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NUCLEAR REGULATORY COMMISSION

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PUBLIC WORKSHOP

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The above-entitled workshop commenced, pursuant to notice.

P R O C E E D I N G S

MR. FAUVER: Good morning, everyone. Let's go ahead and get started.

This morning we're going to discuss with a couple of folks who have some areas that they're doing some does assessments for and who have agreed to act as a test case for finalizing the guidance in developing our SRP.

We're not exactly what that means yet as a test case, but we're going to find out as this thing unfolds. I think it just means that we're going to do -- try to share experiences, going through the guidance to get quick feedback, perhaps quicker resolution to some of the issues that they're facing and hopefully we can go through this thing over the next several workshops and carry through this test case. We'll see how this develops today and we'll have some closing comments.

I just want to add that after -- Mark Thaggard's going to go over some of NRC's test cases that we're working on, and I think it's the same situation where, you know, we'd like for our test cases to be forward for industry to comment on, and when we think of a test case, we just think it's a good idea to actually talk about a site as opposed to a theoretical "what if this, what if that, I have a comment about a situation that could occur," so we're trying to use the test cases to sort of focus some of the thoughts on the

guidance and finalizing the guidance.

It's not on the agenda, I guess it is, we've got the discussion summary, but after Mark's talk I'd like to spend some time thinking about the path forward and what we'd like to cover in some of the future workshops or any thoughts on this workshop.

One thing I want to touch upon is the measurement issue that was raised about how do you determine compliance with the results of the D and D code when you've got multiple nuclides, some of the nuclides with the chains, et cetera.

I think that's one thing I want to mention, and then Dave Culberson's issue of how we move forward with the data that was presented yesterday by Dave Spangler and anything else so if you all could be thinking about that, have a little bit of a discussion at that point.

So with that, I think we'll go ahead and start. The first speaker is Earl Saito with Combustion Engineering.

MR. SAITO: Good morning. First of all, I'll move up here for the first part of my talk since I'm not going to be using overheads instead of standing so far away from everybody.

When Dave first asked me to do this, we sat and talked on the phone quite a bit deciding, you know, what should be given, and kind of came to the conclusion that we

were actually modeling at that point. Dave pointed that out that just by thinking of what you're doing, you're modeling. You're making the decisions of what a model is rather than just a computer code being the whole model.

The computer code is part of the model, but if you don't know what your input is going to be, if you don't understand what you should be getting out of the backside of the code, you're going to be in a lot of trouble so you have to have some idea how the model is working in your mind and what you're looking for.

That being said, what I have done -- I'm just going to put up a situation at the end of my talk and invite anyone in the audience to come forward and say how they might model it or how they might program an answer to it to see what different -- how different people would handle it and give everyone a chance to come forward and have some input.

The second thing I'd like to say is after yesterday, there is a lot of change going on and it's gone from a fairly simple situation where we were given a number and we went out and cleaned up to the number and proved that number was the answer to a dose-based model which adds a lot of difficulty.

A lot of difficulty for the people who are deriving the number and a lot of difficulty for the public

to accept that number. That's something that we're all going to have to be sensitive to.

The numbers may go up, they may come down, but if we do our best job and get the best number we can, that means that those 25 millirem a year or the best representation of 25 millirem a year we can get, that's the best we can do and that's what we should do and move forward.

The answer may be lower, probably will be in a lot of cases, maybe higher, but in any case that's where we're at down. It's 25 millirem a year and so let's figure out how to get our sites to demonstrate compliance.

One other quick comment here. This is a Fuel Cycles Facility Forum. I'm speaking in somewhat a general sense. This is not directly representing anything at my site. While we do have some actions pending in front of the Commission at this point we're so early in the process it's very difficult to say "This is what we plan on doing," or "This is actually what we're going to do" because the regulation is being interpreted.

I don't know what our final plans will look like so I certainly don't want to stand up here and say "This is what we're going to do" because that would create all sorts of problems.

What we're going to talk about today is why do we

need DCGLs early in the process, how to collect historic and public, when to apply the ALARA concept and what can be done with complex geologies.

When are DCGLs needed? Well, they're needed right away. You can't do anything until you know what you're shooting for. For instance, you can't characterize a site if I'm looking for 2 picocuries per gram, I'm going to have a completely different characterization plan than if I'm looking for 1,000 picocuries per gram. Everything will change depending on the DCGL.

To select field and laboratory procedures. Again if I'm looking for 2 picocuries per gram out there in the field for uranium, there's no sense in scanning. Scanning is going to get you nowhere so field selection for DCGLs are very low or are limited, laboratory procedures again would also be limited.

You know, you wouldn't use gross alpha beta, you'd go more for the gamma spectrum, longer counts, changes your count rate. If you go out and collect a lot of data and you have a MDA and then you come back later and say "Well, my DCGL was 2 picocuries per gram, but my MDA was 5," well you have a bunch of data that really doesn't help you at all to determine remediation volumes. This is key in making ALARA decisions. It's also key in pricing at disposal and it's key in the decision whether to use onsite disposal versus

offsite disposal.

Finally, to make ALARA decisions. If you don't know what your DCGL is, there is no way you'd know what fraction of DCGL is and so all the equations in the reg guide about useless.

So now as a licensee who comes up, I have a site that I need to decommission. I go to NUREG 1549 and they've done, I think, a very good job. I think both the regs guides that are out -- or the draft guidance and the reg guide that are out are both very good documents. They're a very good starting point. Of course, as we run into them, everyone's situation is going to be different.

Looking at this circular loop what we have to be careful about is that we don't just get in a circular loop and grid ourselves around for years going around in this part of the loop.

I think that there's also one other important -- that has to be put in here. Before you go out, you also have to do a hydrogeological survey or characterization as well. That's something that's been missing. When we have 30 picocuries per gram for uranium, you really need to know your hydrogeology very well. At this point you need to know your hydrogeology before you can start running any codes.

If you don't know what your KDs are, if you don't know what your depth of groundwater is, if you don't know

your soil types, if you don't where anything is at, you cannot do a model or a code run and figure out what your DCGLs are. So this is something I think that the guidance needs to pick up on.

Once you decide that you can't use default parameters and you're into dose assessments, you need to do a hydrogeologic study somewhere along the way as well, and then you get into your loop here and have all sorts of good things going on.

So since this started a couple of years ago we're moving forward and we decide to start looking for some historic data. One thing is historic licensing information. You have environmental monitoring that you've done around, you can kind of look out and see if these models are right, and I have contamination at this part of my site and it's as mobile as the model says it is, then I should be seeing it on my environmental monitoring near the edge of my site or closer in on my site.

Then you look at your historic licensing information to determine are you seeing migrations. If you are seeing migrations, then you can check it against the model. If you aren't seeing migrations, you know your model parameters are too conservative to start with.

Historic construction geology information. This was a very good source of information for us. Whenever we

built a building, we went out and did some punches into the ground to see what was below it for how to set the building on, how to construct the building and make sure the building wouldn't fall down when we built it. So there was a lot of historic information for the area right underneath the buildings which was very useful data.

State well installation data. We're in a rural setting and around that setting you have houses that are on wells. All those wells were logged when they went in or recorded when they went it so that tells us where people are drawing water out in that general area, which part of the aquifer they're drawing the water from. USGS maps are very good to look at what's the underlying geology of the site.

To apply ALARA at this point also, the guidance provide good tools which need to have site specific information included. For instance, the distance to disposal site, but most important it must be done as an up front tool.

I think that's one weakness with this model is the ALARA requirements are here. The ALARA requirements have to be made when you're determining where you're going to go dig. You have to decide up front. ALARA means I need to actually clean down to 10 millirem or I actually have to clean down to 5 millirem a year, and then you go out and do your digging.

After you've done everything, you've cleaned up, you've got to say "Now I'm going to apply ALARA," it's very difficult at that point. You may have backfilled areas. You may have already released all your contractors. You have to remobilize everyone.

Most importantly I think in a lot of uranium and thorium sites we're going to be looking at onsite disposal. If you take and apply ALARA at the end of the process, your cell may not be big enough. You may have a 10,000 cubic foot cell and you have 10,000 cubic feet of material in it. Then any ALARA decision is going to be "I can't do it," because it's going to be too expensive to build another cell.

Whereas if you do it up front, it may be appropriate to build a 12,000 cubic foot cell and have 12,000 cubic feet where 25 millirem would say 10,000 cubic feet is sufficient, ALARA may say it may be 12,000 cubic feet. So ALARA needs to be applied as an up front tool.

That's the third point here. It will drive remediation volumes and it will drive selection of site, onsite versus offsite disposal and that's what this next slide here is trying to demonstrate.

What I did when this guidance first came out is I took some of the equations, that's why the equation numbers have changed slights, and tried to look at this as a

maximization problem. Where we have disposal costs per cubic foot, I converted to cubic meters to try to keep everything in scientific notation because it's a lot easier for me to do.

Then you get your residual level and what this tells me, not concentrating on the numbers so much, but here in the upper left-hand corner here if you can remove one-tenth of the -- if you can remove down to 10 percent of the DCGL limit, you can afford to move 7 millimeters at $10 a cubic foot.

Likewise on the bottom right-hand corner you can't afford to remove a millimeter of dirt if your disposal cost is $600 a cubic foot and you get everything, that's cleaning up to background.

Now this is what I'm saying when I said at the beginning that we're getting into things that are more difficult. It's no longer one number. It's no longer one number. We cannot stand here and say "I need to get to 30 picocuries per gram and therefore I am right here on my chart. I need to dig this deep." Those days are gone.

Now it's what dollars and how many dollars is at ALARA to spend at, to what residual activity, how much can I clean up, and that drives -- that will drive restricted released especially and it will drive unrestricted release also when you look at onsite disposal, building a cell,

incremental cost of the cell at dollars per cubic feet. It also drives disposal costs at commercial disposals because your price can vary significantly depending on your volumes.

Finally what I'd like to talk about and this is where like anyone here who is a modeler or has an idea on how to move forward with this process to stand up and give some input. What do you do with different soil types above bedrock, different types of bedrock and potentially artesian conditions? Conditions where the water is actually flowing upward.

So I'd like to present this as a potential case. This isn't our exact geology and we don't have any Flintstones, Fred and Barney aren't there, but it seemed like a good thing to put at the bottom.

So we start out with a silty clay say it's 10 feet deep to make it easy. You have a "fat" clay that's very impervious, that's say three feet deep followed by some sand and some gravel and then some sandstone and then a limestone, different types of bedrock underneath this.

Now to complicate the situation slightly more there's a hill over here and the hill is pushing down and the water that comes down through the upper layer of the bedrock and also the gravel actually has an upward gradient so you have an artesian condition where if you put a well in, you would actually have a flow if you were in this

region.

Above the "fat" clay, the "fat" clay is the confining layer over portion whether it's perched over the entire site or a smaller part of the site is actually an interesting question to figure out. How is that handled? I mean, the water is actually being held up there so you have -- if you put a well down to the first level -- to the first bedrock and one to the first layer of "fat" clay, you'd have two different heights on the wells.

It's not hydrostatically equal so there's definitely a perching condition. Whether perching is over the whole site or not, is that significant or not? These are things -- I thought about running some codes and looking at things, but then after talking to Dave, said "Just put this up and let's see what people have to say."

So whoever wants to stand up at this point and say how would you model something like this -- there clearly isn't a wrong answer, and I'm looking for -- we're just looking to see how people would handle something like this.

MR. THAGGARD: This is Mark Thaggard from NRC. Before getting up there and making fool out of myself, I'd like to get a little clarification. Which zone did you say the groundwater was flowing through? Is it the sand and the gravel and the sandstone?

MR. SAITO: Well, there's definitely groundwater,

just for this situation say there's definitely groundwater moving along this gravel interface because as the water comes down it reaches the less permeable layer so it's going to scoot along that surface, so we have water flow say at least in that region in the X-Y plain.

And that's one thing, I'm not so sure the code handles, is how when you have a very serious X-Y gradient of flow, whether that's handled at all in the transport methods. I don't believe it is.

MR. THAGGARD: Well, which code are you talking about?

MR. SAITO: Any code. Any code -- I'm sorry, not any code, D and D and RESRAD.

MR. EID: This is Bobby Eid. Can you expand further, do you indeed to use D and D's screen for this kind of geology --

MR. SAITO: I intend to use whatever --

MR. EID: -- when D and D is -- you know how it functions.

MR. SAITO: I intended to use whatever will work and is acceptable. I have no particular answer right now.

MR. EID: I believe in this case you have a soil specific conditions that justify, you know, more complex codes or more sophisticated code to deal -- if you like to get credit with this kind of geology.

MR. SAITO: I may also make the argument that I have less -- that I have information that says I need almost no coding all together because the artesian conditions isolate the groundwater, therefore I can just turn the groundwater pathway off.

MR. THAGGARD: From my prospective, see I would argue that you don't know that you're going always have artesian conditions. I mean, it wouldn't take a whole lot to reverse that situation, so I wouldn't -- if I was modeling this, I wouldn't take credit for the artesian conditions.

In fact, I would ignore that quite frankly. I mean, it would just be a bonus, and I would just model this as though you had a regular groundwater system there so you basically have got an unsaturated -- I mean, you've got a unsaturated zone and a saturated zone, and so if you look at it from that situation, I don't think it's that overly complicated of a setup.

I mean, I don't know what benefit it would be to try and take credit for all the variant layers of material. You probably need to do some -- you know, trying to homogenize some of it. I mean, I don't think there would be much benefit to trying to distinguish the difference between silty clay versus "fat" clay and sand versus gravel.

Most of the flow is probably going to flowing

through the gravel so or the saturated zone you would probably want to use your gravel, the permeability for the gravel and so I think the problem could be simplified quite a bit.

From my prospective, as I indicated, you know, if you tried to take credit for the artesian conditions, there would be a much more complicated problem, but I don't think you can defend that you're going to always have artesian conditions there so I wouldn't try and take credit for that.

MR. SAITO: No, I have a 200-foot hill that's driving the artesian condition. I mean, unless the hill goes away, the artesian condition is going to continue, but I mean, that's exactly the kind of comment I'm looking for is what -- how do people handle that thinking.

So you would take everything and kind of make an average KD is that or you would just say you're taking just the gravel and sand which is going to have a very low KD in that?

MR. EID: This is Bobby Eid. Concerning the different kind of geology and layers, certain codes they do allow for different inputs for each of those layers in terms of KDs and in terms of porosity so you may get credit for that and use this layering.

If you intend to use a code for, you know, singular layers or unsaturated zone, so to speak, this means

it will be good to use probablistic analysis for the variation of the KD values within this kind of ecology it was different and you could look at the lower bound and the upper bound for these KD values because, you know, to assume one KD value for all of this of different kind of ecology it is not correct so you need to some kind of averaging and some kind of upper bounds and lower bounds.

MR. WILLIAMS: Alexander Williams, DOE. On your problem here, first of all, is it correct that the contamination is sitting on top of the silty clay layer?

MR. SAITO: For the sake of this discussion, yeah, we'll put it on top of it.

MR. WILLIAMS: So I don't see how the artesian conditions down in the gravel, sandstone, sand layer have much to do with what's on the surface because if there was a connection, a hydrological connection between the silty clay and the aquifer and the gravel layer, then you would expect there to be artesian conditions, an artesian spring or something at that point because if you do have, you know, a weakness in the --

MR. SAITO: Yeah, one side of the site, we do have a spring, a flowing spring.

MR. WILLIAMS: Yeah, okay. So that there is some sort of connection somewhere.

Getting back to your basic question, the way that

I would model this is to look at the silty clay being unconnected with the aquifer simply because the "fat" clay presumably has very low hydraulic conductivity, presumably there's not much of a connection between that and the underlying aquifer. I would certainly go out and try and learn enough about the silty clay and "fat" clay layer so as to, you know, have adequate data to support this.

Certainly at the individual sites where I've had any involvement, site geology and site groundwater is an off-the-shelf item. In one case I remember that one of our scientists at Argonne National Laboratory walked down to the local university and found a master's thesis on the local hydrogeology so that it was an off-the-shelf item from a published source that presumably had some sort of peer review. I believe the gentleman did get his master's thesis based on this work.

I don't see in this case how the artesian conditions would have anything to do with contamination up in the silty clay layer. If, in fact, the artesian conditions are arising because of topographic features that are presumably some distance away. If the recharge area for your artesian aquifer is some distance away, how is it that something at this site is going to make a significant difference?

Also most artesian aquifers tend to have fairly

high flow rates so in terms of their being a significant dose, you would have to have very large amounts of contamination and long lived contamination before it ever caused a significant difference in an artesian aquifer.

In the case of long lived radionuclides, thorium is significantly insoluble. Plutonium is also insoluble and these are well-known thermodynamic properties that to my knowledge under most environmental conditions they retain those properties.

So the only site where I could see where you might have trouble with groundwater would be a site with uranium, especially the soluble forms or perhaps technetium or perhaps iodine-129, but for the rest of most of your radionuclides because of the low hydraulic conductivity in your "fat" clay layer I don't see how these would ever get into groundwater and I don't see how that would be a significant issue.

MR. SAITO: So in essence what you're saying is that you think that the groundwater pathway could be eliminated?

MR. WILLIAMS: Yes. I mean NRC as a regulatory matter requires clay layers to be put into uranium mill tailings pilings so as to keep leachate from the mill tailings from getting into groundwater and this method is believed to be effective and I fail to see with a

significant clay layer there geologically that is believed to be impermeable, I fail to see why that wouldn't be adequate in this case.

Also the fact that the underlying aquifer presumably would have relatively high flow means that whatever comes through is going to see significant dilution, and I don't believe in dilution being the solution to pollution, but at the same time if you're going to model the site, I think this is what you wind up with.

Unless the "fat" clay layer has some holes in it or there are other things at this particular site that aren't identified, I don't see how groundwater would be significant.

The other thing I would look for is between the silty clay layer and the "fat" clay layer look for sand lenses there which might have some perched aquifers or something of that sort, but perched aquifers generally don't give you enough water to be useful for any significant purpose so I'm not sure that -- I'm not sure that that would be a source of concern.

I'd also look at the water quality in the groundwater. There are some sites where groundwater quality is such that it is not potable.

MR. SAITO: Yes. If you had something that was very salty, very salty water.

MR. WILLIAMS: Yes. Or high sulfur or other undesirable things.

I don't know whether this is helpful or not, but I'm willing to take up the challenge on this.

MR. SAITO: Thanks, Alexander. That's what we're looking for.

Theresa, do you have a comment?

MS. BROWN: Theresa Brown. Sandia National Laboratories. Actually, I'd take you back to the flow chart of the decision process.

MR. SAITO: Yes.

MS. BROWN: And what I'd do is I'd step through this from the beginning and see if the groundwater pathway even concerns me before I start worrying about hydrogeology and modeling a very complex flow system or trying to justify assumption for the way the system is behaving.

MR. SAITO: Yes.

MS. BROWN: And so you say that you need to know the hydrogeology before you start making any decisions about the options, and I would say to you I think you need to understand what's controlling your dose, your simulated dose before you decide whether or not you need to know very much more about the hydrogeology.

Now that's not to detract from the sources of information you already have and how you could already make

this a more site specific analysis that just --

MR. FAUVER: Can we go back to that diagram while she's talking because --

MR. SAITO: Yes. I really wanted to get to this, too.

MR. FAUVER: -- because this is going to be a discussion of the guidance as written and maybe we should have a little dialog about this and the ALARA point as well, I think we need to talk about and have some dialog on.

MR. WILLIAMS: This is Alexander Williams with DOE again. I agree with everything that she said. There's not a lot of point of getting into hydrogeological investigations if it's not an important pathway.

MR. SAITO: But how do you know it's not an important path until you understand your hydrogeology?

MR. WILLIAMS: What's your nuclide at this site?

MR. SAITO: Uranium.

MR. WILLIAMS: Okay.

MR. SAITO: And uranium is --

MR. WILLIAMS: Start looking.

[Laughter.]

MR. SAITO: Uranium's as an internal dose and that's going to drive your path as any internal pathway's going to drive your dose.

MR. WILLIAMS: Would you agree with that?

MS. BROWN: I would like to look at it first to see what sort of concentrations you have in the soil to see how much of a problem it is, and then I would look at the sensitivity of the parameters and I'd start looking at parameterization and what's the most sensitive before I started going out and doing a full-blown site characterization.

MR. FAUVER: Theresa, let me ask a question. As you go through the framework, you do your system conceptualization, basically at some point you have to do a preliminary run with some model to get an idea of what pathways are important to get into that Box number 8, right after he's got that hydrogeo mark there.

Any insights into using this kind of a flow chart, how someone would then select that model, do a preliminary run?

MS. BROWN: I guess I'd be careful if you're going to look at the hydrogeology, if you don't a hydrogeologist there to help you understand what the ranges of parameter values could be, what your uncertainty is for you site given the information that you do have.

I think that you point out -- I'm pretty sure your background isn't hydrogeology because it isn't the weight of the mountain that causes artesian flow, and so that sort of thing is --

MR. SAITO: But it's the flow of the water on the top, the top is a fairly barren area, it's a lot of rock and it's coming down along that gravel seam, is what's making it artesian at that point.

MS. BROWN: You have to have enough head at a higher elevation to drive it.

MR. SAITO: And it's about 200 feet higher.

MS. BROWN: But there are large areas where, you know, a tremendous amount of irrigation has come in and --

MR. SAITO: Where it may not --

MS. BROWN: -- you've changed conditions. You have a 14,000 foot peaks that are driving -- so you can change artesian flow conditions so Mark is correct about that.

So that's why you need a hydrogeologist to help you frame your argument for why this is a persistent set of conditions. You do need to have some experts. You can't just do all of this by --

MR. SAITO: Yes.

MS. BROWN: -- you can't automate everything to where you can't ask for some advise in terms of what to do, but what I would do is say "What are my uncertainties for my site?" What are you likely to be able to gather information to change values from something that say is a bounding estimate given current information.

If NRC is going to require bounding estimate if you don't have site specific information to back it up. "What can I then go out and collect at a reasonable cost?" It maybe something less than trying to find sand lenses in the clay. I mean, that's going to be a very expensive --

MR. SAITO: Yeah, that would be and this also, aside from this rule, the time limits rule comes into play, and I don't see how the time limits -- you're always on an alternative schedule. I don't see anyway if you have uranium in any complexity at all, you can be anything but an alternative schedule.

Hopefully everyone agrees with that because no matter what you do, it's going to take time to figure out what the answer is and it takes time even when you decide what parameters you want to look for, you're talking about several months of finding that.

MS. BROWN: It could be maybe something very simple as doing a layered system, taking credit for the gradient as it is now and looking at time frame, but this is all fairly hypothetical. It's hard to say exactly what your options are until you start to look at some of these uncertainties. The source term, the distribution of source term and the hydrogeological properties.

MR. SAITO: That's, I have a question here because this has confused me greatly, is the source term the

importance of the source term when you're looking for a dose conversion factor?

I mean, I kind of can't grasp that from a big picture, again, probably because it's not my -- if I have a source term, if I have 1,000 picocuries per gram spread over some area, is that source -- what's your definition of source term there, I guess.

MR. WILLIAMS: Let me try and help out again. This is Alexander Williams again. Your source term basically is the inventory of stuff. You say 1,000 picocuries per gram of uranium in soil.

MR. SAITO: Yeah, just for a round number.

MR. WILLIAMS: Fine. How big is the area? If it one square meter, it's going -- your initial inventory is going to be "X" number of grams or "X" number of picocuries. If it's an entire football field at that concentration, you obviously have a lot more.

If it's air deposition, it's just a surface coating that soaked in with rainfall and whatever, you obviously have a smaller amount of material than if it's 1,000 picocuries per gram, three feet thick.

MR. SAITO: Yes.

