Centers for Disease Control
National Institute for Occupational Safety and Health
Advisory Board on Radiation and Worker Health
Metals & Controls Corporation Work Group
Tuesday, November 20, 2018

The Work Group convened in the Montreal Room of the Cincinnati Airport Marriott, 2395 Progress Drive, Hebron, Kentucky, at 8:30 a.m., Josie Beach, Chair, presiding.

Present:

Josie Beach, Chair
Henry Anderson, Member*
David Kotelchuck, Member*
Loretta R. Valerio, Member*

Also Present:

Ted Katz, Designated Federal Official
Nancy Adams, Niosh Contractor*
Bob Anigstein, SC&A*
Christine Corwin, DCAS
Pete Darnell, DCAS
Michael Elliott*
Rose Gogliotti, SC&A
Jenny Lin Naylor, HHS*
John Mauro, SC&A
Pat Mccloskey, ORAU Team
Jim Neton, DCAS
Mutty Sharfi, ORAU Team
John Stiver, SC&A*

*via Telephone

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Proceedings

(8:32 a.m.)

Welcome/Roll Call

Mr. Katz: Welcome, everyone, in the room and on the line. This is the Advisory Board on Radiation and Worker Health. This is the Metals and Controls Work Group and we're ready to get started.

This is site-specific work. So we're going to, please everyone but the Board Members we'll need to speak to conflict of interest. The Board Members don't have conflicts with the site that they serve on the Work Group so they don't need to do that.

And we have Josie Beach the Chair here in the room. And I've already heard, we have Dr. Kotelchuck and Ms. Valerio on the line. Henry, Andy, are you on the line too, Anderson?

Member Anderson: Yes, I am.

Mr. Katz: Super. So those are all of our Members all present. And let's go on then to the NIOSH ORAU group in the room first. You guys.

(Roll call.)

Mr. Katz: Okay, then. Just a few administrative things. Please everyone mute your phones who are on by phone. Press *6 to mute your phone if you don't have a mute button and press *6 to come off of mute.

But that will help the audio for yourselves and for everyone else. And please don't put the call on hold at any point because that makes a mess of things. And then --

Member Anderson: Is the Skype on?

Mr. Katz: Excuse me.

Member Anderson: Is Skype on so we can see slides?

Mr. Katz: I don't think Skype is on, no.

Chair Beach: No.

Member Anderson: Okay. I just wanted to be sure because I don't see anything.

Mr. Katz: No, right. You shouldn't be seeing anything then.

Member Anderson: Okay, that's good.

Chair Beach: I think there was only one slide and that was John's but it pretty much follows his --

Mr. Katz: Yes, I distributed that.

Member Anderson: Okay.

Mr. Katz: And I don't know whether that got to you, Mike. But, Mike, did you receive anything in the last day?

Mr. Elliott: No, I did not. I'm sorry.

NIOSH Status Brief

Mr. Katz: Okay, okay. Well so, Mike, let me just say a couple things. There's, SC&A has done a lot of work in a very short time and will be presenting that today.

Their report wasn't completely finished so it's not out. So you don't have it. But you will get it shortly after this meeting. You can listen on and of course then when you get it you can respond to that too.

But you should be getting that pretty shortly after this meeting. So just to let you know. And then the slides that we're talking about are just text slides that summarize that report and you should be able to get that even sooner.

I sent that to be sent to you. But I guess that hasn't gotten there yet. Okay. And then the agenda and

so on are on the NIOSH website under the calendar meetings today's date.

Okay, then. So I will turn it over to you, Josie.

Chair Beach: Okay, thank you. And first of all I want to thank Rose for updating the BRS. We were briefly talking about it. It's nice to go in and see that Pete has put some stuff in, you've put some, anyway it's nice to see that and we can track it.

And I know you'll keep that up after each of our meetings. I think the two documents we're really focused on today are the October 24th. That kind of ties in a lot of the SEC issues that we started discussing.

And then SC&A's paper that is not out, as Ted just mentioned, but we'll discuss at this meeting and that will be out shortly. And I believe, Pat, are you going to give the brief, the NIOSH brief before and then SC&A is going to take over?

Mr. McCloskey: That's the plan.

Chair Beach: Okay, well we'll let you go ahead and get started.

