory requirements.

SRP Section 3.7.2 Seismic Systems Analysis

- Adequately performed site-specific 2D SSI analysis for the purpose of determining the maximum seismic demands for use in the NI structure stability and maximum dynamic soil bearing evaluations.
- Staff's evaluation of in-structure response will be done as part of the SCOL review.
- Met the applicable regulatory requirements.

SRP Section 3.8.5 Foundations

- Demonstrated that the mudmat and the waterproofing membrane are adequate and that the NI foundation is stable during an SSE.
- Met the applicable regulatory requirements.

Advanced SER/LWA Conclusions

- The VEGP ESP application meets the applicable standards and requirements of the Act and the Commission's regulations.
- Site Characteristics, Design Parameters, and Terms and Conditions proposed to be included in the Permit meet the applicable requirements of Part 52.
- There is reasonable assurance that the site is in conformity with the provisions of the Act, and the Commission's regulations.
- The proposed ITAAC are necessary and sufficient, within the scope of the ESP, to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the emergency plans, the provisions of the Act, and the Commission's regulations.
- Issuance of the permit will not be inimical to the common defense and security or to the health and safety of the public