MR. WILLIAMS: So when it comes to material leaching out of the surface and getting into groundwater, the total amount of uranium makes a big difference because

obviously if you start with more stuff after you run a model, it doesn't matter whose model you use, you let rainfall percolate through and so the more stuff you start with, the more stuff that winds up in aquifer if it's long lived.

If you've got short lived stuff, like cobalt, it never gets to the aquifer because it decays before it gets there, but with uranium, that's not the case.

MR. SAITO: But if I have 10 or 1,000 picocuries per gram, the dose conversion of picocuries per gram, per millirem, per year, per picocurie, per gram it should be linear, isn't it --

MR. WILLIAMS: No. No. No. For contamination on the surface with inhalation pathways or direct gamma exposure, that is very nearly correct assuming that you have large areas, but for material leaching into the groundwater and using RESRAD, you get a number of other things going on.

How much hold up is there? What's the travel time? If you've got clay layers between your source and the aquifer, you get a very, very long travel time, and it's going to be thousands of years before something comes through if it ever does.

MR. SAITO: But's what's making not linear with concentration?

MR. WILLIAMS: What is happening is how your

contamination is oriented with respect to the groundwater flow, if you -- where your well is place theoretically relative to the contamination. In RESRAD we assume a well is on the down dip side of the contaminated area.

So you get into some geometrical things. You get into dilution. If you have a big fat aquifer with heavy flow, you get a lot more dilution when the contamination finally gets there then if you have a small aquifer without it.

People only use so much water per day. They only drink so much water per day so that you have other factors that are very important and I would agree with Theresa said, to look at the parameters and see what is important and what isn't because some of the parameters can be very important.

MR. FAUVER: Alexander, can we -- Theresa, did you have a comment on source term?

MS. BROWN: Well, again, I think he said it very succinctly when he said it's the amount of activity, the total amount of activity you have there and this sort mass balance. Do you have enough to cause a problem if it got into drinking water, to create a dose that would be high enough.

MR. SAITO: Yes, but assuming once you get past that. We wouldn't be modeling if we didn't think we had much.

MS. BROWN: But you should be --
MR. WILLIAMS: If it's 10 picocuries per gram on the surface, you should have the same dose conversion factor as if you 1,000 picocuries per gram so I don't think -- At any given site, yes. At any given site, yes, if you freeze all the other parameters. If you freeze all the other parameters, but the trouble is --
MR. SAITO: Okay.
MR. WILLIAMS: -- is that the other parameters you can't say, you know, you move from site A to site B --
MR. SAITO: But on a particular site, the dose conversion factor should be linear with initial concentration; is that correct?
MR. FAUVER: Mark, did you have a comment on that?
MR. THAGGARD: This is Mark Thaggard, again. I tend to agree with you. I think the doses should be linear in terms of -- I mean, it should be linear in terms of concentration because you're only putting in a single concentration value in your dose assessment so it almost has to be linear, you know?
SPEAKER: What I'm saying is that if we've got -- wait, could you get --
MR. WILLIAMS: I understand site to site -- site to site it changes. I'll sit back down.
MR. FAUVER: Well, you're welcome to stand back

up, but let some other folks go.

MR. MORTON: Isn't the answer to the issue of linearity that in the simple problem, we're in the very simple mode it is very nearly linear because the simple model in effect is a static model?

Isn't it the case that in the real environment, within about the 1,000-year time frame for something like uranium, for a large system, the aquifer -- the problem is still in the dynamic state.

That is, it is changing over the 1,000-year period. It's still a changing system so you don't necessarily reach that steady state where you can have a big ratio between source and concentration in the 1,000 years?

MS. BROWN: But if you can measure small enough, I would think that it -- I'm just missing -- maybe some there's second order of terms, but on the first order of term I don't see where it --

MR. MORTON: Well, for instance, you may still be having retardation in the clay layer that isn't saturated and so basically the move from where you original source is to where the concentration in the water is hasn't achieved that steady state yet.

MR. SAITO: Okay. So since --

MR. MORTON: It's still not linear.

MR. EID: This is Bobby Eid. I believe if you

assume everything is fixed, if you assume the area is fixed, the thickness is fixed, everything is fixed and the other parameters, they are fixed and you vary the concentration only, this could be correct that is linear.

However, if you vary the area and you say you have, you know, different concentrations, you know, this could be the same -- this could be different. For example if you, you know, 100 picocurie per gram in an area of about 100 square meters, it's different when you have larger area because the code that you use -- many codes they do account and make corrections for the area, the infiltration rate is significant and in this case and in the interaction of that infiltration and leaching over the material will be different.

So if you fix all of these physical parameter, the area, the thickness, the KD values and everything for those layers, this means you are correct, it could be linear.

MR. SAITO: So you're saying -- but I still don't see how that would change by concentration, initial concentration or whether your initial concentration is 1, 10, or 100 or 1,000 picocuries per gram. The conditions change and the flow will change and your final result will change, but will it be linear with your initial concentration of contaminate?

MR. EID: I believe it's close to being linear if

it is not exactly linear.

DR. YU: There is one condition. This is Charlie Yu. There is one condition. Even though you fix all parameters, the only parameter you change is concentration, initial concentration. You change from 1 picocurie per gram to maybe 10,000 picocurie per gram and that may change those conversation factor, the final dose you've calculated although all other parameters are the same.

This is because the adsorption/desorption process that we assume is linear -- in other words, the amount so it's proportional to the initial concentration, but if it's nonlinear absorption the absorbed amount may change due to your initial concentration. Under that condition, those conversion factors may not be linear.

MR. SAITO: So once it's saturated with uranium more will flow through it? Is that -- in essence, that's what you're saying?

DR. YU: Right.

MR. SAITO: Once all the binding sites are filled --

DR. YU: In RESRAD and I believe in D and D, we all use KD so the dose is proportional to initial concentrations.

MR. FAUVER: Henry?

MR. MORTON: But isn't the real problem where you

have reservoir areas? One of the things that can change is that if the solubility product constant is determinant of the concentration of the leachate, then that basically changes the problem up in the source term part and that interplay between that concentration and the KD layers in the absorbing portion of the soil can change that dynamic and thus the linearity.

MR. FAUVER: Thank, Henry. Ken, did you have a comment or you're just sitting up getting ready to talk?

MR. WEAVER: Nice to have the microphone so available here. Ken Weaver, State of Colorado.

Looking at your NUREG 1549 chart there, I sit in a hazardous materials and waste management division, uranium and special projects, and we have Superfund sites and UMPT Title I and II, uranium mill tailings program and also RCRA corrective action is just three cubes away and they use the site conceptual plan as their first step.

It's actually in the MARSSIM manual. There's a wonderful table that compares the different approaches to the site survey investigation and final status survey and the MARSSIM.

My analogy here, maybe that assimilation of existing data and information step really should be recast in terms of the decisions you're trying to make and it should be a kind of a site conceptual plan in the RCRA

corrective action model of doing that really first from the data you have pointing toward the particular scenarios.

So I think it was useful to put this chart up because it kind of reminded me that you start out with a site conceptual plan and then you get into the scenario pathway consideration and then what particularly you're going to do, if I understand the system conceptualization step as it's laid out in the NUREG so that was the thought I was having.

You kind of get past some of these theoretical discussions we've been having for half an hour if at a site you really start out with a conceptual plan and then work to the pathways that are going to come to play.

MR. FAUVER: So are you commenting then, if you look at this flow chart that's in NUREG 1549, you're saying that 2 and 3 should be flipped?

MR. WEAVER: That's a possibility for change if that works in a way the NUREG was really designed. It is a framework and I'm just reasoning by analogy to the site conceptual plan step and RCRA.

MR. FAUVER: Does anybody want to comment on that because I'd like --

MR. McKENNEY: Yes. Chris McKenney. NRC. Actually I think more that system conceptualization is taking your conceptual model of your site, how does mass

flow through your site? How does water flow? How do trace materials move through the environment in general terms?

And system conceptualization is taking that conceptual model someway and then picking or developing a mathematical model and subsequent computer models to simulate that conception, so the conceptual model or the site characterization of RCRA is more of what 2 and part of 1 are and I think they could be recast that way.

You're developing in 1 and 2 your conceptual model of how your site works in a way from data of what you know about your site, somewhat about your geology, other things and then if on a simple model in this diagram, if you go through and on -- you don't screening or you don't pass on your attempt, what you're going back to in 8 is one of the things under site characterization is how much more do you need to know about your hydrogeology? How much more do I have to know and how much more do I have to take account of in developing my site conceptual model and then developing a similar mathematical or computer model?

And as to the other one about the concentration, since all of our models are based on static conditions, they're in a linear system, you could set up a rate equation of a model that would be developed on -- would be time dependent, you know --

MR. FAUVER: Go ahead.

MR. SAITO: Just to keep on this same track, just to kind of tell everyone where we were actually at, we were driven by the time limits rule to take some actions and we did sort of a two step.

We looked at the big picture, where are we at and Tom, what you're saying, what do I need to know, what are the limiting pathways. Limited pathway is inhalation, ingestion, getting it into your body for uranium. Uranium externally, you can have a lot of uranium externally and not have a big problem.

So kind of look to say what do we know about this stuff, internally, externally, this is a former burial area, so we know surface windblown is going to be pretty low, it's got four feet of cover on it, so kind of that pathway goes away.

The only one really left was the hydrogeology and so we kind of said "Well, what do we know about hydrogeology?" We looked around, we went to the USGS, we went out and looked for papers on our area. We went -- like I said, the biggest one we got was the construction logs that came out.

And we said we really need to know more about the hydrogeology. Under time limits we have to do something and that's what we submitted. We said, "Well, we're going to do some hydrogeology here to try to figure out where we're at

so that we can do a dose assessment in the sense of giving you a hard number.

MR. FAUVER: Can I ask you a question? You went through this framework or this --

MR. SAITO: I went through this before this came out and this really helped me understand what I did.

MR. FAUVER: So did you use it?

[Laughter.]

MR. FAUVER: So then you think it's useful the way it's laid out to try to get through the first couple of steps of the process?

MR. SAITO: I think that, yeah, well, up until you've got -- we have to move away from the idea -- and that's when the source term came up and kind of -- it's one of those things that the NRC kept asking. I kept saying "I don't understand why you need to know source term at this point." I need to know to know a concentration not a source term. I need to know what am I looking out at there.

And we really need to move more towards understanding the pathways and what influences the pathways and this chart really doesn't grab us and pull us into our new -- the new way to look at things which is a dose based model and it's still somewhat back in the old way of, you know, do I have a -- can I go to the chart and find a number? The first part -- there's a lot of work up front

before you can do a dose assessment.

MR. EID: This is Bobby Eid. The reason we need to know the source term is to know the extent of contamination, the area of contamination, the thickness of contamination because the dose will change if you have different area and different thickness.

MR. SAITO: Well, yes, but --

MR. EID: Where the contamination is, that's what the source term is.

MR. SAITO: Well, in our case the NRC's already written a report on these burials and so the source term to me is pretty well established and it's clearly -- it's above 30 picocuries per gram, but less than 500 picocuries per gram in the burial and to me source term -- source term is not going to get me to dose assessment.

MR. EID: It is not only the concentration again, it is the geometry of the source. It is how spread the source is and how thickness the source is.

MR. SAITO: And that's hydrogeologic information to me, that's not source term, that's how are things laid out and it could just be nomenclature. That's why I was kind of asking "What do you mean by source term?"

MR. EID: The source term is, you know, the extent of contamination.

MR. SAITO: To me source term is the number of

millicuries out there.

MR. EID: Well, not really. Not exactly that. You need to have more information.

MR. SAITO: That's what I'm saying.

MR. EID: So the extent of contamination horizontally, the extent of contamination vertically and also the homogeneity of concentration, distribution of contamination within that contaminated zone area. That's what it is.

MR. SAITO: Okay. To me source term is a concise, it means how many millicuries do I have out there and that's the nomenclature difference that confused me greatly.

MR. THAGGARD: Well, this is Mark Thaggard again. I'm not sure if I'm understanding how you're applying the framework here, and I want to make sure I understand this.

The way it's laid out is really -- I mean, it sounds like we're making it a lot more complicated than I think it was originally intended, but the idea was you need the source term, initially you collect your source term in step 1 because you would do some preliminary analysis.

In step 4 there, you would do some screening analysis and the idea would be to do those screening analysis to help you determine what data you need to collect, and I think that's what Theresa was saying, that you don't want to go out there and just start punching holes

in the ground and collecting hydrologic data because that can get to be very expensive --

MR. SAITO: Yes.

MR. THAGGARD: -- especially if it doesn't buy you anything in terms of your dose assessment, so the idea of the framework would be to go through and so preliminary analysis to help guide you in terms of figuring out what data is really important in terms of the dose calculation, and that what you would want to go out and collect data on.

MR. SAITO: But if I have no idea of whether I'm looking 5 picocuries per gram or 500 or 5,000 to go out and collect information, what information am I going to collect, If I don't have some idea the activity I'm looking for? It gets pretty circular.

I mean, at some point, we all intuitively know that at 100 picocuries per gram out there with uranium, I'm going to have to do something. So if I go out there and look for 100 picocuries per gram and look around and if it's greater than 100, I'm going to be doing something or 30 or 10 or you know some number that comes up.

You can get an intuitive feel, but when you're actually going to go out and do a characterization, you need to know am I looking for 10 or am I looking for 100 or am I looking for 1,000, it'll make a totally different characterization survey.

MR. FAUVE: Theresa then Rick.

MS. BROWN: But Earl, I think if you know it's 100 picocuries per gram, obviously you know something about the source term to begin with and you came by that number somehow, and so the first step in assimilating existing data, that box doesn't tell you what all is in there, but it's hydrogeologic information, it's source term information, whether it's about mass, total amount of mass or concentration and distribution and the isotopes that are present.

And so actually I think your hydrogeology that you put in after "Can the site be released," that hydrogeology that you're talking about actually goes up into Box number 1, and so maybe it's a description of the flow chart that isn't there that's missing.

But just by the things that you're saying, you do have information on source, on hydrogeology, on geochemistry, things like that.

SPEAKER: That's interesting.

MR. SAITO: You're saying it goes up there on the very top --

MR. FAUVER: That would be existing information, I think, is kind of what Theresa saying. It's just readily available. You haven't punched any holes. It's just something that you already have.

MR. SAITO: And then you can do some sort of dose assessment and figure out where you're at. That's fair.

MR. ROBERTS: Rick Roberts. Rocky Mountain Remediation Services. If I could change the subject just for a little bit to go back to an earlier part ALARA analysis.

I believe that the ALARA analysis should -- there should at least be a component in number 9, number 10 to start looking at ALARA when you look at your remediation alternatives, and I think one thing that needs to be looked at in that is that when you did your ALARA analysis in your example, you assumed that excavation was the preferred alternative and you looked at different levels of remediation based on excavation.

But there's actually a matrix of thing that may need to be looked at and it's very complex and I think we should think about making that less complex in that there are a number of different remediation alternatives associated with a site and there could -- with radionuclides or it could be capping or there could be some type of soil washing, a number of different alternatives and to do that type of matrix with a lot of different alternatives is very costly and could get very confusing as well.

I think we need to try and figure out how we're going to implement an ALARA analysis into a remediation

alternative selection process that is not that complex.

MR. SAITO: But it is going to be very complex and it is going to be costly and you need to spend the money to make the right decision. If you're unwilling to spend the money to make the right decision, then you shouldn't be in the business. I mean, that's -- not meaning to be short with you in particular, but to look at the general outlook that people have.

If you have run a uranium site, you have made a decision that's going to cost you a lot of money in the long term. There's -- I don't think -- would any of you guys disagree with that? I know no one who works in the industry would disagree with that assumption.

My point here is that it is complex, but -- and it's no longer -- you're no longer just looking at -- you're no longer just looking at a one by one matrix, 30 picocuries per gram, how do I get there?

You are looking at something that is, you know, my original training was in physics, and I always didn't like the idea of orthogonal spaces, things that don't connect. I can understand three orthogonal spaces. When you get more than three, that's when they kind of lost me. We're in one of those spaces where we're in more than three orthogonal space here.

I mean, there's all sorts of things that are going

to drive your costs, and if we don't get a grip on this and try to find some tools to help us make good decisions, we are going to make very poor decisions without -- and this just -- this might not be the right tool, but this is at least one way to look at with different points.

MR. ROBERTS: And in looking at it that way, I understand what you're doing, but you need to realize too that that's a three-dimensional matrix when you start looking at capping --

MR. SAITO: Oh, yeah.

MR. ROBERTS: -- different alternatives, soil washing and different alternatives --

MR. SAITO: This is just once slice of a huge --

MR. ROBERTS: Exactly and I think it needs to be -- people need to try and think in the next little bit and maybe have a session on it to try and reduce that complexity while still having protectiveness --

MR. SAITO: Yes.

MR. ROBERTS: -- because this could make us -- this looks like a scientist's dream, but we've got to make it more workable.

MR. SAITO: It is, but there is a definite and there is some how do you get from here to there and this is just the first step. I mean, this doesn't even take into account travel distance or the other costs that the ALARA

analysis takes into worker injury, time, all these things. It gets very complex, but this just looks at part of it.

MR. FAUVER: Before this gets too far ahead, I just want to make sure that everyone understands that the guidance in Draft Guide 4006 on ALARA is very clear in several sections that the ALARA analysis is done up front and it's intended to define certain activities, remediation activities, that would then be performed.

The ALARA regulation and the way we've developed the implementation guidance is not intended to develop a lower release criteria. It's not intended to lead you to a 15 millirem release criteria. It's meant to try to be a process by which you can then determine what remediation techniques you're going to pursue that are going to be cost effective.

From that prospective in essence it has to be done up front, and I think that that's the way the guidance is structured and that's the way it's intended to be used.

MR. SAITO: Again, looking at this, the ALARA should be right up there because you can't release a site if it's not ALARA.

MR. FAUVER: Right.

MR. SAITO: You can't answer a question "yes" or "no" until you --

MR. FAUVER: Right.

MR. SAITO: Right. It has to be ALARA and DCGL.

MR. McKENNEY: Actually that was two years ago when we started this. Six became about a lot because on the first pass through we didn't have an obvious place for ALARA where screening occurred, but we recognized and felt it may not have been in the NUREG that for other situation, 8 and 9, where you lay out your preferred options, and you lay out your alternatives, and you look at the cost benefit analysis of those, that selection process is your ALARA analysis, your up front ALARA analysis.

There is still a functional ALARA organization duties during the time of remediation similar to the ALARA program you have for your workers right now. You need to make sure that the assumption that are made about your efficiency of cleanup are -- how are you doing?

You can't just go out and do everything and then come back and say "Well, we weren't as efficient and we never looked at it until we got done."

MR. FAUVER: Right, that's a good point.

MR. McKENNEY: There is some evaluation that needs to be done. It doesn't mean that if you start out a preferred option and all of a sudden it's not as efficient, you're not going to have to go back and make necessarily a new option or something else.

It may be that you're just not going to reach that

goal and if, you know, you were actually shooting for something that resulted in 15 millirem, you may actually come out with 22. That doesn't mean you lose the ALARA requirements.

MR. SAITO: Right. It would be very important how you write your commitment in there. Writing your commitment into your plan is going to be very crucial. You have to get your DCGL, but then you say "Once I reach the DCGL, I will take steps such-and-such" and, you know, that's a very great point.

MR. FAUVER: And then you would document that you took the steps as the demonstration of ALARA, and that if it turned out not to be as efficient as you first thought in terms of cost, than as Chris was saying, I presume you would then submit something to modify your original --

MR. SAITO: Well, unless you write your plan sufficient that that would --

MR. McKENNEY: Unless we put a more performance based --

MR. SAITO: Yeah, right. We're submitting the plan, so we can make it more performance based --

MR. McKENNEY: There is also the consideration on our management side about how they -- most people are hoping for performance based, but we don't want to redo this application.

But actually the ALARA is going to be currently in the plans and this is not -- it's one of the one-day sessions in the next set of workshops and it's currently proposed to be in the June meeting is going to be the discussion on ALARA.

MR. FAUVER: Okay. Thanks. Scott?

MR. KIRK: Yes. I have a question --

MR. FAUVER: Identify yourself, please.

MR. KIRK: Scott Kirk. Nuclear Fuel Services. I have a question about determining depth to groundwater. Could you put the geological cross section back up.

MR. SAITO: Yeah.

MR. KIRK: The question I have is when you're determining the depth to groundwater if you initially put in a shallow well, like in the sand and gravel layer and you have uranium contaminants that are detected there, but you also compare to the water quality standards and you know it's not a potable water source, then would be it be feasible or practical to estimate by some other model how long it would take to -- over a thousand year period of time to travel vertically, you know, downward and then to also drill a well at that point and to determine whether that water was a potable water quality source. If the answer was no, then you could exclude that as a viable drinking water pathway exposure or scenario.

MR. SAITO: Yes, that's actually one of the things I was wondering is how do you -- because wants it hits the gravel layer, it's going to travel much more in the horizontal direction that the vertical direction.

MR. KIRK: Correct, especially if the bedrock like the limestone or the flintstone is pretty impermeable and it may not yield sufficient groundwater qualities, but something underneath it, there may be a viable aquifer that's separated by that confining layer, and you would need to know what the migration rates would be and you would also need to know whether or not the lower aquifer yields a potable water quality source.

MR. SAITO: Yeah, I'm learning a lot more about this, and I'm starting to understand why geologists always want another well. I mean, you can always take another -- and that's an interesting question.

MR. McKENNEY: One of your assumptions that's talked about a lot is that whether the confining layers actually were across the whole site and --

MR. SAITO: Yes.

MR. McKENNEY: -- but in a real complex site, it is interlay and tension of various different layers and so you have confining some places and you don't have confining elsewhere, and then they're trying to model a site that has not a little heterogeneity, it has a lot of heterogeneity in

your groundwater. That's what I always considered --

MR. SAITO: Yeah, all confining layers have to end somewhere because they aren't everywhere around the world. You know, that doesn't stretch around the world, so it ends somewhere.

MR. McKENNEY: Yes, I know but some of them don't even go for 100 meters.

MR. SAITO: Some of them will only go the size of this table, too.

MR. EID: This is Bobby Eid. I would like to emphasize the importance of defining the source term and identification of the contaminated media. I'm not talking about only this case, but in general term for other cases it's quite crucial to establish what kind of environmental media that's contaminated and also to establish and define the source term because this could lead to selection -- the criteria for selection of the code that is used in the dose assessment.

So prior to the dose assessment it is essential and crucial to define the contaminated media and the source of contamination. If you have already existing groundwater contamination, it could be certain code are not suitable to be applied for that specific case or that specific contaminated media.

If you have subsurface contamination, certain

codes may be not adequate or not appropriate for that specific case so it's quite essential and crucial to identify the contaminated media and to define proper source term.

MR. KIRK: I guess I was really posing my question about whether or not a water quality source was valid to consider for a drinking water pathway because it was not potable. Is that an appropriate methodology to use?

MR. McKENNEY: Yes, that's actually been used before in different cases at NRC so with the right data, it's perfectly valid.

MR. EID: I would say to add more to what Chris said the classification of the aquifer is significant. If you have classification of the aquifer based on EPA classification that is not potable water, this is for most likely the pathways that are associated with the drinking water pathway and irrigation if it is not useful for irrigation could be eliminated from the dose modeling. Yes, the quality of the aquifer is quite essential.

MR. SAITO: Along that same question though is would current well codes be considered restricted or unrestricted release. Current well code in Missouri says you can't -- everything has to be cased down until you hit the first layer of bedrock. You can't draw out of this unconsolidated region so a well cannot start to be screened

until you reach the bedrock. Is that considered restricted or unrestricted?