SC&A Review of NIOSH Subsurface Exposure Model White Paper

Mr. McCloskey: Okay, good morning, everyone. So NIOSH presented the initial ER to the Board last year, 2017 in August.

At that Board meeting at the conclusion of our presentation the Petitioner, Michael Elliott presented some of his concerns about how we may have missed the boat on a few types of exposures that occurred at Metals & Controls.

So in response to that we visited the Metals & Controls area and interviewed some subject matter experts and some former workers there, got some

input and went to work adding some more models to the ER. And we put those initially into White Papers that are on the website at the moment.

So, and at that same meeting the Board gave SC&A an opportunity to work on the ER and come up with some comments about our work there. And let's see, their report, SC&A's report came out in February of this year, 2018.

And it discussed the subsurface work that was done digging in the soils within Building 10 at Metals & Controls and also subsurface work in the outdoor areas.

And also they introduced some of the, they discussed some of the other types of maintenance work that occurred in those controls such as HVAC maintenance, penetrations of the roof, work on the roof up on the ceiling area.

So after that in April we came out with our first White Paper. It's on the website. It's called the Metals & Controls Corporation Subsurface Exposure Model.

In that paper we delved into the subsurface model specifically. Didn't touch on any of the other maintenance type activities, just the subsurface model.

That was only released to SC&A and the Work Group and the Petitioners and put on the website right before our May Work Group meeting. We had a Work Group meeting for this site.

And so there wasn't much of an opportunity for many to look at that. But the Petitioner again was able to present in May that there were still those concerns about the HVAC maintenance and the roof penetration work, the work up in the overhead.

So went to work right away after the May meeting trying to also address those types of maintenance exposures. And let's see, those, that additional type

of maintenance work is in our latest White Paper which is on the website and which I will speak from this morning.

It's titled Metals & Controls Corporation Maintenance Worker Exposure Model. So I'll just page through there.

Chair Beach: That's your October?

Mr. McCloskey: Yes, dated October 24, 2018.

Chair Beach: Can I stop you before you get to that?

Mr. McCloskey: Sure.

Chair Beach: I might have missed it. But there were two papers that came out right after the last Board meeting. I know Ted asked John to put his thoughts down after the public comment period.

And so he sent, put out a paper September 17th and then NIOSH answered that on the 18th. Those two papers, those are all --

Mr. McCloskey: Memos?

Chair Beach: They're memos. We're not, and everything, all the stuff that's in those are covered now in that October 24th, is that correct? So those two pages are kind of --

Mr. McCloskey: I think so, Josie.

Chair Beach: Because we've never discussed those two papers. So I wanted to make sure that they're --

Mr. McCloskey: No, I'm pretty sure that they are all covered in this October 24th, our latest maintenance work disclosure model.

Chair Beach: And then John's November paper. Is that correct?

Mr. McCloskey: That's not to say that there aren't some concerns that we're going to hear about from SC&A and others.

Chair Beach: Okay. So I just didn't want those two to be involved because they just came out and we haven't discussed them.

Mr. Darnell: In writing the memo in August or, excuse me, in September I went basically back and forth to make sure everything that was in their memo was covered in our memo and also had covered the latest issues matrix that we put out a month before.

Chair Beach: Okay, because those two aren't really on the agenda to talk about and they are memos that are part of this. So, okay.

Mr. Darnell: Those went out to make sure that you guys knew the technical change that was going back and forth.

Chair Beach: Okay.

Dr. Mauro: To add to that, I've been operating on the premise that the precursor documents were all subsumed within the latest round of documents. Although I have to say I didn't go line by then to see if anything is missing.

If anyone has noticed that there is some material in the precursor documents that we did not address in the, what I would say the final of the October 24th deliverable and SC&A's November deliverable that should be brought to our attention because that means there's a hole.

But I don't think that's the case. But we can certainly confirm that.

Chair Beach: Just wanted to make sure.

Mr. McCloskey: Glad to do that, Josie. Okay, moving on to the, I'm going to page through the Metals & Controls Corporation Maintenance Worker Exposure Model White Paper dated October 24, 2018.

The first type of maintenance work exposure that we modeled in this paper starts on Page 3 and it's the Building 10 HVAC maintenance. If you remember I just said that SC&A's report came out in February of this year.