MR. FAUVER: Those are the kinds of things that we're looking at developing this SRP and any kind of suggestions and thoughts on that, the more that they could be documented either a posting on the Web site or in some other written form, these kinds of questions and real life experiences are the kind of input that we need so that's the kind of perfect example of what -- you just make a posting on the Web site and say "I want to know if the Missouri" the example that you just gave "can be used." We would bring that in and perhaps use it as an example of an acceptable way to build into your groundwater assessment, dose assessment.

Okay. I don't see any more people offering up comments. Henry looks like he's over there chomping at the bit.

MR. MORTON: Yes. Henry Morton. Back to the flow chart on the sequence of looking at things. It seems to me we often have trouble with these flow charts, perhaps because we try to make them basically a one-pass chart and this case got one loop.

What we've basically seen in as we talk through it we see increasing more little loops and in trying to construct not only this pathway, but to bring in the matrix

and to think through that process seems to me what we really do overall is to creep up on the problem in a cost effective way. We really do think first in terms of what do we have roughly, a scoping kind of survey.

Broadly, what are our alternatives. Well, the alternatives might be: Do nothing, because we don't have to pass or dig it up and ship it away or put it in a cell or somehow cap it in place.

Then we begin to look at other boundary conditions. Is there something there that prevents doing one of these. Munitions, some other hazardous condition or even in the extreme do we even have enough money to execute some of these or one of these possibilities.

I have 80,000 cubic yards potentially to haul away, maybe I don't have the money to do it so we begin to, I think, roughly creep in on these in cost effective ways so it seems to me in trying to construct these flow diagrams, logic diagrams we need to try to think systematically in a way that building roughly the sequence of thinking that allows for the reality that what we do is to refine quite a bit.

We roughly think of where we are. We might go through a rough dose assessment to see where -- that is, we think through the process first, where do we need to collect more information, and then we begin refining by collection

more information.

We kind of penalize ourselves if we try to make this too linear, too simple on a one pass through because, for instance, in the ALARA requirements, one of the things really is the cost effectiveness, that is, the cost and the effectiveness of cleanup, so it's not necessarily a linear process.

I think what we really do is to look sometimes in a parallel process where up front somewhere we're going to do a rough cost estimate to see where the boundary condition are of what our alternatives are and roughly what are the doses and roughly what are the costs going to be and then we'll refine those so those two terms may really be in parallel.

But the point is I think we've been trying to construct this process, we need to kind of think generally about the sequence, but leave the idea that there will be probably at least two passes through it in any complex case and there's opportunity for a lot of little loops through parts of it as we're refining the process.

MR. FAUVER: I think the guidance is fairly clear that it's iterative. If you look at 1549 on this framework, okay?

MR. WEAVER: Ken Weaver, State of Colorado. And in the MARSSIM manual that cycle, the plan-do-check act,

stepwise cycle is actually one of its strengths because it takes a very general principle used widely in industry and government, brings it into that manual -- somebody's got to still make a cookbook that we can follow, if that possible, but the plan-do-check act is exactly what was prescribed here if that could be more present in this framework, that would be helpful I think, to actually have a site in there trying to work through it as you are.

MR. WILLIAMS: Alexander Williams again. I wanted to address the cost and ALARA business in some very general ways. First of all, your costs for cleaning up a site are a combination of fixed costs and variable costs.

The fixed costs are all regulatory costs and the costs of running a cleanup and these don't vary an awful lot.

Variable costs, though, are costs of excavating or cleaning surface and shipping waste and stuff like this and it, of course, varies with the amount of stuff you have, and I understand that sometimes things arise that push costs out of site. If some citizens with some absolutely bizarre claims come up that just can affect fixed costs and so on and so forth.

I remember one site which will be nameless, where I asked the NRC licensing person how many hours they had spent dealing with the citizens group at this particular

site and this gentleman said, "I spent 700 hours last year." This man was spending almost half of his time dealing with the terms of this citizen's group and I suspect the licensee was probably paying for it.

Moving along to ALARA, we have found that in terms of soil clean up the amount of dirt generated from cleaning up has an exponential relationship with the soil clean up limit whatever that might be.

It doesn't cost you very much to clean up over many ranges of this curve, but you also get to a point where you're making enormous costs with very small reductions in dose, and I submit that in looking at doing a cleanup that it would be prudent to make such curse and to look very carefully at it because if cleaning up from one level to another only changes the cost by 10 percent, this is probably a well justified use of money.

On the other hand, if you're reducing the dose by 10 percent but doubling the cost, I submit that this is not a well justified --

MR. FAUVER: Well, what NRC is draft guide 4006 per some indications in previous guidance that we've got on ALARA we have a dollar cost value, $1,000 per man rem so the way that it's structured right now, we're not specifically asking for detailed cost benefit curves and crossover points and that kind of thing.

I wanted to make one more response to your comment regarding the public input. Certainly, it is the right of the public to have all of their opinions about it, it's their backyard --

MR. WILLIAMS: I didn't say otherwise.

MR. FAUVER: -- and we will willingly review and discuss and spend those 700 hours.

MR. WILLIAMS: Sure.

MR. FAUVER: That's our mandate.

MR. WILLIAMS: Sure. I fully understand that, but this does cost money and so that sometimes your fixed costs become variable depending on whatever claims someone makes, and I realize that NRC thoroughly investigates claims however bizarre. We do at DOE as well.

MR. FAUVER: Well, we don't really characterize them as bizarre, typically, but thanks. I'd like to get back to the framework so can we get back to that specifically? Are there any other comments --

MR. SAITO: I'd like to make one furthering what he said. I think what you're talking about there is the fact that contamination is more or less logarithmic as you go down. The contamination up top is much higher than the contamination at the bottom so as you start digging deep as you lower that limit it's not a linear function, it's a logarithmic function going down.

MR. FAUVER: Sure.
MR. EID: I believe because also the increase of the volume of the contamination because if it is lower level and the difficulty of removing the contamination if it is very low level concentration.
MR. SAITO: Plus the cost of analysis. As you drive your limit down, the cost goes up.
MR. FAUVER: So then at some point it's going to exceed the $2,000 per man rem criteria.
MR. SAITO: Sure. Well about the DCGL for uranium, probably.
MR. FAUVER: And that's something should be evaluated.
MR. SAITO: Yes.
MR. FAUVER: The prohibitively expensive determination for restricted us, but when you talked about restricted use in your situation, I'm presume your considering a restricted use.
MR. SAITO: I'm considering just about everything right now.
MR. FAUVER: Okay.
MR. SAITO: We have -- like I said, we have no preconceived notion as to what we're going to be doing a year from now.
MR. FAUVER: Okay. All right.

MR. WILLIAMS: There are some other factors that come --

MR. FAUVER: Excuse me for a second, Alexander.

When you consider restricted use, you mentioned turning off the pathways for resuspension and that type of thing. You need to, of course, recognize that there's also an intruder scenario where those pathways would be turned back on depending upon the intruder scenario you chose.

MR. SAITO: And that's one other point that I meant to make is that we will never have a single analysis model run that will be sufficient. No matter what we turn into you guys, we're -- and Greg's going to bring this up later when he talks -- we will probably give you guys four, five, six model runs that say this scenario, this scenario, scenario, this scenario, and then we look at all these scenarios and they all look good or this one looks a little worse than the others and since all -- it's not going to be a single --

MR. FAUVER: What you're really doing is documenting your evaluation of alternatives as a part of your ALARA analysis or as a part of a type of environmental report or whatever.

MR. SAITO: Yeah. People who are thinking you have one analysis that does everything are not in touch with what we've been talking about.

MR. FAUVER: You're going to be doing that anyway for your -- just engineering, cost benefit analysis to see what your best option is, and you know, the one thing that we in our reviews recognize is if somebody comes in says "I'm just going to cap this stuff," and if we looked at it and said -- "Well, I'm going to cap it and it's going to be for an intruder, 490 millirem," something like this, we may want to see an evaluation why some other method, for example, consolidation with some other kind of cap or some other type of alternative maybe could deliver 100 millirem to the intruder or the groundwater dose could change from "X" to "Y."

So the alternatives are useful for us to review and I guess that's something that we have to do anyway so one of the I guess real life aspects of this framework is one of documentation and what we have to work out in our standard review plan is what level documentation are we going to ask for.

We don't want to have you submitting something and us going back with comments and you submitting back again. We want to try to structure this thing so that you can submit this structured evaluation that sort of steps through it and says "Here's my conclusion," so it would be a performance oriented type process because it is a process, I think that's what we've concluded here.

You know, Henry's comments, your comments, it's iterative. Ken Weaver's comments about the data quality objective process. So it's a process and one thing we have to do is figure out how to document that as opposed to -- so that we're sure that we've got the best alternative selected as opposed to just "Here's my evaluation," the final alternative that you selected. That's just another thing --

MR. SAITO: The answer is three.

MR. FAUVER: -- we're considering.

MR. SAITO: The answer is three.

MR. FAUVER: Okay. Alexander, do you have some more?

MR. WILLIAMS: Yes, I wanted to add a bit more on the question about exponential increase and stuff. When you actually do a cleanup at a site, though, we find some other things happening in addition to this, you know, distribution of soil with different levels.

The bigger areal extent if you decrease your number, you get a bigger area to dig in both horizontally and vertically. Also at DOE at least we use the latest high tech equipment for doing cleanups.

The equipment has names like bulldozers and front loaders and bobcats and stuff like this and there are some limits in this high tech equipment. Even if you have a Toscanini at the controls of this stuff, if you have someone

with bulldozer to go dig up two inches off the front yard, you may get one inch, you may get three.

There are just limitations in how well you can do stuff, and I don't think that there are very many people in this business who are going to make a pass with a bulldozer and have everybody lean on their shovels while some sample goes off to the lab to tell you whether you're 10 percent above or 10 percent your cleanup level.

I think most people would keep digging until their sure just to avoid having people standing around and stopping progress essentially while some sample goes to the lab so you wind up as a practical matter with a sniff and dig operation that in turn achieves cleanup at a level that is below whatever was approved.

In addition, whoever is planning clean up typically plans it to achieve it. I mean, the engineers that design bridges, the bridge is suppose to hold 10 tons, there are some like safety factors put in so the bridge will hold a little bit more so it doesn't collapse in a windstorm or something and the same thing is true in the cleanup business.

MR. FAUVER: All right. Thanks, Alexander. I think we're going to have to break that.

MR. WILLIAMS: Okay.

MR. FAUVER: We're just getting ready -- I guess

it's 10:00 o'clock. Are the other folks that have any closing comments before the break? Okay. Good. So we'll reconvene in a half hour at 10:30.

[Recess.]

MR. FAUVER: Our next speaker is Greg Chapman from NFS and he's going to run us through some of his thoughts on some work on dose modeling that's he is currently conducting.

MR. CHAPMAN: Well, good morning. My name is Greg Chapman. I'm with Nuclear Fuel Services and I guess the first thing I want to do is thank Dave for giving me the opportunity to come out and present some of our problem issues, especially considering he really doesn't have the slightest idea what it is I'm going to say.

I'll give you a little bit of quick background on our site. I'll get into a little more depth here shortly. We are one of the complex sites that are dealing with all these different issues that make the implementation of the guidance very difficult.

What we're specifically trying to do is we've got about a 24-acre portion of our northern facility that we're trying to get decommissioned and license termination for it. This portion of the facility has some burial trenches and some surface impediments in it, and we really don't have any building of any sort at that particular area so we're not

worried about buildings. We're worried about soil and groundwater.

The contaminants that we have out there -- we've dealt with all the different enrichments of uranium so we do not have a consistent ratio among the uranium isotopes present which makes that complex. We've got the thorium there and of course the who decay chain is present because it's been there for a sufficient time to allow progeny and grow and secular equilibrium conditions to hit. Those are our two primary contaminants on the site. In addition, though, we have the potential there to encounter transuranics and also tech 99 so we've got the full mix.

And since the regulations are out there for bio-radionuclide basis now if you list out all your potential primary contaminants, by that I mean not the progeny associated with them, you end up with something like 15 contaminates that we're having to develop CGLs for and be able to apply them.

Some of the issues that I've come here with, obviously the big one is dose modeling and how we're trying to develop these CGLs, what's the acceptable method for doing that.

If we already know we're in the site specific realm here, one of the particular issues we want to make is the fact that we really need to be reasonable in doing our

modeling and be as accurate as possible and throw out some of the conservatism, and we've got a couple of very specific examples on how we want to do that.

Another thing we want to do is help -- for us in finding the critical groups that we're trying to look at, and it's not just one, we have to evaluate several of them, and the groups that drive the CGLs vary for radionuclides, and the exposure pathways associated with these guys, and also to find the critical group, we need to know what kind of justification does it take to eliminate certain exposure pathways. I want to present that case.

The groundwater issue is a real complex issue for us because I have to admit I'm a little bit snowed on it. Essentially, the problem there is that the modes D and D and RESRAD, those are static models, as you say, and what it basically assumes is at times zero your groundwater contamination is essentially zero and the only source for groundwater contamination is leachate through your residual radioactivity in soils.

The problem that that causes if you're going to do remediation or if you've done remediation, you've obviously had waste sources there and the source term in your groundwater is not due to residual radioactivity in soil, it was due to the radioactivity in the waste that got removed before you started your modeling period to begin with and

it's unrelated to what's currently in the soil. That's a confusing issue. It's one we're trying to work through and it's why we're here.

The last bullet there is ALARA determination from multiple radionuclides. That was a kind of an academic exercise I was going through to demonstrate the fact that essentially the ALARA equation that's in the guidance is very radionuclide specific and it will vary depending on the radionuclides, exactly what determination you come out with, but wiser heads have prevailed there and said, "Let's don't confuse an academic exercise with things that are important to us," so I've taken that out of this presentation.

One of my justifications on the need for reasonableness is we've already got several sources of conservatism in this decommissioning rule making process.

The first one I want to make there is the fact that we've got the 25 millirem per year regulation in effect, and the thing that's interesting there is it wasn't very long ago when -- actually, it's still effect -- in the regulations you can have up to 500 millirem public dose limits.

I'm assuming that that wouldn't be the case unless 500 millirem was pretty much safe to the public, so 25 millirem is only 5 percent of that value so that's pretty conservative just to begin with. I'm not going to argue

with the 25 millirem value, but I'm just saying it is starting out conservative.

The final status survey if anybody's tried to look through the MARSSIM manuals and the statistical tests and really understand what they're trying to say there, you cannot leave contamination that your CGL values and pass MARSSIM. The MARSSIM statistical tests are not looking that you meet the criteria.

By "meet" I mean leaving things right at 25 millirem level, the highest that you could possible do it. You have to be significantly below that level to prove it statistically. So you're not leaving things at 25 millirem. You're leaving it somewhere down below that.

Of course ALARA as a conservation faction, that's also a step beyond 25 millirem so you're already being conservative still showing things for ALARA.

All these things taken into consideration and when you go back to the rule and it's talking about 25 millirem to an average member of the critical group if you're in site specific mode, what you're trying to do is throw out that conservatism and if this is the only place that we're really wanting to throw out conservatism, I'd tend to make the case that this is the case where should be allowed to do that.

We want to make the dose modeling as accurately as possible, and that means essentially unlike 5049,

unfortunately, we don't really want to use 90th or 10th percentile values. We want to use the most appropriate value for each input parameter. That's essentially what I'm saying there is the last.

I'd like to have some guidance out there that shows me just how accurate I have to be or how accurate I should be and not necessarily held to -- insert a conservative bias into this program so that when you come out you still end up with something that's very conservative.

Now if we're throwing ourselves out as a test case, I need to give you a little bit more information. Our plant site was built on some farmland back in the 1950s. It got incorporated into Erwin city limits and it's now on the outskirts of the town back in the 1980s, and of course, there is zoning in the town so we're in an industrial zone facility and so is the property to our west and our south.

If you look immediately adjacent to our property, we do border, of course, a railroad, other industry and some suburban properties. Like I said this is about 24 acres. A lot of this is in a 100-year flood plain, and of course, there are quite a few building codes for how you can build in a 100-year flood plain. You essentially have to raise the grade one foot above the flood plain level so that you can build there.

Also running through the middle of this portion of our plant site are the municipal utilities that we use for supplying water to us so we have municipal utilities available in that portion of our plant site we're trying to decommission. Not only that, but they're pretty cost effective.

Local industries have come in and they've evaluated whether to sink their own wells in there and the cost of putting in wells and operating a water purification effort there to make it usable water, it was more cost effective to go to the municipal cities and use their water so they've done that kind of study in local industries in the area and that's basically their outcome on it.

Polling up at the utilities the employees at utilities that should hopefully know this, they couldn't identify any private wells in the whole town of Erwin currently used for drinking water purposes.

Now I'm not saying that there's not some wells in there, obviously, with time the municipal system expanded out to incorporate some houses that were already there and the houses that were already there, of course, had to have water from somewhere and they had their own wells in place, but new construction with the water service available, everybody uses the municipal city water system.

Of course there are within the town of Erwin some

municipal codes saying you have to hook up to their sewer system. They have a POTWA system out there so they're not going to let you sink septic tanks in the town of Erwin anymore.

You've got to hook up to their system and it kind of implies that you're going to be hooked up to their water system too because they can't meter how much sewer you have unless they meter the incoming water use, and I'm not aware of a sewer meter essentially. I don't think anybody is.

Other kind of interesting things there in the county that we're located in, we're in Unicoi County in Tennessee and 47 percent of that entire county is a national forest so the available land in that whole area is pretty strictly limited, and with time going on and population growth being what it is the usage of that available land is not being towards farming and that's kind of born up by some statistics.

If you look at population growth, it's been about 16 percent increase in number of households in that county per decade over the last 40 years and similarly, if you look at the farming trends over about the last 20 years from 1978 through 1997, I believe, there's been a 30 percent decrease in the amount of harvested acreage in that county. So it's pretty obvious to me that the trends in that area are towards suburban development or industry and they're not

towards farming.

The last thing that we did, kind of an eyeopener for us, was we went up to the planning commission and asked them kind of "What do you all think, what would be the possible land uses there?" They actually told us something that was fairly interesting.

The said, "Well, you know, if you consider the fact that your site is kind of on our south side of the town of Erwin and also the fact that you've got a natural spring right there, it's a pretty nice little area. You've got some creeks and streams running through this portion of your site. It's in the flood plan. It would be kind of nice -- I shouldn't say it would be nice, it'd be a possibility that it would be a good park, recreation park similar to what we have up on the north side of town." So we scratched our heads and said "Okay. Well, let's call that a possibility," and so we've looked at that also.

To give you a little bit better visual idea of what exactly I'm talking about, this is a 1950s photo, I think actually 1953, of the area where our plant site is located, and if I can located this very easily. Right there is a farmhouse I believe was our first industrial building.

The area that we're trying to release at the moment is all this area back up in through here. This is the spring running through there. It's noncontaminated, and

this is another creek. Of course, this is the Nolichucky River. All the groundwater flows toward the Nolichucky River at which point there's a significant amount of dilution.

The other thing that's probably not terribly obvious off of this photograph, but this area right over here is national forest. It's about a mile off our site and the area back up here is national forest. It's also about a mile off our site.

And if that was a 1950s photo -- I may have flipped that around. If I did, I apologize. This is a 1990s photo. Again, this is pretty obvious. This is the plant site itself right now. The area we're trying to decommission is this part of it including these surface empanelments that you can see right there.

You can tell there's been a significant amount of development of that area, suburban as well as industrial. I was hoping I could actually get an even more recent photo because even since 1990 we've had three, at least three, new industries go in in this industrial park area.

This has continued to be developed as an industrial park. You can obviously see the railroad tracks running there next to our site. We've got a nice new Interstate going through there so it's kind of an attractive area for industry for that reason.

It's got access to quite a few things, and basically you can see just looking at it that trends have been toward suburb and development. There's not too many farms there whereas there was back in the 1950s.

So when we looked at this kind of information together and we said "Let's look at the possible critical groups that we want to evaluate there," and basically we've identified critical groups we think are most probable, most likely and we're trying to model those as accurately as possible to get realistic dose to source factors and static model that values linear -- and we want to apply those to develop our CGLs.

The three that we wanted to look at that we felt were most probably, most likely, include a suburban residential land use type situation and the NRC's even put out some guidance, PG-8-08, I think it was back in '94 and that's pretty analogous to the scenario B situation and it's kind of interesting to note that that does include eating plants so there's a kind of suburban residential gardener scenario if you will, but they're not raising livestock and they're not raising essentially more than 25 percent of their plant diet. So that's kind of how we defined our suburban resident there.

I've got the light industrial scenario and again, that's another scenario that's in PG-8-08 that we wanted to

utilize and we looked at this recreational scenario and we felt like the critical group in that situation would be a park groundskeeper similar to what's out there in North Erwin and that's somebody that spends more than half a work year on the site. We felt like that was suitably conservative. I don't know too many park attendees or park users that would spend more than that amount of time at the site.

In addition, we know that the NRC is interested in it for reference purposes if nothing else, other scenarios that we did not consider likely and so we're not using those to develop our CGLs, but that includes this subsistence farming scenario.

Again, there's a general outlook on that in PG-8-08 and that's your classic resident farming where somebody spends something like 75 percent or more of their time on the site, drinks the groundwater on the site, raises the livestock that they're going to eat out of the site and that raise 50 percent of their plant diet off the site, but we're saying that that's not really credible.

But I can imagine why you actually want to see that because if we're for some reason wrong on these things, you want to see just how the effect would be if that might be what the situation is that occurred.

The other thing that we're making the case on

there or hoping to make the case I should say, is use of the groundwater there as a drinking water source is highly unlikely in our opinion. By that I mean with the city utilities right there as being an economical source, I can't imagine personally anybody coming in there and developing that area and not making use of those facilities.

In a hardship condition we do have that spring up there which is a natural, uncontaminated spring and if you really hurting for money or whatever, the cheapest thing to do is go through the spring and get your water. It's not to drill a well there.

Same kind of logic follows for if you're wanting to irrigate with water bodies going through there or provide water to your livestock, you've got surface water bodies going through there so use of the groundwater in that situation we think is pretty highly unlikely, and I would at this point kind of like to ask you all, do you think that's sufficient justification to exclude the pathway?

MR. THAGGARD: This is Mark Thaggard again. I've just go a question. Is the spring fed by a different groundwater system or are you -- I mean, it's not clear to me. You're saying that you could use the spring. Well, the spring would be fed by the groundwater. I mean, it's the same, generally, they're interconnected.

MR. CHAPMAN: Oh, gosh. I apologize. I should

have had these marked a little bit better.

If this is our plant site, I said everything is flowing down here towards the river. The spring is up here on our eastern portion, up gradient of the plant site and the stream that comes out of it goes right through the middle of our site, and the other creek that's there is up here on the far northern portion of our -- our northern portion down here of our site, and that's also coming off of our site and is uncontaminated to begin with.

MR. THAGGARD: So which site are you talking about decommissioning? The site up at the top?

MR. CHAPMAN: I apologize again. This is the 1950s photo. I was pulling this one out because it showed the creeks a little bit better. The portion of the site that we're looking at is right in this area.

MR. THAGGARD: Oh, okay.

MR. CHAPMAN: We're wanting to get that taken off our license.

MR. EID: This is Boby Eid. What is the depth to the groundwater level?

MR. CHAPMAN: What's that?

MR. EID: It's a flood plain area, right?

MR. CHAPMAN: Yes.

MR. EID: So what is the depth to the groundwater level?

MR. CHAPMAN: It depends on where you are. We have one portion of the site up in, I believe up in this area, this is marsh area, groundwater is essentially --

MR. EID: So it is on the surface?

MR. CHAPMAN: Right. Yes, but in other portions of the site, there's quite a bit of depth to groundwater, about 16 foot.

MR. EID: That's another complexity in the site where you have different kind of characteristics for this site.

MR. CHAPMAN: Yes, Alexander.

MR. WILLIAMS: Alexander Williams, DOE. One thing I'd add to your list of justification is the close proximity of the river to your site that if someone were going to use water for irrigation or any other similar purpose in addition the spring that you mentioned, the close proximity of the river would -- that would be far useful as a water source than putting in a well. So I would add that to a list -- to your laundry list of justifying why, you know, any further onsite well would not make sense.

Also I would very carefully review in view of the marshy or swampy area that you have, I would look at that very carefully because there are legal prohibitions under Section 404 of the Clean Water Act involving development and disturbing wetlands. Whether this is a wetlands and would

or would not be under that, I don't know, but I'd look at that as well as legal land use restriction.

MR. FAUVER: Thanks, Alexander. Do you have another comment?

MR. THAGGARD: Well, I think that to get back to your question, first of all, it seems to me that you're kind of implying that you can only use the resident farmer scenario, that somehow that we're requiring people to use that, and I think that's not true. I think if you've got justification for using another scenario like you're trying to make here, I think that's what we would be looking at.

Now in terms of the arguments about not -- I mean, excluding the groundwater, I think we would probably need to think about the arguments you're making. I mean, I could think of some reasons why they would not be acceptable, but I mean, maybe with more information I could be convinced otherwise.

One would be if you're arguing that people in the area right now are getting their water from the city, I don't know how strong of an argument that is considering the fact that, you know, these analysis we're talking about far in the future, so whether that's going to be a reliable source of water, I mean, whether that's going to be a continual trend in the future, somebody could debate that.

I'm not saying I would, but I don't know. I

guess, for example, if the groundwater at the site is not usable, if it's not potable and that's the reason why people are getting their water from the city, I think that would be a stronger argument, but simply to say "Well, everybody in the area there is getting their water from the city and we know that that's going to continue indefinitely," I don't know how you can defend that kind of argument.

The same thing would be the argument about use of the spring, again, that's been fed by the same system, that's coming from the groundwater so you can't argue that on the one hand, you know, people may use the spring and then they won't use the groundwater and I mean, it's coming from the same system. They may use the spring, but if the groundwater gets contaminated, then presumably somebody using the spring, you know, they're going still get that contaminated water.

What I'm saying is I think it's reasonable to try to make arguments to change the critical group and there's nothing I think in the guidance or anything that we put out that precludes people from doing that, but one of the arguments that you're putting forward would be the type of arguments that we would debate. I think these are the kind of debates I guess we need to have and maybe it's useful for us to talk about this.

MR. CHAPMAN: I'm hoping so.

MR. KIRK: Scott Kirk, Nuclear Fuel Services. I'd like to add to that in that the city, the geology there is really complex. It's in the Appalachian Mountains. The city has a well where they obtain most of their drinking water sources for the local residents. I think it's about a mile and a half a way and it's outside the capture zone from where out site is so we could demonstrate that our water supply -- I mean our groundwater would not impact their sources.

I'd also like to add that the Nolichucky River that was referred to earlier that was pointed, it does supply the drinking water source for the nearby community of Jonesboro which is about 20 miles down stream so it is a viable source and that we believe that the drinking water, the aquifer immediately underlying the site is not suitable.

It's in a flood plain. If it was flooded surface water could contaminate those wells and that also leads to another argument, we just don't really believe that that's a viable exposure pathway for us to consider.

MS. DAILY: Just a suggestion for another source of information that you could use to support your argument one way or the other. I know that in this county the currently water use restriction -- they're trying to move like livestock away from flowing streams so actually that's an argument that you might end up with a well since you

can't allow livestock to go down into streams anymore except for grandfathering. You do have to sink a well actually to get water or some other system.

On the other hand, Tom, you may have local restrictions on finishing wells, flood plains and things like that if they've got those kinds of restrictions, but that brings up another thing that Mark was talking about.

One of the things that we've talked about is do we accept current, existing conditions and assume that they continue over the 1,000 year period, kind of something that high level waste does or do we have to assume that conditions change over those 1,000 years, sociological, socioeconomic changes. That's up for debate.

MR. CHAPMAN: Well, again, I just can't imagine exactly what change would occur that would make it more economical to drill your own well, and having come from South Florida, I can you that they're putting quite a bit of restrictions on groundwater use down there because there's enough wells being used, enough golf courses that I don't see that particularly going in that direction. I can see it going the other direction totally where it's all city supply, but I don't see it going that other direction where they go from city supply back to privately-owned wells.

MS. DAILY: Right, but what I'm saying is there may be information in current regulations to defend --

instead of just saying that "I feel that this wouldn't be viable," if you can get some nice hard defense from existing regulations that say "Our well system is such" -- well, in Florida, you're going to have saline problem. Too many wells and you're pulling in bad water. In your situation there maybe other regulations that you can draw on.

MR. CHAPMAN: Okay. So to summarize the feeling I'm getting from you is we've got a decent case, but you feel like we may need to do a little bit stronger justification looking at other regulations, things of that nature to help build the case even more.

MR. FAUVER: Yes. I think another consideration is going to be the potential dose from the referenced scenario groundwater. If it's very high, then the standard of demonstrating that the groundwater won't used may be slightly different than if it's relatively low.

That means that the probability outcome type discussion comes into play. If the probability is low groundwater contamination, however the outcome is very significant groundwater contamination, then that may lead to some further discussions and different types of discussions than if it were relatively low potential.

MR. CHAPMAN: That's a good point. We'll come back to that in a second.

MR. KIRK: I have a question. Are you

decommissioning under the old criteria or the new criteria?

MR. CHAPMAN: We'll hopefully find out soon.

[Laughter.]

MR. SAITO: I have a quick question here. In relation to the drinking water from the city. If it's a municipal water system, wouldn't that be considered a durable form of government by the NRC that since it's a government supplied water system that would need to be a stronger case than a commercial system that was doing it or would you guys not view it in that manner? Similar to the restrictive release durable form of government argument.

MR. THAGGARD: Yeah, I don't think I have the answer for that because I'm not a lawyer, but I guess one of the concerns would be whether the city is requiring that all people hook up to the supply. You know, if it's not a requirement, then what's to preclude somebody from putting in their own well. That may be more of the argument that I'm trying to make.

DR. GREEVES: Okay.

MR. MAHOSKY: Keith Mahosky, Earth Sciences. I think that under the 4006 that if you look at the institutional control issues for restrictive release, the city has to be assumed to be durable, just like Earl said, and I think that you'd have to consider that they would continue to provide functions to the people of the city and

those things would indeed be durable as well. I don't think you can slice it both ways.

MR. THAGGARD: Yes, it's like I said, it depends on whether the city is requiring people to hook up though. Not every municipality requires that people hook up and so if you're not required to hook up, what's to preclude somebody from drilling their own well? I mean, it's not -- you might be right, but --

MR. MAHOSKY: Well, I think you'd have to take a look at what the regulations are in the city to insure that something consistent is developed.

MR. ROBERTS: Rick Robert, Rocky Mount Remediation Services. Let's say you don't look at groundwater ingestion pathway, and you've got a river right near by, I mean can you just say that there's not a pathway so you're not going to assess it or are you going to assess the ground water transport for 1,000 years, look where it goes, and then assess, say, a recreational scenario in the surface water, you still have to -- you're still going to contact at some point, and you can't just say just because the pathway doesn't exist at one point, that there may not be contact downstream of where the groundwater is going.

MR. CHAPMAN: I'd be glad to do that. The dilution factors are so extreme it would not be an issue.

MR. ROBERTS: And that may be and if that's the

case, then you can show on paper that you've met the criteria, but you still have to show protectiveness over the 1,000 years.

MR. CONWAY: I'm puzzled by --

MR. FAUVER: Identify yourself.

MR. CONWAY: Kenneth Conway, Babcock & Wilcox. I'm puzzled at the insistence of the sinking of one well as invalidating their case. He specifically says the average citizen -- from what I read, it seems to me that if you prove that the overwhelming water supply is from the durable system, the fact that in an isolated case, someone may choose to do something unusual or highly unusual, such as sinking their own well and obtaining their own water supply, is irrelevant. They are not the average citizen. They are not the average member of the group.

MR. McKENNEY: Actually, the regulation says, not citizen, it says critical group. Critical group is a subgroup of people who are most likely to be the highest exposed, and it's the average member of that critical group that's --

MR. CONWAY: So you going drive that few people, small number of people within a larger population that have certain habits and characteristics that expose them to a great dose --

MR. McKENNEY: Which could be sinking a well so

it's not what the average citizen does.

MR. CONWAY: Sure, but a group is more than one person and it typically should be more than a family or two to five people. There's a limited size for this particular area, for instance, and you're talking in the realm of one to two wells at a maximum simply from the physical size of the region, and so is the group size going to be as small as two to four people?

MR. McKENNEY: It can be.

MR. CONWAY: So essentially then it's a maximally exposed person you're talking about not an average.

MR. McKENNEY: No, I am not. If you look at our guidance, the way we created the group's characteristics and the data values are not taken from maximum. We actually took the median values of averages to create the average member's habit. It's not a maximum.

MR. FAUVER: But I think that you're really making a good point that perhaps these probability arguments that it could be such a low probability that one could argue not to include in the critical group as a possibility. I mean, I think you're --

MR. CONWAY: Right.

MR. FAUVER: -- thought process is consistent with the guidance and the arguments that one would make to alter the critical group.

MR. CONWAY: Right. The main point was that there is strong evidence of durable alternate water supply which goes beyond that other major alternate water supplies, difficulties of access and then there's a small region so the population that would be potentially exposed is inherently very small and there must be some cutoff point where you can stop and say, like what chance do I have to take it out to. That's what I was trying to say.

MR. FAUVER: Well, for example, in our default scenario in D and D we don't assume 100 percent of the food. Right? So one could argue that 100 percent of the food has to be there just as easily as one could argue the well. It's just a matter of, I think, consequence as well as all these other arguments.

MR. EID: Also in defining the critical group there is a time factor. There is some conception about what could happen within 1,000 years because the time frame for the dose impact analysis is 1,000 years so if there is certainty that within 1,000 years this critical group could be the critical group defined in this analysis, there is justification for that, why not? But if there is no justification that you can guaranty such kind of critical group within the time frame of analysis, this means there would be questions.

MR. FAUVER: Well, I want to clarify that, Bob,

that I think we specifically put in the guidance to strongly consider current land use and current structure. I mean, I think that to sort of paraphrase our office director, I mean it would take some significant social upheaval perhaps to change this configuration of this Erwin area, and who knows what that will be at that point to make that kind of a radical change.

So I think we are trying to move away from this worst case, 1,000 years, it's almost a virtual probability that someone would do a certain activity, almost any activity you can imagine so we are trying to focus on current activities at least as a starting point for looking at some of these critical group discussions.

There has to be some reasonable projection. It's not like, well right now it's this whereas everybody else is doing something different in a very near vicinity. It has to reasonable.

MR. CONWAY: And that is -- I certainly agree with that, your point, sir, and that's one of the reasons the limited physical of the area, which limits the probable population was a significant part of the comment there. If this was 10,000 acres, then the point I was trying to make would be much weaker.

MR. FAUVER: Thank you.

MR. EID: I have a question about the use of

PG-8-08. What is the rationale for using this not using D and D's default values specifically for the behavior parameters?

MR. CHAPMAN: Yes, I apologize. We are using RESRAD. We have spent considerable time and resources into understanding that code, trying to alter it in areas where we want to make it site specific. In the areas where we're unsure exactly how to alter it in that way, we'll try to make it reasonably conservative.

So we spent quite a bit of time and effort understanding that code, trying to make it site specific and yet reasonably conservative in the areas where we can't because it is a simple model. It's not something you can make terribly complex, and D and D just came out a month a and half ago. I mean, we at this point don't really want to put the time and effort necessary to do that same level of evaluation of D and D.

MR. EID: Well, I mean if you are using the old criteria, that's fine. This is what typically is used. If you are following up the new criteria, there are new guidance that it came to support the new criteria. That's the reason for my question.

MR. CHAPMAN: Well, the interesting part about this is we've done and we actually have submitted a dose modeling effort to the NRC and we did that back in November

of last year, and all the new guidance has come out January of this year so January and August this year, excuse me.

So the time frame you're looking at overlaps significantly and now we're trying to address comments and resolve this issue and define our CGLs, assuming that's the way we want to go to it, and we've been trying to figure out does the guidance now apply to us when it wasn't out there previously when we submitted it. There's a lot of iffy questions like that that are out there.

MR. SAITO: Bob, I think an important point here, rather than just going to the default values like you suggested, he's looking at the actual situations and then trying to put it in a regulatory context of PG-8-08. He's found a regulatory context which seems to be acceptable and that's the direction he's going for a site specific application and do you object to that or do you --

MR. EID: No, if those values are site specific, they are for his site, that's fine, but using PG-8-08 values as default regarding of the site conditions, that was my question.

MR. SAITO: But you were using these as input values, the characteristics of the land use --

MR. CHAPMAN: Yes.

MR. SAITO: -- and the personnel use, is that correct?

SPEAKER: Yes. Again, PG-8-08 is an NRC document on how to input the default scenarios there, what inputs to put in based on NRC guidance.

MR. CHAPMAN: But, we started this effort before you came out with them.

MR. EID: Yes, I understand. That's why, you know, there are -- concerning the new rules and the Federal Register notice that was published on the 18th of this month, there are certain -- that they are superseded and the DG-4006 is the guidance to be used when you try to apply the new rule. So it depends where you are applying it.

So if you are saying that PG-8-08 values here are appropriate for your site and they are suitable for your site, yes, why not? If they are not consistent with your site conditions and you're using them as defaults and you are trying to use the new criteria, then there would be a question.

MR. FAUVER: Yeah, not to get into licensing details, but I think you recognize the key decision that's probably on the table right now is whether we're considering this under the old or the new criteria, and so once that decision is made, then we're going to -- you'll probably off in one direction or another.

MR. THAGGARD: Yes, I think the more germane question though is whether you can vary the scenario, and I

think that's really what you're asking here, whether you required to this subsistence farming scenario or whether you can try to make some arguments to modify that scenario, and I think certainly what you're doing seems to be a reasonable way to do it.

I think that the things where we may get into some debate is the level of justification that's needed to justify, you know, one or the other scenarios that you seem to be trying to use, but the idea of trying to come up with a rational to change your scenario is certainly reasonable, and we're going to obviously address that in the standard review plans so you're kind of a little bit ahead of the curve in that respect.

MR. FAUVER: Just a process question I want to bring out or a point. When we get this -- this is a test case, you know, we're kind of calling it that, it's also a licensing case as most of you are aware.

When this kind of information comes in to us as we're going to be developing this SRP, what we've got are some specific examples of ways to change these scenarios and each of these specific examples may actually take us into some tangential areas and help us additionally develop these kind of thoughts, so what we'll do with this information is lay it out on the table and start looking at every one of them in a generic sense.

From the other prospective there's a specific licensing issue being considered, but generically we're going -- this is more information for us and we will look at every one of these justifications and see if there's room for making generic guidance and reflecting generically some of these issues in our guidance and that's the process we're hoping to go through over the next several months.

MR. WILLIAMS: Alexander Williams, DOE. One thing I would look at on this whole subject of growing food on this land is how much land you actually have that's contaminated. I suspect that there's not enough land there to support someone in any kind of subsistence farming, and given some of the governmental or practical restrictions on the land, like this is in the industrial district in town.

If we presume that the City of Erwin is still there in the future, I doubt that this land would ever be used for serious agriculture given that that's in an area of town that's not used for this purpose.

I also from looking at the map it would appear to me that there's not enough land to do subsistence farming so that if someone were to do subsistence farming in the future, the amount of food stuffs grown on the contaminated portion of the site would be relatively small.

I've never done subsistence farming and I doubt that anybody in the room has done it either, but my

understanding is that it takes many, many acres of land to support a family by subsistence and if there's anyway here that's an expert at that, I think it might be helpful if they straighten me out.

MR. FAUVER: Thanks. Do you have another slide?

MR. CHAPMAN: Yes. Yes. Let's move on.

[Laughter.]

MR. CHAPMAN: I said I had a couple of very specific situations where we're trying to pull some of the conservatism out and make it more accurate in our model, and it's kind of interesting one of the areas where we're wanting to do that and we're using RESRAD and the simple fact of the matter is they have plant soil concentration ratios in there, and the way RESRAD treats this whole issue is, there is one value, one plant to soil concentration ratio, they apply to the total plant diet.

And I believe if I remember it correctly, they basically went through a literature review, and they picked from all the different potential plants that somebody could eat, leafy vegetables, root vegetables, grains, fruits and even forage plants for livestock, they picked a suitably conservative value from that to plug in there, and of course, when I suitably conservative, I say "Well, I can make that a little bit better."

One of the things I did is I went back to NUREG

5512 and sure enough they broke it down a little bit more precisely and they even used geometrical means for each type of vegetables or plant that could be part of your diet, however, they treat them each separately as well and so you end up with four ratios in NUREG 5512 or D and D as opposed to one in RESRAD.

If I wanted to pull this over into RESRAD and hopefully come out with something that's a less conservative, more accurate, I had to figure out a easy way to do that and what I did was I took the geometric mean for each one of those categories and I weighted it based on the portion of diet that that is associated with.

The value ended up in RESRAD that they wanted to plug in for RESRAD is essentially a weighted average of the geometric mean for the different portions of a plant diet, and the case I kind of want to make there is this can potentially affect the CGLs that we want to come out by about 50 percent. Again we've got a lot of radionuclides and that ratio varies quite a bit among them, but typically we can see that kind of a difference.

Just to give you some idea of exactly what we're talking about there, I don't know how easy it is to see that, but in some cases we're talking about two or three order of magnitude difference, and in other cases maybe a factor two a best, things of that nature, and I ask you what

you all think of that approach.
MS. DAILY: Can I ask a clarification question?
MR. CHAPMAN: Yes.
MS. DAILY: What's the diet assumptions you were making? Are those from 5512 or RESRAD or PG-8-08 or --
MR. CHAPMAN: Yes. The diets -- essentially in RESRAD, also in D and D and 5512 are essentially the same. There's no huge variation among the portion of plants that are part of the diet so it didn't really make a difference whether I weighted on the diet and RESRAD versus the diet and 5512, I think I was consistent in using the 5512 diet.
SPEAKER: Greg?
MR. BURKLIN: Rich Burklin with Siemens. Is this considering all pathways or are you considering only one pathway here?
MR. CHAPMAN: This is -- these obviously apply to just one pathway, plant ingestion, but the CGL's I'm talking about are for our scenario that we're looking at.
MR. BURKLIN: For the whole scenario?
MR. CHAPMAN: Yes.
MS. DAILY: Can I just point out that for the values that are in D and D and that are based on the distributions that we developed, what we did before looking at the diet, was look at what people might actually raise on their site.

We don't have a subsistence farmer anymore, for example, and the quantities of food that you're expected to raised are based on survey of people who actually raise those types of food on their own sites. So then the idea behind doing that was -- came up with a kind of a generic diet that way, but based on your part of the country those may shift around a bit and if you're already getting -- you're saying you're getting a 50 percent change, if you looked at local dietary patterns then local ingestion fractions it may shift even more.

MR. CHAPMAN: That kind of study hasn't been done and to do that would take considerable effort, resources and time again and what I'm trying to do here is hopeful shortcut that process. I want to use existing literature where possible.

MS. DAILY: I think there may be some existing information, like available on the Internet on some dietary fractions. I know that -- at one time I looked in Oklahoma for example, and the agricultural extension had information about common raised quantities of food that people in that area were raising so there may be some relatively inexpensive source of information that are applicable to your particular area.

MR. CHAPMAN: Yes.

MS. DAILY: It depends on what you want to do and

what's cost effective, but just as a generic comment for other people, there is a range of information available that's relatively inexpensive.

MR. CHAPMAN: We're aware of the agricultural census data for our area, however, this is looking at intake, not raising necessarily and I'm not sure if we could make the distinction or if we can alter the diet based on what the census data says you raise, and again for -- if we're saying it's not subsistence farming, but a garden, it could be a kind of strange mix.

MR. ROBERTS: Rick Roberts, Rocky Mountain Remediation Services. One thing on the RESRAD code that we found with plutonium that may help you out is that really the highest fraction on the plant is due to deposition on the plant.

There are actually two pathways to contaminating the plants in the garden. There the up through the plant's roots, which is the plant's sort of concentration ratio and then you've got another pathway of deposition which controlled pretty much by the -- there's a factor in there on dust loading that you looked at, and we found that really the dust loading factor is the more significant factor for plutonium because you get very little uptake through the roots.

MR. CHAPMAN: I appreciate that. Okay. I guess

I'll keep going.

MR. FAUVER: Again, this information isn't being lost. What we're going to do is take the transcripts, summarize all these suggestions and either post the on the Web and/or continue to explore and so our goal is for you as a reward for your effort and for everyone else participating willing to search the Web site will see these again and see some of our analysis of these options for varying data.

MR. CHAPMAN: I hope so. Another input parameter into these simple codes that has a huge effect is the KDs. That's something that everybody knows up front essentially, and even in a NUREG 1549 they talk about methods that you could possibly use to make them more site specific.

As best as I can tell, we've got three methods that are available to us. The first one is we look at soil mapping for the area and it's kind of unique because sure enough this area that we're trying to get decommissioned, off our license, is at the conjunction of three different soil sites.

There's been quite a bit of movement. Like I said we put in some burial trenches. We've built up some surface empanelments. We've come and did a little bit of subsequent remediation in the burial trenches. We've moved a lot of soil around essentially.

And at any one particular point now if you go out

there and look at it, I can't really tell you exactly which soil type it will be, plus even though they do soil mapping and draw very fine lines exactly where one type ends and one type begins, in the field I challenge you to go out there and identify that line.

Anyway that's kind of a confusing point for us at this time, however, there's other methods to have our site geologist, he can go out there in the field and look at the soil that we're pulling up and we can also go back and check our well boring logs that have come and there is a paper out there, a study that was done based on soil textures, what KDs are appropriate.

Going back to how we've set up our model more or less we have two layers, one is contaminated, one of them is saturated and we felt like that was adequately conservative and essentially geologist with that in mind, went out there and looked at an upper layer equivalent to the depth of that layer that we're modeling and said, "Well, you know what, if you go to the literature, that kind of fits the lone category in the literature and if you go lower than that everything kind of fits the sand category." It's kind of interesting I found out to consider sand is also gravel, boulders, bedrock. It's not beach sand. So we can go back to literature and we can pick those values of there if we want to.

The third thing that we can do which there's quite a bit of guidance out there suggesting that we do this. We can do some analysis and we went and had a few samples analyzed using the ASTM method and essentially we took site soil, some groundwater and we did adsorption and desorption processes on that.

We basically got three samples, more or less three samples of each and our primary site contaminant we wanted to do an analysis for was uranium and the only way to measure these environmental levels was alpha spectroscopy so each sample yielded three data points and that gives us a total of nine and it's nine data points for adsorption and nine data points for desorption.

It's pretty obvious from the model exactly which category applies where. The kind of interesting thing that I found out there was, you know, with nine data points and looks at 1549, it's says 90th or 10th percentile, you should use whichever most conservative.

Nine data points, that's basically the highest or the lowest value you have and given measurement area and everything else, I was kind of wondering about that a little bit.

Also the fact that ratios of the soil concentration to the water concentration which is essentially your KD value, those vary quite significantly.

I think there's over one order of magnitude within each category there, and I don't know, I'm just not quite sure how to treat that.

Finally, one other point about NUREG 1549 and the complexity of our site and trying to figure out how to use that, the 90th or 10th percentile, which is most conservative, is going to vary.

For one radionuclide it might be the 90th percentile for the upper layer and the 10th percentile for the lower layer. For another radionuclide it might be just the opposite, and trying to configure your models to take in all these possible -- for the 90th and the 10th percentile, that's over complex, you know. We want a little bit of a break there. Let's give the best accurate value that we can which of course is geometric means.

MS. DAILY: If I could interject, that's one of the reasons why if you develop a Monte Carlo version of D and D or use the Monte Carlo version of RESRAD, you get to appropriate the information that you've already go and you don't have to worry about choosing 90th or 10th, that's really something that you have to deal with if you're doing a deterministic calculation.

MR. CHAPMAN: Yes.

MR. EID: I believe in this case when you come to the site specific analysis and you are metering data it's --

you are into the process of using the mean value rather than the 90 percentile value, so because you are metering data for the site and the variation for the site is not, you know, a certainty for sites across the United States so I believe you could use the mean value for the site.

MR. CHAPMAN: Thank you. I appreciate that.

MS. DAILY: Well, there's different things that we're talking about here that -- what you do with the dose distribution at the end or how you handle you input --

MR. CHAPMAN: Yes.

MS. DAILY: -- and all I'm saying is have the opportunity to input all of the information that you've got about your site as part of the distribution for your input parameters. What happens on the other end is going to be a policy decision, but at least you've capture all of that information.

MR. CHAPMAN: Yes. I agree that a lot of this issue will go away when the probablistic codes do come out, the first quarter of next year.

MR. WEAVER: Well, Boby mentioned the 50th percentile or the mean, excuse me. Let's put that in context. That's the mean in a probablistic analysis with some type of consideration of the upper bound of dose and the uncertainty in that estimate of the mean for the parameter or the final does.

In this case I think he was referring probably to the final dose. I don't think he meant in a deterministic evaluation that the guidance was leaning towards selecting the mean. Those are the choices that we're presenting and analyzing right now the benefits and costs and level of effort et cetera, do a deterministic calculation, end up picking conservative parameters because you're not providing uncertainty information necessarily or trying to do some more quantitative or semi-quantitative evaluation of some of the uncertainty in these parameters in which case you might be able to fall back to the mean if, in fact, it's a lower number than the 90th percentile.

So be careful, I don't want to speak for Bob, but I don't think he said site specific, therefore, you can use the mean of your individual parameters loading in the deterministic code.

MR. CHAPMAN: So you're saying that you can use the geometric mean of your data too or you cannot use the geometric mean of your data?

MR. FAUVER: For deterministic parameter load without consideration of upper bound?

MR. THAGGARD: You can see we are still wrestling with some of these things.

[Laughter.]

MR. THAGGARD: I tend to agree with Boby on this.

I think, you know, you ought to use the best available, and for me your best estimate quite frankly and what you send is that's your best estimate so if you've got a best estimate, you ought to be able to use that. I don't see why you should be necessarily forced to use one of the tail values.

MR. FAUVER: I'll speak for me. I want to.

If I read the guidance correctly and let's go back to something in writing it basically is providing a couple of options.

It says we're encouraging this treatment of more of a quantitative treatment of parameter uncertainty, however, we recognize that deterministic evaluations are going to be useful and maybe easier and more cost effective and can get you where you want to go.

But if you look at the guidance, it says that if you're not going to treat uncertainty and you're going to use a deterministic analysis, you have to use some upper percentile of the deterministic parameter input. That's what the guidance currently says.

I think that that's what we're trying to do is to evaluate whether using a probablistic tool provides relief without too much excessive effort and too many significant digits and all of this kind of thing such that we can take the mean values of the output dose distribution, for example, while considering the upper bound of uncertainty,

perhaps at some other dose point. Those are the two techniques that we're looking at right now in terms of which one is going to work or not work.

Commenting on your difficulty with data collection, well, you have to make some statement about why there's not a cost benefit to collecting more data, what's going to happen if you have to collect more data and what the potential uncertainty in your data, what does that mean in output dose distribution, and I'm not sure there's an easy way to avoid in some cases that more data more be needed. I don't think that's a clear call.

MR. SAITO: Well, may I make a comment here, Dave? When you're talking about when the KD -- I forget which way it goes, but when the water flow becomes more rapid through a region, it becomes less important because the water has moved through that region rapidly, so if you have many KDs or different water velocities in a system, to me it would be inappropriate to then use the fastest moving water system for the entire system because the water is going to move rapidly through the sandy layers and then be held up in the loam layers here.

So to take your analysis and say to take this system and go entirely with the rapidly moving system, would be extremely conservative. To me the more appropriate one would be to use the high -- do you seem what I'm saying

there? To use the place where it's moving less rapidly unless that's a very thin region.

MR. THAGGARD: If I can put words in Dave's mouth and maybe I shouldn't do this, but I think what he's trying to say is the debate we're having is the fact that if you do deterministic analysis, the analysis should be conservative. I mean, I think that's basically what he's saying, and I don't think anybody would argue that it needs to be demonstrably conservative is basically what we're saying.

Now you've got for a particular parameter whether it's okay to use your best estimate or whether you need for everyone of those parameters that you've got data, use a conservative value, I guess gets into a little bit of a question in my mind, and then that's where I think we were kind of disagreeing.

But I don't there's any argument that the fact that if you're going to do a deterministic analysis, you're going to come up with a single value. You're going to come up with a single dose estimate and you've got to demonstrate that that dose estimate is somehow conservative because you've not quantified the uncertainty in the analysis.

And so if you come up with a dose estimate, for example that says you've got a dose of 20 millirem, the obvious question somebody's going to be asking is "Well, geez, I wonder what will happen if one of the parameters in

that model were to change a little bit? Wouldn't you get a dose of 50 millirem or would you get a dose of 75 millirem?"

See with a deterministic analysis, you don't have that information so put those kind of issues to bear, you've got to somehow be able to demonstrate that that dose estimate is conservative, that you've somehow -- that you're likely to overestimate what the dose really should be with a probablistic analysis you're quantifying the uncertainty so you're going to get a spread of dose estimates so the information is out there for everybody to see.

So I don't think there's any debate that if you undid deterministic analysis that that final dose estimate you get out of the result, you somehow are going to have to demonstrate that that is conservative and that's -- I think that's what Dave is saying.

MR. CHAPMAN: If I can go a little bit further here, the point I was trying to make is we've got several sources of conservatism built into the rule and a demonstration of the rule in ALLAR and the simple fact of the matter is after you complete your remediation you're got going to have things at 20 millirem level or 25 millirem level. If our analysis of our site and our data looks right, we'll have 1 millirem being as accurate as we can be.

And even if it's five times higher than that, I mean, 5 millirem, I mean, let us be as accurate as we can be

in this step because this affects our operations. We cannot effectively do our remediation effort there and be sure we got it unless we have criteria that's high enough to identify operationally.

MR. FAUVER: Well, that sounds like some of the arguments that one could make to demonstrate conservatism. Parameters aren't the only source of conservatism in this system, in the models and scenarios et cetera so you have to look at all of them to try to put the whole equation together.

MS. DAILY: If I could add another thing to think about here. You talk about inputting a best estimate on your parameters, you have to remember that you have to match that parameter to the type of model that you're running.

If you're running a very simplistic model and do a best estimate of your parameter, there may be a mismatch there. It may be worth your while to go and get a more accurate model that matches the amount of information that you have in that parameter.

MR. CHAPMAN: The other question I have for you real quick while we're on the subject of probablistic. If we go through this process of saying best estimate, 50th percentile, things of that nature, means, whatever we feel is the most appropriate values, all these inputs, does it stand to reason that our output is going to be pretty close

to 50th percentile?

MS. DAILY: That's the other thing that we probably should have brought up here is it depends on the sensitivity of your parameter and it depends on the structure of your model.

If you have your -- let's say that KD is actually driving your calculation, then the shape of that parameter, the way that you select that parameter has a big effect on your output, so one of the underlying things that we've been talking about here is finding out which is the sensitive -- what are the sensitive parameters that are driving you calculation?

Those are the ones that you have to put the effort into describing well and those are the ones that you need to make sure are matched in your model. You have a system that you would get a big benefit from doing a more detailed analysis to match the amount of information that you're putting into those parameters.

That's information that you could use for substituting a model for a pathway or a part of your pathway or the whole system and whether or not your output is matched by what you're doing with that parameter, that's part of the analysis of the framework going through and selecting which are the important ones and that tells you in that information about what the impact on the end result is

going to be. You're talking about the input structure and we're kind of concentrating on the output structure.

MR. CHAPMAN: Well, I think we know what the important ones are to us. Again, it's what level justification are you all forcing us to here, I mean, because that determines what plans we're making.

MS. DAILY: Absolutely. And I think Dave made the most important point here is you need to match the inputs and the outputs, the level of effect of that one parameter on your output dose distribution, that's how you determine the match of the amount of information that you need to defend that parameter.

The most simplistic way to look at it is if the parameter has no effect on the outcome, we really don't care how you came up with it. If it has a big effect on the outcome, then we need to have a reasonable amount of information to defend it.

And the really nitty gritty conversation comes down to what exactly do you mean by sufficient justification for that parameter based on that kind of weighting, and I think that's where we need to have more discussion and more ideas from you about, you know, I think that if I get information from this source and I provide you this kind of information, that should be sufficient to defend this, and we have some ideas that we're starting to put into the SRP

in terms of acceptance criteria, that's where we need to match up.

MR. FAUVER: You mentioned if you picked the mean, does it leave you at 50th percentile sort of anyway, well, we did some runs with the D and D probablistic output and I don't think -- there are people that have worked in this area quite a bit, I'm not necessarily one of them, but people -- when they asked them what they expected to be from that and they were right in that, what ended up happening was that the mean was much greater than the 50th percentile, in most cases because these output dose distribution, probability dose distribution tend to be sort of a log normally looking thing and so the arithmetic mean tends to be up a little towards the front, towards the higher percentile.

In fact, some of the radionuclides, the mean was greater than the 90th percentile in out output dose distribution so there's not a clear connection between just picking the mean input parameters that leads to the output dose distribution.

MR. CHAPMAN: But if you only have a deterministic total to work with, what kind of information are you looking for there to tie that in?

MR. WILLIAMS: Alexander Williams, DOE. A couple of comments. First of all, it doesn't surprise me that your

KDs are all over the map. I suspect that the site had uranium in a number of different chemical forms and with the multi-soil types, it's not very surprising that you would see quite a bit of variability given the different sources of contamination and different soil types.

Second of all, your problem, I think, illustrates something that I tried to point out yesterday which is that you can look at parameter distributions for a lot of parameters, but at the same time the thing that really is driving your analysis is a presumption that groundwater at your site will be used as potable drinking water.

And the difficulty here, and we had an earlier discussion which showed that maybe this particular possible future land use doesn't pass the "ho-ho" test, but the presumption that you're using water for potable sources is probably far more important than some of the individual parameters that you put into the code.

Last, as a practical consideration, one of the features in RESRAD is of course, the ability to look at parameter sensitivity and to print out some graphics on that so that you can see the exact effect of changing particular parameters and whether --

MR. FAUVER: Yeah, that's a good point. In fact, Mark's going to talk about that when he's talking about how we're looking at our test cases using the RESRAD code and

some of it involves a sensitivity analysis or using their probablistic capabilities in some way to answer some of these questions about "Well, where am I headed with these deterministic inputs?" So that's, I think going to be consistent with what we're going to here this afternoon.

We're running over a little bit. We're about 15 minutes over, but I think this discussion is very useful. Greg, would you just want to continue this for a few minutes after -- 15 minutes, half hour, I think --

MR. CHAPMAN: I don't have much more to go.

MR. FAUVER: Well, or we can do it after lunch. How much more time do you think you've got depending on the discussion. I think this is real useful. We do have some time in the afternoon. If you have some significant remaining points that you think are going to promote this kind of discussion?

MR. CHAPMAN: Yes, I do.

MR. FAUVER: We can carry it over to after lunch. So why don't we do that and --

MR. McKENNEY: I have one question, just one.

MR. FAUVER: He hasn't even gone through this yet.

MR. McKENNEY: Oh, not that one. The previous one on the nine data points.

MR. FAUVER: One more question.

MR. McKENNEY: Which is that you've got nine data

points, how sure are you that --
MR. CHAPMAN: That what?
MR. McKENNEY: That the value you put in is actually the mean?
MR. CHAPMAN: That's the best estimate of the mean. It's a sample population versus true population.
MR. McKENNEY: Actually, you can find statistically what you're confidence level is on the mean.
MR. CHAPMAN: Yeah. Sure.
MR. McKENNEY: And you're going to evaluate that because if your mean isn't -- you're not sure within an order of magnitude, then --
MR. CHAPMAN: Right.
MR. FAUVER: That's okay.
MR. McKENNEY: -- shooting from the -- you might --
MR. FAUVER: We can make --
MR. CHAPMAN: All I'm trying to find out is what kind of information are you guys going to be looking for --
MR. McKENNEY: One of those evaluations is that you would then take and look at what is RESRAD's sensitivity on fuzziness of the mean.
MR. FAUVER: I mean there is a common sense here, Greg. If you put in the number, if you've got this huge spread of data and you plug this spread of data into the

RESRAD code and you end up with 25 millirem on one end or 5 millirem on one end and 1 rem on the other end, then the common sense answer is, I think we need more information on this parameter and then there's a cost benefit equation related to some of these other uncertainties, but that's sort of the basic was that we look at that information.

MR. CHAPMAN: That said I want to make one other real quick case. We did inhouse ASTM method. There are some Rolls Royce methods of determining your KDs. It costs $200,000 to run your samples and that's not an expense you going to enter into lightly.

If you make use of literature values which I haven't heard anybody say you can't yet, there's a lot more cost effective ways to go about it.

MR. FAUVER: Right. Nobody said you couldn't use literature values, but --

MR. CHAPMAN: Can we?

MR. FAUVER: -- not using deterministic code, if it's a very sensitive parameter and you do a sensitivity analysis in RESRAD and this is a very sensitive parameter, then you're going to have look at the spread of your data and you don't even need a probablistic code to do that.

If it's your primary sensitive parameter, then you can just "My mean estimate is 25 and my upper 95th percentile is 800, well that's, you know, an output that

would lead us to probably ask for some more information so I think that's fairly clear in terms of the performance objective here. Even in deterministic mode, if it's that sensitive, you're going for a deterministic analysis, but if sensitivity analysis is clear on that --

MR. CHAPMAN: But if we back up and recognize the variability is something that's not going to change by getting more data --

MR. FAUVER: With nine data points, I'm not so sure.

MR. CHAPMAN: All I'm saying is variability, standard deviation, that's stuff --

SPEAKER: I'm not so sure that --

MR. FAUVER: We should do technical debate, but if you could make an argument that in fact your nine data points, you believe are really -- that your distribution, standard deviation, nothing's going to change from there, that you've really got a good handle on the true distribution of this thing, that's even more of a concern.

MR. McKENNEY: And the shape.

MR. CHAPMAN: I'm not going to go there.

DR. GREEVES: Well, we can talk more about this because these are kind of questions that the SRP is specifically looking at, and we want to get feedback on where the conservatism is built in, where the conservatism

in the model comes in, where these other things from the prospective of industry, the folks in the field, other interested parties that are doing this, this is the feedback that we want. We're going to consider it in an open way and discuss it and come out with some conclusions in terms of process.

Well, enough. We'll reconvene at 1:00 o'clock.

[Whereupon, the meeting was recessed, to be reconvene at 1:00 p.m., this same day.]

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

MR. FAUVER: Okay. Welcome back to round 2 of Greg Chapman bashing. No. I'm just kidding. Glad to have you here, Greg. The conversation I think this morning was very useful and hopefully we can have a little more as you go forward so...

[Laughter.]

MR. CHAPMAN: Okay. I just want to quickly summarize where we left off. I didn't get a chance to do that. That's regarding KDs to use and I can tell you what my current intention is and then tell you after talking to you what I'm thinking I've heard.

My intention coming in here was first choice, use the geometric means from our analytical data when we have them and since we don't have that for all the radionuclides that we potentially have including progeny, things of that nature, for those where we don't have the analytical data, I wanted to use the literature which is based on soil texture typing. I was wanting to plug in KDs for the appropriate model zone layers depending on whether it's sand or loam.

Now if I've heard you all correctly, I'll go ahead and I can try to do that, but I also to have to start throwing in some uncertainty analysis to give you some idea of just where my best estimate and mean values are relative to a 95th percentile or 10th percentile or something of that

nature and that's information you want in order to review this. Correct?

MR. THAGGARD: Well, I think the better way to characterize it is if you submit the dose assessment and we know that the KD is a sensitive parameter, then I guess the obvious question would be what effect the changes in that KD has on the dose, so we're not necessarily saying you have to do a probablistic analysis, but you're going to need to maybe do some sensitivity analysis to show what effect the changes in the KD will have on dose and I think that kind of gets back to what Chris was saying about showing the effect of variability in the data.

So if you come in and you just present the results with just that one value and we know that it's a sensitive parameter then the obvious question would be "Well, what happens if you change that value?"

MR. CHAPMAN: Okay.

MR. McKENNEY: To clarify a little bit more is that we're not talking the variability over all your data. We really talking about the variability of the mean value. That's really what would be the focus. You have some uncertainty about that mean and you can usually with basic statistical model clarify the upper and lower bounds of that, the lower part of the variability and that's what -- we're not saying that's what -- we're not saying 95 percent

of the data range necessarily. It's more of a look at the confidence internal of the mean."

MR. CHAPMAN: So you're looking at confidence internal on the mean, that's what you're looking for --

MR. McKENNEY: Right.

MR. CHAPMAN: -- as opposed to a percentile value?

MR. McKENNEY: Right. We're looking at more of the variability of the mean itself rather than each single data point.

MR. CHAPMAN: Okay. That's an important distinction. I'll take that into account.

Obviously in case you're wondering exactly what kind of effect we are looking at, we're look at about 70 percent effect on our CGLs that come out of our dose modeling this way, but it does essentially have quite a huge impact. Of course, it's plus or minus -- it depends on what radionuclide you're looking at.

This next subject is something that we've kind of gone over a little bit already and this kind of ties back into do we have enough justification to exclude a groundwater pathway, and essentially if we do, do we even have to worry about groundwater and I think what I've already heard essentially is you want us to evaluate what the potential impact is of -- should we not evaluate it -- or if we should evaluate it I guess I should say.

It's pretty easy to figure out a dose per unit concentration in our wells and over this portion of our site we've got -- I think it's on the order of something like 40 wells, most of which are in our shallow aquifer which isn't the best aquifer for drinking water or anything and it's also the most contaminated one, and I don't I'm going to divulge any secret information by saying if somebody drank out of our worst well, they'd probably get more than a 500 millirem dose. It is potentially an issue for us, but if we can make the justification it's not a true pathway, what level justification do we have to make to basically exclude having to worry about criteria for it as well.

MR. FAUVER: Well, the issue, just to clarify, it's not simply existing groundwater contamination, but the project groundwater contamination as well if the source term remains with all the other factors.

MR. CHAPMAN: But the source term is not related to the sole contamination anymore.

MR. FAUVER: Whatever your groundwater dose projection is, you don't base it just on the current existing groundwater, you're going to have to base it on a projection of ground migration.

MR. CHAPMAN: I'm sure it will go down and not up though is all I'm saying.

MR. FAUVER: Whatever it is.

MR. CHAPMAN: But regardless of that. What level of justification does it take to say that if we're excluding groundwater pathway to begin with, that we even have to worry about criteria for groundwater?

MS. DAILY: I think I need clarification here. This may be the problem about what criteria you're using. For the new rule, the 25 millirem applies to all pathways. It's not 25 for the groundwater and 25 for another pathway. It's not separate criteria so taking that are we talking different criteria here then?

MR. CHAPMAN: Again, this goes back to how you define your pathways and then if you can do that, do we even have to worry about the media in one pathway which is no longer out of exposure.

MS. DAILY: If it's not a viable pathway, then it's not part of your dose assessment. If it is a viable pathway, there all combined to meet that 25. I'm kind of responding to your last bullet there --

MR. CHAPMAN: Yes.

MS. DAILY: -- where you a dose limit for different media that appear to be cumulative, that's not the rule.

MR. CHAPMAN: I understand.

MR. SAITO: I think the question here is --

MR. CHAPMAN: I'm just dealing with this first

bullet item at this point.

MR. SAITO: As a reference scenario -- if the reference scenario is greater than 25 millirem, but the reference scenario is not what you're deriving your release limits from the reference scenario is something that's improbable, it's not a member of the critical group or it's not the average member of the critical group, but it's a potential, farfetched scenario that may occur and I think that's more where that's looking because your DCGL is the average member of the critical group, but the reference scenarios are there as well.

MR. THAGGARD: Well, I think the first question is, well the second bullet, he seems to be asking can you exclude the groundwater pathway without having land use restriction and that kind of gets back into I guess the discussion we were having earlier about obviously if the groundwater is not usable or if you can make a good, strong argument that the groundwater won't be used, then I don't see why you would necessarily have to have land use restrictions just to eliminate the groundwater pathway, you can use these other arguments to exclude it from the assessment.

But there's the other problem, that the other gentleman pointed out that even if you exclude the groundwater pathway, you still have to look at it being a

viable transport pathway so it may -- you may transport the contaminates to the creek or to the spring so you would need to look at what would be the -- I mean, if those are viable, you know, options for somebody to use then you would need to look at, you know, what would be the potential dose at those locations.

MR. CHAPMAN: I don't think that will be a problem with the dilution factor taken into account, that would not be the issue.

MR. FAUVER: Let me add something to that, it's a question of do we have to do any assessment at all, is there any criteria involved in the groundwater pathway if it's not part of the critical group, the defined group.

Again, I think that what you're going to find is that it's going to -- the acceptability of the bases for excluding groundwater are going to be evaluated based on the potential groundwater dose, and it doesn't mean that you're -- it's 25 millirem would be the sort of potential groundwater dose target or whatever that number may be, but I can say this, that if you can have some relatively simple scenario like a drinking well or something and the does could turn out to be with reasonable assumptions a significant high dose, however that's defined, then I think that we probably would take a more careful look at the assumptions of whether the bases are acceptable.

So I don't think we can detach those two items. It's rems versus maybe 50, 75 -- I mean, I'm not going to put numbers to it, but those are connected. It might lead you to some type of restriction -- I don't know where it would go, but I don't think you can detach it. It's not the same evaluation, "Well, yeah we can accept it, and oh, it's 15 rem. We can accept it, it's 26 rems, 26 millirems."

Those are not the same evaluation of the robustness and probability of the bases for excluding the pathway.

MR. CHAPMAN: Understood. That also give me a pretty good lead in to my next bullet right here.

For various reasons we are operating the facility, hopefully an indefinite lifespan. It would be bad PR to go for a public -- or a restrictive release and involve the public in that issue knowing that we're going to have to additional permitting in the future for new business, could impact us in other ways.

We want to get an unrestricted release. Now if everybody can kind of agree, you know, and I think I've kind of heard this that this unlikely and kind of improbable that someone would actually tap into that groundwater, use it for drinking water, is it possible that we can develop our CGLs for -- excluding that pathway and then apply as an ALARA action a restriction and by being an ALARA action not throw

us into the realm of restricted release?

MR. FAUVER: I'm don't think that that's -- I'm not going to say whether that complies with the rule. I don't think that that's the rule for ALARA, but as some type of -- that's an idea that you've just floated that we would be very willing to entertain as we continue to develop the SRP.

I don't think it would be ALARA demonstration for the rule, but ...

MR. CHAPMAN: Well, the ALARA methods that are in the guidance won't -- it's just one of those things that I don't quite see how to apply it to this situation, but I was kind of curious how receptive you might be to such an idea.

MR. FAUVER: I don't know the answer to that.

MR. CHAPMAN: No?

MR. FAUVER: It's a Catch-22. If it's enough of a problem where you kind of want them to put in this restriction then why isn't it the restriction and I just think we have to look at that very carefully from different angles other than purely technical. I think we're getting into now regulatory issues. I think we have to very carefully explore that particular proposal.

MR. CHAPMAN: Okay. Basically like I said, the other issue that we have is the fact that it's not attributable to current contamination of the soil if we've

done remediation of waste sources there that have been present for sometime. The contamination is due to previous sources that are not there and now the groundwater itself is the source. It's not the sole -- so you're modeling of sole is not a very good model anymore.

I'm kind of curious how exactly would you all propose trying to throw in a model that incorporated that type of situation.

MR. THAGGARD: Excuse me. Can you repeat that.

MR. CHAPMAN: This comes back to dose modeling. If our source of contamination is no longer sole, it was the waste sources that were there that have been remediated, if those sources are now gone, your source of contamination is the groundwater. It's no longer the sole. And how is your model going to pick that up?

MR. THAGGARD: Well, certainly models out there that -- I mean, you could -- I mean, you're saying you're using RESRAD, and I think maybe Charlie could speak on this better than I can, but certainly you can include groundwater concentration in RESRAD. I mean, you can do that.

MR. CHAPMAN: That affects your sole model.

DR. YU: This is Charles Yu. Let me rephrase his question. Suppose you have groundwater contamination from some other source, another contaminated site up gradient contributing to well water concentration on my site.

Suppose the groundwater concentration is 10 millirem per year, does that mean the additional groundwater concentration, the dose contributed from groundwater from my contamination at my site, is limited to 15 millirem per year instead of 25?

MR. FAUVER: That's rephrasing the question.

MR. THAGGARD: I think that's a completely different question, Charlie. I think his question is simply that he's got existing groundwater contamination and he's saying "Well" --

DR. YU: That's similar question.

MR. FAUVER: It is. It's similar.

DR. YU: It's similar question.

MR. McKENNEY: No, it isn't. It where your sources are.

DR. YU: Not the source. It's not my soil contamination.

MR. McKENNEY: Yeah, but it's your source.

MS. DAILY: It's your contamination.

MR. McKENNEY: It's your contamination.

MS. DAILY: And in his --

DR. YU: So you are saying --

SPEAKER: It's an initial condition.

DR. YU: So you are saying that from -- if I wanted to derive the cleanup criteria for soil contamination

at my site, I should base it on 15 millirem for year; is that correct?

SPEAKER: No.

MS. DAILY: No. What we're saying is if he had sources at his site that caused this contamination in the groundwater, even though the sources are gone, he is still responsible for the contamination that's left it in the groundwater.

If it was coming from an upstream site, he's going to be negotiating with that upstream site. He's limit is 25 millirems at the site.

DR. YU: So his 25 millirem per year if the source -- come from other source?

MS. DAILY: Well, there's going to be other issues that make that a much more complex situation, but for what he's talking about, that's basically his contamination, his responsibility in the groundwater and his limit is 25 millirem from all pathways.

MR. FAUVER: Let's clarify the problem. I think they had lagoons, evaporation ponds and lagoons and during the operation of the lagoons, they became a source for groundwater contamination. Those lagoons have subsequently been -- the source term lagoon -- removed. Now they have this residual contamination on the site.

The primary source term is gone, but the

groundwater contamination remains. So in this case, the legal issue of who is responsible for the groundwater under their site, if it didn't come from there isn't germane. I'm not sure what the answer would be to that anyway, but we shouldn't that. The contamination resulted from in this case their activities, but the primary source term has been removed.

DR. YU: Right. But suppose the site A, whatever, they already got approval from NRC, they can cleanup soil contamination to a certain level, but the groundwater components 10 millirem per year and the groundwater is flowing through under my site, okay?

If I drill a well, I will get 10 millirem per year from their source, now --

MR. FAUVER: That's an interesting question. I think there's an answer to it potentially, and I think potentially the answer is that one of the justification for selecting 25 millirem was the idea that there may be multiple sources below the 100 millirem ICRP number for public does. The idea was to reduce that to account for multiple source of environmental radiant activity other than at your particular site.

Perhaps that would be part of the argument made to try to address your situation which is really tangential to what we're talking about here.

DR. YU: Yes, I think when I submit my calculations to NRC I only base on my contamination, soil contamination. I use 25 millirem per year, but actually the groundwater concentration may contribute way more than 25 millirem per year if I add contribution from other source site.

MR. THAGGARD: Well, that's true, but I don't think that's the question. Maybe we need to rephrase the question here, but I thought all you were simply saying was that you've got existing groundwater contamination, you want to remove the surface contamination and now you need to figure out what would be the dose from that remaining groundwater contamination and it's all from your site.

I mean, you're not saying that it's from some other source, but assuming that it's all from your source, then how would you analyze that? I thought that was the question. My response to that was "Well, you can put groundwater concentration is RESRAD and you can calculate what the dose would be from that to determine whether you've got a problem with the groundwater.

I mean, it's -- I'm not sure -- maybe I don't understand the question.

MR. CHAPMAN: I don't mean need to put the other concentration to RESRAD. I can do that without RESRAD.

MR. FAUVER: That's fairly straightforward.

MR. CHAPMAN: Yes. But the simple fact of the matter is that it invalidates my water models in D and D or in RESRAD. Those are no longer factual models for what my situation is, and if I want to use those to develop my sole guideline levels --

MR. EID: But I believe the issue is the background of the groundwater. I mean when you talk about the groundwater, you need to establish what is the background for the groundwater and come to an agreement on that.

MS. DAILY: No. What you're talking about is -- what you're basically saying is that the models that you're using are not valid for your site, so our guidance would say then don't use them. If something is happening on your site that you need to model in a special way, you have to take into account the fact that you've got this pre-existing concentration in your groundwater, you need to evaluate the dose from that specific pathway, then develop a model or find a model that you use that in a valid way. You're not restricted to models that don't apply to your site.

DR. YU: Well, Mark put the question to me, I think I better answer it. In RESRAD there is a way that if you know your groundwater concentration, there's a way to back calculate KD values that will you the concentration in groundwater and you can use that as a source term and

further calculate your transport of groundwater.

MR. CHAPMAN: That's also an invalid way of looking at this. My KD has not changed. I've got the best KD value I can get, but --

DR. YU: KD doesn't change --

MR. CHAPMAN: -- my source of contamination has changed. So it's no longer the residual sole contamination because that has been removed.

MR. FAUVER: The rule doesn't talk about residual soil contamination. It talks about 25 millirem per year to somebody who is using you site in an unrestricted way so the residual contamination can definitely include existing groundwater contamination.

MR. SAITO: But Dave the timeless rule then really, this kind of puts us in a very bad quandary because we're allowed to give 100 or the limit to a member of the public from his operational site is 100 millirem a year so he's -- how do you balance all of these things together?

If he's not decommissioning the entire site, how do you decouple these different potential pathways? I mean, I think that's really the point of Greg's question.

MR. FAUVER: I don't think we have effluent limits for groundwater. We have effluent limits for surface water and air.

MR. SAITO: Surface water release and goes into

the ground.

MR. FAUVER: But I think if you went back and look at the basis for the surface water, I don't believe it was, you'll find that there were consideration of then percolating to groundwater with subsequent irrigation. I think what you find is that they're based on dilution and surface waters and these kind of calculations like Reg Guide 1.109 or something like that, but I -- effluent limits associated with groundwater.

MR. SAITO: But still the fundamental question is there. If his site is out and it's probably not releasing it at the limit of part 20, I don't know if that's the case or not, but you still would have 50 millirem a year from that source there that's potentially there, and how do -- how does this all fit together?

MR. FAUVER: If the groundwater pathway were active and the justification were not robust enough to shut off the groundwater pathway and you had 50 millirem dose from existing groundwater contamination, you would not be suitable for unrestricted use.

MR. SAITO: But it's still part of the operational site. It's still being fed by an operational -- so it really not in decommissioning space.

MR. FAUVER: Well, then if this is being fed from an operational lagoon and it's migrating over to part of

your land that you'd like to release for unrestricted use -- is that what you're --

MR. SAITO: We wouldn't like to, we're being told to.

MR. FAUVER: I'm sorry. I shouldn't have said it that way. I mean, it's not -- the regulations are compelling you --

MR. SAITO: We have a site that it's hard to say, you know, we can't put a rad tape up and say we're going to stop all contamination from -- all affluents from our site from reaching this new, pristine --

MR. FAUVER: That sounds like a justification for alternate criteria under the time limits rule or a decommissioning alternative of restricted use until the groundwater migration or groundwater through dilution and whatever other mechanisms perhaps are there or whatever.

You may have pump and treat program that could take 10 years if that were the conclusion well then that's your decommissioning program and that would likely be suitable schedule for decommissioning in that case.

MR. SAITO: So a suitable in this case may be to keep that as part of the licensed area? I mean, I'm trying to put Greg in this because this is more hypothetical that that, but for an active site it may be just to remove the source term and say in active use and to keep all the area

under license because it is still part of the --

MR. FAUVER: That's possible. You could be considered as decommissioning and restrictions of the land. I guess there would be a number of ways that administratively sort of you could look at the license termination and one may have more benefit for the licensee than the other while still being within the realm of the regulation.

In this hypothetical case we're talking about the action of reducing the source term would be the key action and how you call it, restriction or under license or unrestricted, I mean, it's the same thing really.

MR. SAITO: It's quite a bit different to be out from the license and still be licensed though.

MR. FAUVER: Yeah, well, yeah I understand that, but again, that's sort of a legal issue and I'm not sure how that would come -- what I'm saying is that there are options.

If you have existing groundwater contamination, what we've done in the past is maintained the license until the material was removed. We had one case where we -- there was potential groundwater contamination and the licensee agreed to a five-year monitoring program.

I believe we terminated the license because the state assured that they would do it, but that wasn't

existing groundwater contamination above the limit so the baseline answer is if you have groundwater contamination at your site that's resulting from your operations, you've got to deal with that existing residual contamination as part of the 25 millirem per year dose limit.

MR. SAITO: Even if it's not from the portion of the plant that you're --

MR. FAUVER: Yes. Even if it's not from the portion of that plant that you're decommissioning.

MR. SAITO: So in essence you're talking --

MR. FAUVER: I say that -- but that's something we have to explore. Say that again, Earl?

MR. SAITO: Then you're really not decommissioning -- you're decommissioning you're plant at that point, you're not decommissioning -- to make it as an example that would be fairly clear and I don't know if this is happening or where it would be happening, but say you had a process that was leaching into the groundwater from an acid operation, all right, and this acid operation has leached in the groundwater and you've fairly well contaminated the area below your building, okay?

So now this area is now leaching across underneath the area that you're removing the source term from the soil, now these are actually two very separate --

MR. FAUVER: Right. That's right.

MR. SAITO: -- issues. One is still the operational area of the plant. You're not going to go and remediate that source term --

MR. FAUVER: Yeah, but it's exactly the same as windblown contamination if you want to look at an analogy --

MR. SAITO: So you have --

MR. FAUVER: You're not going to be able to release the property. If your windblown contamination resulted in surface contamination that exceeded 25 millirem per year, you could not release that property.

MR. SAITO: Okay.

MR. FAUVER: Now what you have is migration in groundwater from an operation that exceeded 25 millirem per year then it's the same situation. You might want to say, maybe we should stop the -- decrease the source term or change the operation, you know, so that you don't continue to contaminate the soil.

MR. SAITO: So as long as long as the migration is still occurring then that would still be an active area of the site and decommissioning the entire area would be a moot point.

MR. FAUVER: If it exceeded 25 millirem per year from a pathway that was deemed credible, then the most fundamental legal position is, I think from the regulation, that it's not suitable for unrestricted use and --

MR. SAITO: But it's from two different sources.
MR. FAUVER: It doesn't matter. It's just like windblown contamination is from two different sources.
MR. SAITO: Then why do you have to decommission this source if this source is keeping it from ever being releasable? I mean, you can never get this source clean --
MR. FAUVER: Then I would suspect that --
[Discussion among panel members.]
MR. FAUVER: -- be a Superfund site. If you have groundwater contamination and the only thing that's stopping you from being a Superfund site is that groundwater contamination is not off your site, you continue that operation and it gets offsite, hello EPA, you're now a Superfund site or RCRA site I suppose.
MR. SAITO: Yeah, but you've stopped at -- you've found your problem, you've fixed it, but it's still migrating from underneath -- it's still an active area of the site though and that's where the active area of the site is -- that's where I'm a little confused there.
MR. McKENNEY: If you stop the head, right, is what you're saying, that there's no more source coming out of the lagoon into the groundwater, but there's --
MR. SAITO: Yes.
MR. McKENNEY: -- groundwater underneath, then that's no longer an active source.

MR. SAITO: Well, no, I mean --
MR. McKENNEY: You are responsible not for a single source on the land. You are responsible for all the radioactivity that you contaminated in a property. There isn't 25 millirem soil -- 25 millirem for groundwater.
MR. SAITO: It's very hard to separate these things in an active site. I mean that's my question here.
MR. FAUVER: Well, then you've got something going on I think that would under the basic reading of the regulation prohibit you from releasing that property from restricted use.
MR. McKENNEY: But it also may be able to be used in a method, like if you say, you've got groundwater contamination, we're not going to be able to clean it up in two years, so therefore our action is to clean -- we're not going to take this property for unrestricted use at all, we're going to be treating the property so under the timeliness rule you don't --
MR. SAITO: So then we wouldn't clean up the surface because the subsurface which is still active --
MR. FAUVER: That would be your business call. If you can show that the existing surface contamination is not going to migrate, it's not going to move, it's not going to blow offsite, it's not going to spread around.
You've got this groundwater contamination

exceeding 25 millirem per year which prohibits you from releasing the property for unrestricted use. You're going to treat that groundwater to get it down to some level. Well, in actuality that level that you're shooting for is going to be dependent on your surface contamination so at some point when you get to your pump and treat of a certain level, then you'd go back and dig up your soil contamination so that the combination met your goal. That would be one way to sort of envision the project.

It may be from a business prospective, you just dig it up now and wait for the five year pump and treat to go down or natural dilution to take care of it or whatever the case may be.

MR. WILLIAMS: Let me stick in a nickel here. First of all, on the regulatory side my understanding of DOE's proposed rule at 10 CFR 834 is exactly as the lady and gentleman from NRC explained the NRC rule so that if water contamination, groundwater contamination would be part of the dose for the site, second of all for your immediate problem, what you're facing here is one of the complexities of your site.

I got up to answer your question about what models do you use to do this, and I don't know of a model that would do this. There are some ways that could approach your problem using RESRAD, but there's no model that exists that

I know of that would deal with current groundwater contamination resulting form one source which had been removed, but where there's a remaining source behind. You can do this with RESRAD, but you have to treat it as several different separate problems.

Finally, the reason you've got the groundwater contamination is probably because you had some highly soluble material that basically got into groundwater and if you have a large extent, I suspect that you had some widespread soluble uranium at your site at some point and it washed into the soil and just kept right on going down to the groundwater.

Since you site has only been active for about 40 years, you have to assume that the KD for the material in the aquifer is very small because it's moved very quickly or that there was some sort of chemicals with this stuff that mobilized it.

MR. FAUVER: Alexander, we're kind of running out of time. These are details that are interesting, but --

MR. WILLIAMS: At the same time --

MR. FAUVER: -- we need to get --

MR. WILLIAMS: -- he asked how do you model it --

MR. FAUVER: Right.

MR. WILLIAMS: -- and the fact that you may have two compartments --

MR. FAUVER: Right.
MR. WILLIAMS: -- two different sources --
MR. FAUVER: Right.
MR. WILLIAMS: -- and two different KDs not only is relevant to his example, but also to the problem that he noted earlier.
MR. FAUVER: Thanks. I appreciate it. We're a little behind schedule here. Yes?
MR. NALLUSWAMI: I'm Sam Nalluswami from NRC at the decommissioning group. Regarding the groundwater dose due to groundwater, for example, at any site you have up gradient, down gradient, concentration -- you measure the concentrations that is coming to your site from an up gradient source.
Say, for example, the concentration is "X" and you can calculate the dose using that number, at your site the concentration is "X" plus "Y." Use that number to calculate the dose so you get the difference so what the up gradient person is doing to your site you get from that kind of analysis.
MR. FAUVER: Thanks, Sam.
MR. CHAPMAN: Okay. I think we beat this one up. The issue that I'm trying to get into my last one more or less is I think it's the same thing essentially that Chris has already said, that if you have this industrial building,

CGLs between 5 millirem and outside the building of 25 millirem, how do you incorporate two criteria in proving that you were underneath 25 millirem and what survey methods and how does that affect the CGLs that you're planning on using.

If it affects the CGL's you have to change your survey techniques and it's a very confused issue and one that I'm not clear on and I was hoping maybe you guys had some insights.

MS. DAILY: I think the most direct way to attack it is with the concept of critical group. If you have a situation where the same critical group is exposed to the building and the soils, and we've played with these kinds of scenarios where you have a worker in an office building and they go out and have lunch and smoking breaks and whatever near soil contamination.

That's a combination of pathways and you adjust your behavioral parameters essentially for that specific critical group so your exposure inside the building is set for an office worker, your exposure to the soil is not a resident farmer exposure, it's an office worker going outdoors for lunch type exposure.

There's way of combining the scenarios that makes common sense for a critical group, but there's other situations where you're going to have separate groups and I

think Chris touched on this earlier. You have to evaluate multiple groups and the one with the highest exposure is your critical group for your particular site so if you have an offsite group that's exposed to your existing groundwater contamination and that's what driving your -- and in you situation it's more complicated.

If you have soil contamination over here and you've got an impact from groundwater that's not impacted from this soil anymore over here, you may have to deal with them totally separately. You still have to meet the 25 millirem limit.

MR. CHAPMAN: And I guess the point I'm getting at is meeting this 25 millirem limit means you're going to adjust your CGLs, I guess based on which way you want to allow them to have dose, allow them to get 20 percent out of groundwater, 5 percent out of soil, however you want to do it and the same is true in building.

If you want ot get half in the building, half out of the building and that effects your survey techniques, that affects all across the board -- the guidance is very good on how you're going to resolve that --

SPEAKER: Well, this is where you look at your various proposed actions. You're weighing proposed actions. Are you going to buy a lot more by cleaning up groundwater rather than cleaning up surface soil for the money and for

the measurements you're going to have to take and other things?

I mean you can weigh that in your proposed options, but which one are you going to weigh more? Because it is all pathways.

MR. FAUVER: Dave, we have about 10 more minutes, maybe.

MR. CHAPMAN: Okay. The last point I just want to make is you can see the interplay here between the dose modeling, defining your critical groups, defining your pathways, defining what your criteria are going to be through all pathways and that is so difficult for us to deal with and it's like Earl said previously, it's no longer a one or two dimensional or even three dimensional, this is branching out.

There are quite a few different ways it can impact you and like I said -- obviously, the italics is kind of what scratching our heads, this is about the best plan that we can come up with at the moment is basically come up with some CGLs for groundwater, treat them as goals, not as criteria, and until we get this whole issue worked out about defining the critical group, defining pathways, possible restrictions, whatever else, we'll just evaluate it again after we complete our soil remediation efforts.

MR. FAUVER: You see I don't actually understand

that, the italics, I don't understand what you're saying. When you say the groundwater CGLs is goals, is that the existing groundwater or the projected groundwater? I don't understand what that is.

MR. CHAPMAN: Well, obviously we're not going to be able to release the site until we meet some criteria. We do not know if we have criteria for groundwater -- we can develop 25 millirem CGLs, assuming you're drinking groundwater and -- but we're not sure there should be criteria for all these various reasons.

MR. FAUVER: But you could clarify that hopefully by submitting in your decommissioning plan what your critical group is, your rational for your critical group, what that means in this case and go through the process of approval as to dose assessment approach and parameters in the dose assessment, you might not even have to complete the dose assessment to submit a decommissioning plan that talks about how you're going to do your dose assessment because you might want to go through some of these iterations that you haven't quite finished yet, but you might able to submit a decommissioning plan that cinches down certain approaches and certain dose assessment techniques and critical group that we may be able to work on approving.

MR. CHAPMAN: Well, if you're under a time constraint, obviously I don't think this is one that the

licensee has the final say on as far as defining this as a sufficient justification --

MR. FAUVER: Right.

MR. CHAPMAN: -- as can we exclude this. This is something that it is going to go to the NRC to review,.

MR. FAUVER: The timeliness rule lists a timing requirement for submittal of the decommissioning plan and then the clock stops for NRC review and the unless you request an alternate decommissioning schedule, then there's a two-year schedule after approval of the plan, but in your plan you can request an alternate decommissioning schedule.

MR. CHAPMAN: Well, the clock doesn't stop necessarily because of the timeliness rule.

MR. FAUVER: Yeah, it does.

MR. CHAPMAN: The licensee as an industry rep so to speak, there are time constraints and budget constraints associated --

MR. FAUVER: Oh, oh, oh --

MR. CHAPMAN: -- with getting your site remediated and cleaned --

MR. FAUVER: -- sure.

MR. CHAPMAN: -- and this is a potentially a big time issue in trying to get it resolved and it would be nice to have some kind of guidance out there, I guess would be the correct way to say it, that we'd have some assurance

that we're going in the right direction before we even started so that we can make our plans correctly.

MR. FAUVER: I understand.

MR. SAITO: I have one comment there on timeliness rule, Dave, real quick. Hopefully you guys agree with me. As an industry, we're submitting some things to you guys, some schedules and time limits and we're taking some pretty big swags at it like Greg's saying here, because we don't know the answers and you guys -- I don't think anyone really knows what the final result will be, so that the schedules we're putting in are basically conjecture at this point. That needs to be appreciated I think and I think it is.

SPEAKER: I think it is as well. I don't anticipate a problem where it's very obvious that a licensee is making a good faith effort to get the remediation done, but there are technical issues, I don't anticipate any problems in getting alternative schedules.

MR. SAITO: My point is those alternative schedules will probably end up being changed as we get smarter.

MR. FAUVER: I appreciate that.

DR. YU: Charley Yu. Answer you question, total dose limits still 25 millirem for year. I think you can derive a CGL for groundwater pathway based on 25 millirem for year, soil CGL, based on 25 millirem per year, and then

you see your groundwater concentration and soil concentration -- fractions, should be less than one. That will meet a total dose of 25 millirem per year.

MR. CHAPMAN: What measurement and technique do you use to incorporate the two measurements into one evaluation?

Essentially we're anticipating something very similar to that though, after remediation is complete we can project the dose through the soils only and we can measure groundwater and project that that's going to have to be an evaluation after we complete our remediation efforts.

This last slide is just -- I wasn't sure we get enough discussion during my presentation.

[Laughter.]

MR. CHAPMAN: I would like to go over it real quick and just kind of summarize what I've kind of got a feeling from you guys if that would be okay.

This identification of critical groups seems to be a fairly open subject to you all and the only concern is whether or not we have enough justification. Using our inputs that take out the conservatism in our models and these deterministic models, again, it seems to be something that's open, but you want to have some evaluation of the uncertainty on the outhand of that or the output side of it.

As far as the groundwater criteria and how you

incorporate the groundwater into the development of CGLs for soil and groundwater things of that nature, I'm still scratching my head. Am I wrong?

MS. DAILY: There is no separate limit for groundwater and all your pathways that are appropriate have to meet 25 so how you get to that, that's your issue about critical group and some of the modeling issues, but there's no separate criteria on any particular pathway. Overall if the sources from your material, you're responsible for it, and overall all pathways combined you have to meet the 25 either restricted or unrestricted.

MR. SAITO: No this is the question is a little more clear to me now as far as when we're doing multiple releases on a site under the time limits rule.

Say Greg releases his lagoons under one and now he's releasing another area under another time limits rule. The 25 millirem is applied to the area of the lagoon, okay? Now that 25 millirem is now coming underneath this other area of the site that you're releasing a burial and that's being released at 25 millirem.

Now the question is how do you deconvulute these two releases that are done at different periods of time because this is a problem that's going to occur in the future as different areas of our sites get released and the residual contaminant that's left there migrates to other

areas of the site.

MR. FAUVER: Is that what you're asking, Greg, because that's a good question.

MR. CHAPMAN: These are all together. I'm putting out the issue and I'm hoping that as this discussion progresses, we'll hit them all.

MR. FAUVER: We haven't yet resolved that one, Earl. There's been discussion of that.

SPEAKER: What do you do when you start chopping off this site into piece by piece. There's an analogy argument that's been made as a part of the grandfathering provision. We have some of our sites that we have submitted decommissioning plans in accordance with the grandfather provision of August of this year, where we've approved the remediation under the old limits and they were going to stockpile and it looked like the licensee was choosing to evaluate the stockpile material in accordance with the new criteria.

And in our letters that went back to them I believe we said that's fine to do that, as long as the dose assessment and the material that you stockpile doesn't affect the dose at the other area, under grandfathering.

In other words, we don't want you to have groundwater migration going to the area that you've just remediated from. So that's sort of that same policy

question I think that has been made on at least a case specific basis complicated by the fact that it's combining both the old criteria and the new criteria, but the provision was don't do you dose assessment for the stockpile material that would result in additional dose in the other area that you're already released.

MR. SAITO: What about the area you've already released affecting the area that you haven't released? Say you released at a 100 picocuries a gram under option 2 and now that's undermining the area you're going to release to 15 millirem a year --

MR. FAUVER: Well, I'm just giving that as a case. Now, you've got another example and now I'm back to my first statement which was we really haven't sorted out under this rule how we're going to parse out license partial termination and then the interplay of any kind of dose that would be from migration. We haven't sorted that out yet and that's a valid question that I hope I can pull out of the transcripts and maybe pose for further discussion.

MR. SAITO: Because that's basically what you're talking about Greg, right, you had different release actions or where these two in the same release action? Were the lagoons and the burials all handled under the same --

MR. CHAPMAN: There -- it's convoluted. Potentially I think the same one, but it could have been

under separate ones if we had wanted it to be.

MR. FAUVER: They haven't been released yet in your case?

MR. CHAPMAN: Right.

MR. THAGGARD: Can I take a stab at paraphrasing. I think what you're saying there is simply that if you've got soil contamination and then you've got groundwater contamination and if you include the groundwater contamination in your dose assessment it's going increase the level of cleanup that you indicate that you need to have for the soil contamination. Is that a correct paraphrase of what you're saying?

MR. CHAPMAN: Essentially, yes, it does.

MR. SAITO: But I can see situations where you've released at 100 picocuries per gram soluble under option 2 under the old regulation that would undermine an area so you never release it because the contaminant is moving in from an area that's been released at 25 millirem a year, total dose, because the old regulation didn't take this into account.

MR. FAUVER: Well, for option 2 disposals, we have been requiring groundwater analysis and groundwater migration analysis and hopefully --

MR. SAITO: To 100 millirem, though right? Not to 25.

MR. FAUVER: There was no set limit. We basically used ALARA and then -- individual case analysis for the groundwater results under the option 2 of the BTP. The numbers have been somewhere -- the ones I've seen somewhere close to 25 or whatever, but I'm not going to -- don't quote me on that. The numbers have been a range and we've accepted them on a case-by-case basis.

MR. SAITO: But if the underlying groundwater is 25 then there's nothing you can do on the surface. There's no amount of contamination to remove on the surface and ever be compliant.

MR. FAUVER: The argument that one would put forward in the next 50 years if the groundwater migration that you project, hopefully using conservative models actually occurred and you actually ended up with some concentration in the other area sometime in the future, one would have to present the argument as a grandfathering issue in that case.

Say "Hey, look. We've already done this. It's double jeopardy." I can see that argument being put forward in a legalistic way. It's not necessarily a technical argument except for the extent that it might exceed 25 millirem to a member of the critical group on that area, but then again the rule is based on some reduction of 100 millirem public dose limit in the ICRP/NCRP documents to

account for multiple sources, so there is another plus for an argument like that, but that would sort of be a legal question a that point which is a little different form the question in front of us in the SRP as to predict the interplay of different areas that are released and we can anticipate the potential affect in the future based on some migration estimation.

MR. WILLIAMS: Alexander Williams, DOE. In our example in your case, if you've got contaminated groundwater underneath soil contamination you have materials that are moving very quickly in the groundwater, yet there's quite a hold up time from stuff migrating from the surface into groundwater so just because you've got something in groundwater now doesn't mean that you're going to have thing instantly going from the surface into the groundwater in the future and you would need to look at the different sources very carefully.

MR. FAUVER: Thanks. Well, I think we've -- are you done, Greg?

MR. CHAPMAN: Just one real quick one here.

I said I already pulled out my ALARA situation I was wanting to show, but I would like to challenge you all to apply ALARA to two different radionuclides, significantly different, pick a gamma and alpha emitter, and then figure out how you're going to apply that when there's a

combination of the two present because the rations will vary significantly as far as when it would be ALARA.

MR. FAUVER: Okay. Thank you, Greg. I think we're just going to ahead and just continue on. The next speaker is Mark Thaggard. He's going to talk about some of the NRC test cases and our approach to some of the licensing dose assessments that are in front of us right now.

MR. THAGGARD: Can everybody hear me? My name is Mark Thaggard. I'm going to talk a little bit about what the NRC is doing with test case and how we're hoping to use them. I appreciate those of you who stayed around this long. I'd like to thank Dave for putting me last on the agenda.

As we go through this if you have some questions that we're not able to answer today or something comes up later you can always get a hold of me. I've got my number and e-mail address up here. First of all, let me say there are copies of my handouts up front if you don't have them.

First of all, I'd like to go over the goals of what we're hoping to accomplish with our test cases. While we're trying to develop this standard review plan, we do have ongoing case work that we're working on and one of the things that we're hoping to accomplish with the test cases that we're using is to make sure that we provide some guidance to our licensing staff so that the decisions we

make today before we get to standard review plan are consistent with the decisions -- that we ultimately make when we get the standard review plan finalized.

We also want to make sure that we still maintain some consistency in how we review these dose assessment as they come in before we get the standard review plan finished.

I think somebody mentioned yesterday that it's often difficult to figure out what needs to be in guidance. I mean, you can't think about all the -- I mean, we've talked about a lot of issues here today and so it's often difficult to figure out what all needs to be guidance, what changes need to be in guidance and one way around this obviously is to use test case and this was one of the things that we're hoping to accomplish with our test cases is to help us figure out what needs to be in the guidance, what changes we need to make.

We're trying to use the existing guidance that's out there to the extent that we can. We're trying to use some of the idea that we're thinking about putting in the standard review plan. We're trying to implement those on these test cases so that we can see how they work.

For these test cases, we're actually using real sites. We're using current case work. I was involved a couple of years ago in the development of the technical

position on performance assessment on low level waste and when we were developing that BTP we tried to test out a lot of the stuff we were going to put in the BTP, but we used a hypothetical site. In this case here, we're actually using sites and we're using real data.

The work that we're doing, we're doing some of the work. We're also working with our contractor, Sandia National Lab. To the extent possible we're trying to follow the approach that's laid out in NUREG 1549, that decision framework we're trying to follow that approach. I'm going to talk a little bit more about that in a few minutes.

We're also using several computer codes. We're not limiting ourselves to just using the D and D codes. In fact right now we're looking at two codes. We're look at both D and D and RESRAD. We're probably going to be looking at some other codes.

We've already seen this decision framework a couple of times now. It's what I would call the backbone of the dose modeling in the guidance -- in NUREG 1549. One of the reasons we want to test this framework is because we want to make sure that it's implementable, that it's something that -- you know, when you try to use it that you don't get caught up, as somebody said, in this endless "do loop" and so we want to test it out.

We're also looking for feedback. If there are

good suggestions on how this framework should be changed, we would like to know that so that we can incorporate those changes.

Somebody mentioned that maybe we've overly simplified this process with this framework and I can testify that when we first developed -- when our contractor first developed this framework for us, this thing was very cumbersome. I mean, it had loops going all over the place. So we asked them to figure out some way to try to simplify this things because it was basically unyielding, so if we've oversimplified it, we need to know that too.

I want to talk a little bit about the test cases that we're actually using. Right now we're working on two sites inhouse here. These are former 20.304 burial sites. I don't know how many of you are familiar with the regulation, but in the past licensees could bury trash and stuff on sites under 10 CFR, 20.304, so we call them 20.304 burial sites. So we're looking at two of those sites. We're also working with our contractor to evaluate the former fuel cycle facility, and I anticipate that we're going to be looking at some additional sites in the future.

Let's talk a little bit about the burial sites that we're looking at. The first site has got roughly 1500 cubic feet of buried equipment and trash. The waste was buried over a two-year period in 55-gallon and 30-gallon

drums. The waste is covered with a four-foot cover except in the areas where the 30-gallon drums are, there's five-foot cover.

The site is located in the Midwest and based on burial records this is the estimating inventory that we believe is at the site, natural uranium, natural thorium and enriched uranium.

Some of the features of the other burial site is that it's most trash. It's buried in trenches. These trenches are up to 10 feet deep. They cover an area of approximately four-tenths of an acre so it's not a big area. The waste was disposed of over a much longer period of time between 1959 and 1981. We believe that these trenches are covered with a three-foot cover although we have not been able to verify that yet.

The site is located in the southwest and based on the burial records, you can see we've got a much wider array of radionuclides including tritium, carbon-14 and some chlorine-36.

Now I'll talk a little bit about the former fuel cycle facility that we're working on with our contractor. It's an 85-acre industrial process area that's on a 200-acres site. The facility was in operation for approximately 23 years. The site has a wide array of contamination that's got basically contaminated soil, some

contaminated sludge, sediment. It also has a former 20.304 burial -- it's got some buried -- it's got some building on site that are contaminated that the licensee is hoping to demolish and the groundwater is heavily contaminated with uranium along with some nonradionucliedes like nitrates, fluoride and I believe there's some arsenic.

The site is located in the southwest and they've done quite a bit of characterization and based on what they've done, we found out most of the contamination is uranium and thorium and radium.

You don't have this in your package but I just want to show a layout of the fuel cycle facility. There's some ponds that have sludge in them, some with sediments, some buildings on site and some more ponds down here that the soils in this area are heavily contaminated so this is a fairly complex site.

Since I'm not a hyrdogeologist by training I can't help but show the stratigraphy. It's a lot more complicated than the one that Earl showed. We've basically got a lot of empty layers of shale, sandstone, and these layers are not contiguous across the site so it's fairly complex geology.

Now I want to talk a little bit about some of the work that we've completed to date. There is a mistake on this overhead. I apologize. We have completed some preliminary analysis on one of the burial sites, the one

with the Carbon-14 and the tritium to the point where we've actually done some sensitivity analysis.

We've actually utilized two codes to do some analysis. We've run analysis D and D and we've had to play some games with the source term to analyze the problem using D and D because there is limitation, as was pointed out yesterday, with -- D and D assumes that the contamination is limited to the top 15 centimeters and for both of the burial sites we've got contamination below that. So we had to play some games with the source term to run D and D.

We've also utilized RESRAD on the same problem and what we've attempted to do using that is actually gone through and done some analysis to figure out what the dominant exposure pathway -- I think Alexander Williams pointed out yesterday and -- once you figure out what that pathway is you can figure out -- there's a suite of parameters associated with that particular pathway and we've done some Monte Carlo analysis on those particular parameters to see what has the biggest effect on the dose, and so we've done some of that on one of the burial sites.

As I indicated at the beginning one of the things that were wrestling with is that we're trying to develop this standard review plan and we've got ongoing case work that we still have to analyze and so we've gotten a lot of questions from our licensing colleagues about how should we

use D and D to analyze these burials or is it acceptable to use RESRAD.

And so what we've tried to do is to develop some interim procedures on how we can use D and D to look at burials and how should we look at RESRAD for example. There's a lot of discussion about this. If you run RESRAD using the default parameters and you submit that dose assessment, you really have no basis to know whether that answer you giving us is conservative or not because we don't know what those default parameters mean.

What we've developed in this interim procedure is this process of trying to narrow down and figure out what the most important parameters associated with that assessment and request that people provide justification for those specific situations. Certainly people ought to be able to provide justification for the parameters that had the biggest effect on the dose.

Our contractor has also done some work on the former fuel cycle facility. We've gotten through step one of the decision framework in terms of collecting the initial data at the site, developing our source term. One of the problems we found with this facility is that when you've got widely disbursed contamination all over the site, trying to come up with a representative, single source term is a problem.

Our contractor has been working on the procedure of how they thing -- an approach of how they think this can be done. They've written up something. We've given them some comment on it. They're going to finalize that document and when we get it in good shape, we'll probably put it on the Web site for other people to take a look at.

Some of the work that we're going to be doing in the future -- we still need to do some additional analysis on the one burial site that we've done partially, but in addition to that one of the things we want to look at is the use of these PG-8-08 parameters.

For those of you that are not familiar PG-8-08 stands for Policy Guidance Directive. It was a directive that we put out a couple years ago. We laid of these scenarios and one of them was the resident farmer scenario and for each of those we identified default parameters that people should use in their analysis.

We're rethinking that now in terms of whether people should actually be PG-8-08 and what the dose from using that really represents. We want to try to do something to look at what those dose assessments mean because people are still using PG-8-08.

We want to do some testing on the one burial site where we've not done any analysis. We want to walk through this interim procedure that we've developed that's in review

and I think we can use this site as a means of testing that procedures and see where we need to make some additional changes.

[Pause.]

And as I indicated earlier, I think we're going to be having some additional decommissioning sites that we're going to be doing some test work on in the future.

The schedule for completion of work is that we anticipate having -- I think we can have the work done on the two burial sites completed by some time next month. That may be a little optimistic -- I see some stares from some of my colleagues over here, but I think we can get that completed by sometime next month.

We're shooting to have most of the analysis on the former fuel cycle facility some time in May and as we go through the framework and we start generating some of these initial set of analysis, we will share that information with you.

That's pretty much all I have unless you have some questions.

MR. MASCIULLI: Steve Masciulli. I was just curious as to when you mentioned you were using D and D on buried waste and you said you had to play around with it a little bit. I was wondering what kind of approach you took to get it to do that.

MR. THAGGARD: Well, there's a couple things we did. One way to do it would be to assume -- take the total inventory and assume that it's evenly distributed in a volume equivalent to 15 centimeters, but you take that volume and you spread it out, but that means you have to increase, I believe there's a parameter in there called the cultivation area, so you wind up increasing that because you're taking a volume like this and you're shrinking it but you're spreading it out.

[Discussion among panel members.]

MR. THAGGARD: That would be one way. There was some other and I can't recall off the top of my head, but there was some other ways that we looked at also.

MS. DAILY: I think I might add also that it's kind of interesting when we're looking at these burials, neither of the models that we're looking at handles buried material per se in drums, so there was a fair amount of work that we had to do to generate a source term in the first place, and there's that underlying beginning assumption that all of a sudden we're dealing with soil instead of pieces of equipment and trash. That's the first in this analysis is that we're taking something we know is not soil and assuming that it is so we can start.

MR. MASCIULLI: Right. You've also started out with you have a good knowledge of your source term here. At

the site we had something that was buried and maybe we didn't know what the source term was, you'd have to do some characterization up front.

MR. THAGGARD: Well, the reason we started out using D and D is because it's got built in scenarios and the conceptual model so it fits very well with the framework.

MR. FAUVER: Alexander?

MR. WILLIAMS: Mark, you mentioned that you weren't certain whether the RESRAD parameters were or were not conservative. We prepared and widely distributed a data collection manual which is on the RESRAD Web page and I thought that that did a pretty good job of explaining what the parameter were and were they came from and why the default parameters were selected. Did I miss something here or did I misunderstand you or --

MR. THAGGARD: No. You didn't misunderstand me. I think what I'm saying is that we've look at that documentation -- I guess from -- the concern that I have is that in coming out -- and I think we've had some discussion about this before.

In coming up with those default parameters, I believe that they were derived from looking at each parameter in isolation and the problem is when you get into these dose assessments, you basically got a nonlinear problem and so by picking a series of what's considered to

be conservative parameters, when you get a dose result, you don't know whether that dose assessment is conservative.

Let me give you an example of this.

MR. WILLIAMS: Sure I'd love to have an example because I'm --

MR. THAGGARD: When we were working on the development of the branch technical position on low level waste performance assessment one of the things that we were looking at was infiltration into a waste facility, and me being a groundwater person if somebody were to ask me what would be a conservative value, well I would give them a high infiltration rate with the thinking --

MR. WILLIAMS: Sure.

MR. THAGGARD: -- with the thinking that the more water you feed into the system, the more you're going to have leaching out and so you're going to have a higher dose.

Well we found that actually the relationship between dose and infiltration is not linear so as you start pumping water into the system at some point, you get to the point where you actually start diluting the concentration.

So me picking that value by myself, but because the problem is somewhat nonlinear the result may not be conservative and so that's the concern I have with the way the defaults were derived for RESRAD is that all the parameter values were picked in isolation. Can you tell me

dose rate you're going to get out of RESRAD is conservative?

MR. WILLIAMS: For the default case, the individual parameters were chosen to either be national averages or prudently conservative, but we also recommend using site specific data especially for whatever pathways are important. It's fine to use the default that isn't, but for the pathways that are important you need to be using site specific data when it's available.

MR. THAGGARD: Well, we're not saying anything different.

MR. WILLIAMS: So we can agree on that.

MR. THAGGARD: Yes.

MR. WILLIAMS: Also there are some internal contradiction in the RESRAD default data. For example, the dust loading in air that we use is 100 micrograms per cubic meter and this is very high for respirable particles in the eastern part of the United States.

MR. THAGGARD: Yes.

MR. WILLIAMS: I'm not even sure it represents ambient air concentration anywhere else -- in a dusty environment out west for example. At the same time you also use high rainfall which is consistent with your comment about infiltration and high dust and high rainfall, I suppose there might be a site somewhere that would have both of those, but the rainfall is typical of a humid climate

while the dust loading is typical -- this is to try and have something that is reasonably conservative for both places so there are these kinds of problems and it's why it's helpful to use site specific data when it is available.

MR. FAUVER: Can I add something to that?

MR. WILLIAMS: Sure.

MR. FAUVER: I don't think the issue that we're looking at with the RESRAD defaults is necessarily conservative or not or where are there. I think it's more of a process question. We've started down this road of looking at the default parameters in D and D with looking at a little more -- in a sense that we want to have a little more information about uncertainty.

Now there are problems. You have to estimate the probability distribution functions and there are questions and comments about how those are made, the usefulness so putting that aside for a minute, I think what we're really trying to do is just use a process of trying to be able to understand a little more about the uncertainty and with the computer capabilities that we've got, you've got a RESRAD code out there that has probablistic capabilities and we've got this contract under way that's just going to sort of work though some of the distribution functions for the sensitive parameters in RESRAD and the discussion is kind of moot in a sense. We'll see where we end up and --

[Discussion among panel members.]

MR. WILLIAMS: Well, I can see with Mark's example that if you change the infiltration for any given radionuclide, you increase the infiltration, flush it out of the surface, into the groundwater faster. This is going to change groundwater dose.

MR. THAGGARD: Well, the bottom line is, I agree with what Dave is saying, but the bottom line is if you're going to do a deterministic analysis, then I think you've got to demonstrate that it's demonstrably conservative. As I said before, if you come in and give a dose number, a single dose number, automatically somebody is going to start questioning "Well, what happens if you change" this parameter or that parameter.

I mean, people are going to start playing these games in their mind and -- if you're going to come in with a single dose estimate there needs to be, to me, it needs to be demonstrably conservative --

MR. FAUVER: And Mark's not making a determination one way or another about the RESRAD --

MR. WILLIAMS: Yeah. Yeah. Yeah. Let me assure you that the default values in RESRAD are superior to default values --

[Laughter.]

MR. WILLIAMS: -- determined by NRC. I want to

assure everybody of this.

[Discussion among panel members.]

MR. WILLIAMS: We'll have this discussion afterwards. There's a good alleyway behind the building.

MR. FAUVER: Henry, can you add to that.

MR. WILLIAMS: Thank you.

MR. FAUVER: Thank you.

MR. MORTON: With respect to these analysis of the burial. If I understood correctly you said you were in effect taking the source and making it a six-inch thick surface source from that so you can do the analysis. That seems to me to be in effect changing the problem. What would be the degree of receptivity to using perhaps something reasonably simple that may be more nearly able to model that circumstance to get the relationship to your burial?

MR. THAGGARD: Well, I don't think we would preclude the use of any code at this point. I mean, if there's better code to analyze the problem, you ought to use it. We wanted to do some initial screening analysis as I indicated before. In order to be able to use the screening tool, we had to modify the problem. That's not the optimum way you want to do it.

The optimal way to do it would be to find the code or develop the code to match the problem, but we wanted to

do some initial screening analysis and in order to use the tool to do that, we had to modify the problem. Personally I've got some problems with PRESTO, but that's a whole different issue, but certainly I think as Chris pointed out you ought to use the code that fits the problem.

I'm not advocating the people -- everybody should go out and use D and D. I'm not saying to do that. I'm simply saying that that's what we did to start our analysis.

DR. YU: Charley Yu. You mentioned that you artificially altered the source term from 15 centimeter so it's effective 6 -- that also artificially increase the concentration in the soil.

MR. THAGGARD: Yes.

DR. YU: That may be okay for groundwater passway. Since you are a geologist, you're probably more interested in groundwater passway, but that will increase your external dose and ingestion --

MR. THAGGARD: Yes.

DR. YU: -- it's greater than 15 centimeters, change the --

MR. THAGGARD: Yes.

DR. YU: -- you should take that into account.

MS. DAILY: I think it's important for us to remember here that what we're doing is taking the first step in screening. Screening is not intended to be reality. The

point here is if you can take your source term from a burial of material that you know is not soil and is in containers, take it up as if it was soil, spread it out on the surface, so you are maximizing exposure and you pass the dose limit at that point, why would you go ahead and spend a lot of money characterizing or doing more work? You've demonstrated that you've met the criteria under strict conditions. Our only point is if you can start off and do that, then you're done and there's no more analysis that you have to do.

MR. THAGGARD: On the other hand if you want to go and spend all that money --

MR. FAUVER: But we're also looking at a couple different ways to average the contamination of the burials.

[Discussion among panel members.

MR. FAUVER: If you fail that screening process which in a number of cases you will, then you go into a next level of averaging which has some addition sort of requirements to it so it's not quite as simple, but we have steps.

MR. THAGGARD: I mean this is one of the reasons that we looked at these as test cases because it give us a chance to play around with different things and see what things make sense and what don't. You have to start with something and see if it works and see the limitations of it.

MS. DAILY: I think it's important too that -- we ran into some interesting issues that you all have probably run into also and you may not have thought they were important at the time, but just generating the source term in the first place from a fairly limited amount of data.

When I first got the problem I was told we had "X" picocuries per gram of natural uranium. Well, the definitions for natural uranium can change your source term estimate by orders of magnitude.

So there's all those kinds of piddly issues that can have a significant effect on our source term and that's the kind of thing that we need to have in our guidance when somebody's reviewing this and all the information they're given is it's natural uranium, how are we going to tell them to do a first cut?

Do we have to go back and say what's the isotopic ratios or can they just say I have these five different definitions. This one gives me the highest source term if they're not going to specific we can use this approach. That in itself is an interesting issues that relates back to some of the other things we were saying about source term.

MR. FAUVER: Any questions? Okay. Thanks, Mark. Why don't we take a 10-minute break.

[Recess.]

MR. FAUVER: Well, I'm glad a few people stayed.

Good. What we'd like to do is just summarize a little bit. I just had some ideas and follow-ups related to some of the things that fuel cycle people brought, but I want to open it up first to anybody who wants to provide some summary comments and ideas for future work.

I think that that's the key. I mean, particularly we've got guys who did the test cases over here. I'd be interested in some ideas on where you think you're going with this test case and would you be willing to participate in a future workshop as to where you're at as you progress in this thing, continue to try to use the guidance and what you all are thinking about that. I guess that would be my first question to Earl and Greg.

MR. SAITO: Well, I think I'm really glad that the workshop occurred and got some really good information out of it. As I said during my talk we're at a position now where we really don't know where we're going to be at in the future and so I think that in the future depending on the subject and what's expected, we'd be willing to come back and talk about where we're at.

MR. FAUVER: You have licensing -- what you're saying is you have licensing issues right now that you're not sure whether you're going to be doing further dose assessment or --

MR. SAITO: Our current situation is we're doing

the hydrogeology and so we can do some dose assessment and figure out whether we're going to go restricted release, unrestricted release, do any remediation at all, do some remediation -- it's a very --

MR. FAUVER: Okay.

MR. SAITO: -- wide open. It's one of the reasons why we've become involved. If I knew with certainty what we would be doing, I would know more certainly what the answer to the question is.

MR. FAUVER: Okay. Greg?

MR. CHAPMAN: I think I've got basically the same kind of situation that Earl's got. This is a road we're planning on going down rather hard and heavy in the very near future and one of the consideration that I might have if we were involved in this is speed up our process of approvals or disapprovals or whatever or slow it down. Those would be considerations we'd have to take into account.

MR. FAUVER: Are you saying whether being a test case involved in this workshop process would speed up or slow down your approval, is that what you were asking?

MR. CHAPMAN: [Nods yes.]

MR. FAUVER: Okay. The other thing that I thought was significant that came out of the workshop was the information that Dave Spangler presented on the resuspension

factor and Dave Culberson had asked at the end of yesterday's meeting how we planned of following up with that. I had some ideas that maybe Dave, you could have some feedback on.

Basically it seems like that was step one of essentially a two step process and the second step is to analyze this data in the context of the probability of distribution function for resuspension factor that we currently have.

I'd be very interested in the fuel cycle forum's analysis of the data, quality in data and how that could potentially affect that distribution function and then what the industry prospective on how they would do it if it were there scientists considering it. Look at it maybe site specifically, but to provide that feedback to us and then we would commit to do the same thing, look at the data, think about it, see how we though it would affect the distribution function.

I would propose that we either have a technical meeting on it, maybe a few hours or we use a block of time in the next workshop or the one after that depending on timing to discuss the issue. Do you have any kind of --

MR. CULBERSON: Dave Culberson. I think that's an excellent idea. That is a way I think to bring something like that to completion. There are open issues on the

licensee side as well as formulating the guidance. We need to take it to completion. I agree with you that would be a way to do that.

I'm planning to leave there with an action item to see if I can muster the resources within the industry to get data that Dave Spangler brought finalized, q/a'd in a way that could be utilized to justify that it's valid data, see if there's any other data out there that might be added to that to supplement the argument that were made and get that before you, maybe on the Web site for consideration.

It could be used either as an industry guide or perhaps even NRC could take that and use it in the modeling and make adjustments if appropriate. I think that's a very positive outcome of the workshop and I agree we need to get back together and try to pull some information together, get with you and plan out a date.

MR. FAUVER: In addition to just compiling data, I think it would be useful to hear the professionals on the industry side, what their analysis would be as to how they believe it should affect the default parameter distribution function that we currently have. We've got one additional reference and I don't think Dave had and of course Steve McGuire volunteered to provide us this stack of references that he had.

I think as a minimum there was the Breslin data

that apparently has pretty good pedigree and looks like a reasonable dataset similar to our scenario light industry, so as a minimum I would suggest that we get that data to you. I think that should be combined into this reevaluation as well.

MR. CULBERSON: Okay.

MR. FAUVER: The other think I heard come up was something that Earl mentioned and it was obvious there was al lot of uncertainty, is the measurement of the surface contamination limits. It's different when you have this dose based number that comes out DPM per 100 square centimeters.

If it's a beta plus gamma, if they're daughters for example in the uranium chain, the thorium chain, it's not like the old criteria in Reg Guide 186 which were alpha, 500 DPM Alpha, 1,000 DPM alpha, you know, 5,000 DPM beta where you could measure for the number, and this was kind of all wrapped into the chain when we looked at uranium and thorium.

When you get these numbers coming out of the dose assessments, I don't think that's clear at all particularly when you start thinking about the 10 percent removable factor that we've got worked into the default tables, the screening tables and actually the default resuspension factor.

I would propose that as an area that the fuel cycle forum could take a look at in conjunction with NRC, through a technical meeting or whatever to get that moving. It's an area really that we're going to need to address as a part of the survey guidance.

We haven't talked about that in survey guidance and we need to do more discussion on it so I think that's an area that we would be very interested in hearing your opinions on implementation, multi-radionuclides and things like that. We can talk more about that. Earl?

MR. SAITO: No, I agree with that. I think that it's very important that the people who model and the people who measure get together and make sure that what's being measured is what the modeler thinks is important because if it's not really important, if the measurements were taken and have no relationship to the model, we may as well not be taking the measurements.

MR. FAUVER: Okay. Those are the two items that I had. Any other suggestions?

MR. WEAVER: Ken Weaver, State of Colorado, but conference radiation control program director so I just wanted to mention that Dennis Sinoni from New Jersey was here earlier today for the conferences committee on decommissioning.

He had some notes, but was ill and is working on a

report for that committee. I think he's been in touch with regulators in about 15 states now and it's more the experience of materials licensees or not having tried 1549 and draft guide 4006. He's trying to find out what use has been made to now of those publications and he'll be back in touch with you. I thought it important to put that in your record.

MR. FAUVER: Good. Great.

MR. WEAVER: You can be in touch with him and he'll be in touch with you.

MR. FAUVER: Good. I'll call Dennis and make sure. Mark.

MR. THAGGARD: I was just going to remind you that we were talking about how we were going to get back public comments and questions and Gregory, I think he raised a lot of interesting --

MR. FAUVER: Okay.

MR. THAGGARD: -- and useful questions. You want to go over that.

MR. FAUVER: I'll go over that if you want me to.

What I plan on doing is taking the transcripts and we're going to include all of the overheads and slides and the transcripts. I'm going to go through it and pull out all of these suggestions, for example, that you found in Greg's slide, what about the deed, the fact that there's a

public water supply and there's a swamp and all these other things and pull them out and post them on the Web site as significant idea that came out of this workshop and also to try to put that as priority items in terms of our work group so we can take a look at those and get feedback in a reasonable way so we can keep this process going.

We're not going to let those drop and that's what we're going to do. We have a section in the Web site called Q&A and the intention of that section was sort of -- it was an NEI suggestion at a meeting a couple of months ago -- and the Q&A section is meant to be an area where NRC could post in a Q&A format sort of an interim draft of something that management is taking a look at, revision to our guidance or addition to our guidance.

So the Q&A section could be used to say "Well, there was this suggestion to look at zoning requirements for sinking a well and we think that's a good idea and we're going to put it into our guidance and such-and-such." We can do that piece by piece and then draw it into the guidance when we get to that section. We're going to try to accomplish that to the extent that we can when they're not so interrelated with other issues. We'll try to break them out in that Q&A section. That's the idea for that.

Anything else, Mark?

MR. THAGGARD: No.

MR. FAUVER: Anybody else? Alexander?

MR. WILLIAMS: Alexander Williams with the Department of Energy. There's one other circumstance you might want to consider. One of our experiences is that we are with D and D on a number of building that are going to be demolished as part of site cleanup activities and in addition to looking at cleanup criteria for building for future occupancy purposes, I would recommend that you consider cleanup criteria for a building, specifically for demolition of the building.

MR. FAUVER: That's a good suggestion.

MR. WILLIAMS: Because for elderly buildings that are functionally obsolete, demolishing the building may be the best course of action and it's, I think, a bad idea for people to spend a lot of time and money looking at future building use, if in fact, the licensee is planning on demolishing it.

In the case of DOE we have a number of building at our sites that are WWII vintage and have limited future use, if any. I think that this is something that you might want to consider.

MR. FAUVER: Thanks. I think some licensees are actually consider that right now. Norm, did you have a comment?

MR. EISENBERG: I'm Norman Eisenberg. I'm senior

advisor for performance assessment in the division of waste management. I wanted to follow-up on something that came up yesterday and I wanted to clarify the question.

I believe it was Mr. Williams and Mr. Roberts, I believe. The issue was regarding the uncertainty in the dose conversion factors. There was some question about why we were not folding quantification of those uncertainties into our consideration of variability and uncertainty.

I'm not sure exactly what the question was. Let me propose two questions and then you'll probably come up with a third, but was it that these uncertainties are large and you think they may be more important uncertainties than the uncertainties in the physical parameters and behavioral parameters that are already being considered, is that the issue?

Or was there a question of how we can justify the use of the mean for the behavioral parameters in our modeling, but we're using the 90th percentile for the physical parameters. I wasn't quite sure which question it was or whether it was both of those.

MR. WILLIAMS: In my case it was both. It's my presumption and I hope that there are people in the room who know more about the dose conversion factors than me, but it's my presumption that the uncertainty in the dose conversion factors is substantial depending -- as was

pointed out yesterday -- by age and sex and lifestyle and whatever because people are different and the dose conversion factors you would expect would show some difference.

So I'm presuming that there's a fairly large uncertainty in the dose conversion factors and I realize that these are the best estimates and if you're going to do elaborate analyses by uncertainty analysis or Monte Carlo or whatever to look at the range of uncertainties in dose, you need to understand that in my estimation at least that there's also substantial uncertainty in those diversion factors.

MR. EISENBERG: Okay. Now let me just say and Chris Daily can correct me if I get this wrong, but it's my understanding that what the rule asks for is the dose to the average member of the critical group, and as soon as you say both average member and critical group, I think you're forced to go to an average dose conversion factor, you're collapsing those uncertainties so I'm not sure that we need to continue to --

MR. WILLIAMS: Sure. Well everyone takes the two federal guidance reports as being, you know, divine revelation from EPA. I realize that there's some that don't look at EPA publications as being divine revelation, but nonetheless everyone uses those and they are in my opinion

the best estimates that we have, but none the less, there are uncertainties involved.

And also for your second question, in terms of the behavioral parameters, we saw the example, the gentlemen from nuclear field services and this who question about whether groundwater at his site where there is some uranium would ever be used for drinking and, you know, his company, he can spend a lot of his time and his company can spend a lot their money looking at all sorts or parameters and sensitivities and fancy analyses, but at the same time the simple assumption that the groundwater in this fairly small tract of land is somehow, at some time in the future going to be used for drinking, this is an assumption, and if you presume that it is being used for it when based on the current use, it is not, the uncertainty in the presumed future use of this land probably -- presumed future use of this water probably dwarfs the uncertainty from all the other stuff.

So the short answer to your two questions is yes to both.

MR. EISENBERG: Okay. Thank you.

MR. ROBERTS: My point of view on those questions is that I was looking at D and D when I walked in here as a pure probablistic code and in a pure probablistic code for every input parameter you put in a distribution and what I

heard as the presentations went on is that in actuality it is not a pure probablistic code in that some of the variables are distributions and some are point estimates.

My question came up in the presentation where there were point estimates that were going to be put in the D and D code and they were brought out as "Oh, we're going to use point estimates for these." My question was more, well, wait a second, I thought this was suppose to be a probablistic analysis.

I guess my first question is, is if the NRC chooses not to do a purely probablistic analysis, I feel like there needs to be some justification as to which parameters they chose to do to use distribution and on those parameters they don't chose to use distributions and point estimates, there needs to be a justification on why there was not a distribution actually given for that.

In that same light in looking at this, when you have a point estimate within the D and D code, there has to be something when you go to a site specific analysis that says what NRC finds acceptable for going from a point estimate to putting in a distribution. That's one thing that needs to be put into the guidances, what will be acceptable from going to that point estimate to a distribution.

The other part of it is though is what will NRC

accept if they have a default distribution and we want to put in a point estimate. How will we do that as well? We need guidance on how we can choose a point estimate for that particular parameter, and that kind of feeds into the whole notion of the average member of the critical group.

I understand when they start talking about the average values for biological things for like breathing rate. What you're going to have is you're going to have your breathing rate -- you're going to have an average of a 24-hour day of daily input and you're going to have light, medium, heavy activity and I understand that. Really, those are average values over the long term for a person.

I also understood the fact that you use the upper 95th percentile when you're doing environmental transport parameters, things that would maximize your exposure point concentration, I can see that as well, but all of that needs to be written down and put into a manner that explains what the NRC's position is on how those are derived.

MS. DAILY: I think you've made some excellent points, and the letter reports that we put out there were intended to do exactly what you were talking about and as far as they don't do that, we definitely need to know where they don't.

I mean, I know that some of the parameters that are described a lot better than others and I know there's

some improvements to the writing and we're doing a lot of that, but we tried to explain how we derive the distributions, why we derive those distributions for the behavioral parameters specifically they do have distributions.

We selected the mean of those distributions specifically so they would meet the requirements for average member of the critical group and we tried to be as clear as possible about how we had developed those behavioral distributions specifically so that you would have a template for changing them if your critical group changed, you would have enough information to understand how it was originally constructed so that you could shift it for your modified critical group.

Another just small clarification, for something like breathing rate, it's not an average over 24 hours, it's an average over the time of exposure. We don't really care what happens once you leave the site and you're not exposed anymore. We care about how your breathing rate changes over the course of a work day.

MR. McKENNEY: In short, there's -- when you say the average member of the critical group, there's a tremendous amount of guidance on what that means in the international community.

It's mostly pointed to operations, honestly, but

there are some discussion on how to use it for long term exposure and one of the things is that once you've -- this is from an operation point of view, once you've found you're critical group or people that could be your critical group, you look at their behaviors, age, activities, to see if they are relatively homogenous, that they're all getting about the same dose and from that point of view, once you have your group specified.

In other words you have your habits basically, parameter ranges, other things, then the recommendation is to use -- to represent the average member of the group, use the mean values of each of those habits. Use the mean values of activities and for metabolic analysis how thing travel through the body, use not the members of the critical group who may be sensitive population, but use the average model for general population which would be the ICRP, different models.

The Federal Radiation Council has recommended that the federal agencies use to show compliance with effective dose equivalent, use the models in FGR-11, that is the basis for why each of the regulatory authorities use that, and so that's actually how we came to mean values of all the habits and activities.

We set up these parameter ranges as Chris said and then we looked at the variability they caused in the model

and made sure that it wasn't less than a factor of 10 dose distribution due to their variability, and we found the ranges that would accomplish that and then we took the mean values of those. That's how we got the point estimates.

MR. ROBERTS: So I guess I misunderstood before. You actually are using point estimates for breathing rate and soil ingestion rate within the D and D code?

MR. McKENNEY: Correct, but we have in the documentation how we set up the parameter ranges -- the D and D code runs deterministically current, each is only a point estimate in the code. The defaults were selected using a separate Monte Carlo system based on these various parameter ranges that we setup.

When you run the code yourself, it's a deterministic run and the -- we came at -- from at the behavioral parameters, we looked at them separately than the physical and used the mean value of those. Once we had all those, we evaluated the range of uncertainty or the ranges of doses that are caused by the physical parameters and then through a mathematical process created a single default dataset that satisfied the criteria that was established for that default set which at least gave you the 90 percent dose on the dose distribution.

MR. ROBERTS: Okay. Well, I didn't understand it that way when you'd explained it before because I thought

you were using a distribution of average values, and I guess my comment to that would be that really your breathing rate and your soil ingestion rate and your actual rates of intakes of things are usually your more significant factors and so if you're using point estimates for those in a probablistic code, maybe that should be rethought because a factor of 10 within -- you said plus or minus a factor of 10 for your dose analysis --

MR. McKENNEY: I said a factor of 10, not plus or minus 10.

MR. ROBERTS: Yes. An order of magnitude difference can affect your dose so it's something to look at. I mean those are the most significant especially if you're looking at dose at year zero which you say you're decommissioning criteria you're looking at is looking at dose as year zero. Many of your environmental transport factors are less significant more that your actual metabolic factors.

MS. DAILY: The building occupancy is the one that we're looking at the first year after a license release. For soils we go out 1,000 years, but the way that the distribution is set up, the distribution is for the critical group and then we take the average member of that distribution to the average member of the critical group. We could have constructed a distribution of averages and

input that distribution into the calculation.

There's different ways of doing these evaluations, but we thought that taking the average of the distribution for the critical group would be a little easier to understand and easier for licensees to modify for their particular site if they shift critical group, but that's the kind of thing that we need to discuss further and find out if that's correct.

Obviously we need to clarify or put into our guidance a clearer discussion of exactly how this analysis was done.

MR. ROBERTS: Yeah, because I guess my confusion is more now I'm not quite understanding which -- why you might have chose distributions for some parameters and not distribution for another and if that can be explained, that would be great.

MR. FAUVER: Any other comments?

MR. KING: My name is David King. I had just a general question I guess. I don't operate under an NRC license, but I do a lot of risk and dose assessments and am pretty much free to use whatever code I or my client sees fit, so it's whatever code gives me the more accurate results.

For the most part I've used RESRAD for a couple of reasons. One reason is that I know that up until recently

it was endorsed by NRC. I know that EPA uses it and obviously the DOE uses the code. I know that it has gone through several reviews and has taken part in some testing where test cases were presented and different codes were compared, and I have no objection to using something like the D and D model if it goes through a similar process.

My general question is who is doing the review for the D and D code? Is it completely internal? Is there going to be an opportunity for peer review or is it going to go through any test cases similar to RESRAD code? Thank you.

MS. DAILY: The D and D approach is based on the 5512, Volume 1 documentation. That was peer reviewed at the time and Charlie Yu was involved in that. The next step, and we've kind of stepped through this over the years, and the approach that we used for determining the defaults most recently, the parameter analysis, that was peer reviewed.

The documentation has been out in the public for quite awhile and we're trying to get as much feedback on that as we possible can. We're going to be publishing the methodology in a peer review journal as another mechanism for getting more review.

Remember that the D and D model is not intended to be reality. It's not suppose to go out and say "This concentration means exactly this dose to this individual."

That's not it's intend. It's a little different approach. We definitely want review of the model. We want you to keep in mind when it's appropriate and when it's not. What kind of situations it's useful for and we're early in the process.

The software has only been available for about two years now and it needs more testing and we're doing test cases, industry is doing test cases, we -- if, given the resources, we'll try and get some international comparisons. All I can say is we're in this process. We're doing testing. We don't have the same kind of testing that RESRAD has had since it's several years ahead of us, but we are getting it peer reviewed and we're trying to get it evaluated as much as we possibly can.

MR. KING: Yes. I know that's it's fairly new code and it obviously hasn't been through the same rigors that the RESRAD code has been through. I work mostly with the Corps of Engineers and essentially it's -- we use RAGS, we use RESRAD, we would D and D if it were appropriate.

There's a reluctance to move away from things that are familiar especially, you know, the Corps is fairly -- has been reluctant to move away from RAGS, but they're becoming familiar with RESRAD now and now D and D is out there.

We have some cases that are similar enough to an

NRC scenario where we are trying to adopt 10 CFR 20 for these sites and trying to determine how we're going to characterize and eventually release a building so there are several cases where we're struggling whether or not to use RESRAD build, which is as I understand it is still going through the process.

That's one of the reasons that I'm here. It's not because I'm concerned about a license, it's because I want to know what it is, what's appropriate and so I want to at least gain some confidence that code is appropriate for me to use and it may or may not be.

That has to be determined, but I would feel much better if I thought that there was some kind of documentation out there that such-and-such corporation looked at the code and compared it to others and independently felt major influence from the NRC that it was an appropriate screening too or, you know, it represented not necessarily reality, but it was a sufficient tool.

MS. DAILY: I guess the only independent evaluation that I know of at the moment is I think EPRI was going to view looking at it as part of their model comparisons and industry, of course, is doing test cases and other things like that.

MR. KING: Okay. Is that information going to be provided --

MS. DAILY: I believe so.
MR. KING: -- to the public to use it?
MS. DAILY: Well, we've tried to put everything that we have done with the code in the framework and decommissioning out to the public either as NUREG documents and now with the Web site putting it on the Internet.
As you heard, we're discussing with industry also that as they do more testing and they have test cases that we can post their material also on our Web site so it's accessible to people and the have other ways of testing the evaluation.
MR. KING: I see a distinction between having the ability to provide a comment as compared to having a view of a comment and a response and this is how we're going to address these comments so I think it's a good thing that you're considering people's comments on the Web and formats like this, but it's something completely different to say that "I looked at your comment and here's how we're going to address this." Whether it's to ignore it or lump it in with a bunch of other ones as you do in 10 CFR 20, subpart (e). I would find that very useful and I'm assuming that somebody holding a license would too.
MR. FAUVER: Yeah, I think as I mentioned earlier we have a section on the Web site where we're trying to put resolutions to some of these suggestions and issues that

come up as soon as we're able to as a separate item and it's a Q&A section.

MR. KING: I just wanted to make that one distinction. You mentioned something about Q&A, but I didn't hear it exactly so I wanted to make that clear. Q&A is -- I have a general question about -- it may not necessarily be this is how the code works from a review of the technical end of how it -- well, exactly how the code works, the technical aspect of the code from a review process, not just generally sitting around and talking about I don't feel very comfortable about a certain parameter.

MR. FAUVER: Well that part of the Web site is not intended to get into real detailed, technical documentation and that kind of thing. It's meant to address things like if you're local county doesn't allow wells in a certain area, we've evaluated this and find that it is or is not an acceptable way to shut off the groundwater pathway. That would be a draft review by management. A way that people could get feedback as we get some resolution to these things so it's not intended to be a place where you have detailed technical documents, that's another location.

MR. KING: That's why I'm making the distinction because you're saying it's a general -- maybe a site specific and not necessarily a technical detail for the code, but somebody may want to get a response to a comment

and if that's going to be made available, then I'll shut up.

MS. DAILY: There's a distinction to what we're doing on the Web site and maybe I should clarify a little bit. When we were in the process of doing the rule making we had a site set up. It was a bulletin board originally at that time. That tells you how long we've been working on this rule.

Because of the fact that we were working on a rule making, any comments that came in were docketed. They were treated as official comments and we had to respond to all of those comments. When they're in the document, they're recorded and either grouped and responded to or responded to individually.

What we're trying to do here with the Web site is a little more casual in the effect that in order to have an ongoing technical discussion that's going to be useful to all of us, we need to step back from our official roles a little bit and be able to kick some ideas around without people thing that the NRC has spoken.

We need to be able to talk a little more freely so we're thinking of these message areas as being more discussion between technical people or bringing up different issues and then the Q&A section would be slightly more formal in that management would have had some input into those responses.

Then when we actually finalize the guidance, you know, that's a more official approach so it's kind of a balancing act. You don't get -- if you put a question or a comment up on the message area, you won't necessarily get a response from the NRC staff that says "This is the way it's going to be," but we'll try to respond to it and respond to it in that -- "This is what we're thinking about doing" or "We took your suggestion and we tried this out on it and here's what happened." It's that kind of an interaction.

MR. FAUVER: All right. Thank you. Anymore questions? With that, I think we're going to adjourn. Thank you very much.

[Whereupon, at 3:40 p.m., the meeting was adjourned.]