And in there they delved into this HVAC maintenance work first and they took three cracks at it. They had three different models presented in their paper.

And by the time you let a team of good health physicists like them chose three models they're going to have one of the best ones picked. So what we did is we just took one of their models and recreated it here in our paper and used it pretty much verbatim, wouldn't you say.

Dr. Mauro: Yes.

Mr. McCloskey: Yes. And so I'll just talk about the HVAC work. Workers were required to maintain the Building 10 HVAC system. That system handled air that potentially contained suspended contaminants generated during AWE operations.

So we talked to some of the workers at Metal & Controls and there's a pool of maintenance workers that would have been drawn upon to do a myriad of duties. The same pool would have been selected to do some subsurface digging.

They would have been selected to go up into the overhead and do some roof penetrations. They would, some of them would even be selected to do the HVAC maintenance.

So that's who we're calling the maintenance worker.

The dust that would be collected in the HVAC units was resuspended dust that was partially there from former AWE operations.

So the model, what it does is it says that we used the survey data from the end of AWE operations and we generated a 50th percentile of that survey data and, mostly SC&A did this. But and then we resuspend that contamination and we allow for the HVAC system to collect it on their filters.

And then we say that workers would go into these HVAC systems were large, you know, maybe ten foot by ten foot would be a picture you could use where someone could walk inside of this thing and change out a group of filters.

And, you know, they desired to go in there quarterly and do that but they didn't often get in there that often and sometimes these filters, as you can imagine if you've changed the filters on your furnace they get pretty dusty.

And we used a very high dust loading factor to allow for that saturated filter to even crumble and go airborne into the worker's face. So these workers, this pool of maintenance workers did not just replace the filters in Building 10.

They would also be selected to go to all the buildings on site and do this. But Building 10 is the building that we're concerned with.

And so let's see, we've got the geometric mean survey data. We suspend it. We collect it on the air filters and then we use a high dust loading to put that in the breathing under the worker.

And we allow an occupancy of one hour per year for filter change out. And John Mauro talked about this during the May Work Group meeting. You could say it took longer to do this filter change out.

You could say it took three hours, if you do that. But

then which would mean that you came in and did more frequent filter changes, change outs during a year so you came in three or four times a year. You would have more occupancy time inside of that HVAC unit.

But each time we went in the activity level deposited in the filter would be less, right, because there was less time for it to accumulate on the filter, right. So that's where --

Chair Beach: So that was like 1,000 or 1,300 filters I know and you said you're not worried, that was overall the whole site. That was from worker testimony that said that's how many filters there were. How many in Building 10?

Mr. McCloskey: I don't have that in front of me.

Chair Beach: And I get what you're saying. You're giving it an hour at a higher rate.

But if it took longer, if they changed them more frequently, they were supposed to change them quarterly that you're still, it's still a model and you're still just guesstimating on who did what and when and how.

I know some of the workers stated that they did, because they didn't go in as frequently the filters typically did disintegrate. They cut holes into the filters to go up in there to vacuum and sometimes they were vacuuming the foil. So anyway --

Dr. Mauro: Let me help out a little bit here because there's a trick, a short cut that we came up with that greatly simplified the problem and it all goes to the heart of the issue.

You know, picturing, you know, the Classic surface contamination on the surface, okay. And it resuspends, okay. And we know we have lots and lots and lots of data on contamination level on the ground, the surface of the building during the

residual period.

And in fact the original work that was done had that resuspended, I believe, at 10 to the minus 5 per meter. So you get an airborne concentration of the dust in terms of if I know the becquerels per meter squared I can get the becquerels per cubic meter.

So now I know the becquerels per cubic meter in the air, okay. And we know that it's those becquerels that are becoming airborne that are being swept up into the HVAC system.

That's where they end up. So now I know the becquerels and I assume well I'm going to let that go as chronic surface that is continually coming in.

And I could let that go on for a week, a month, six months or a year and if it's a long period of time you're just accumulating more and more becquerels, atoms on the filter, okay. It could be a big filter, small filter, this filter.

It doesn't matter because what we did and here's the trick. We said listen, but we also have a pretty good idea of what the airborne dust loading is in milligrams now.

So we have two pieces of information. We have becquerels per cubic meter and we have some estimate, and this is always discussable, you know, we can vary it, of really micrograms per cubic meter.

So we've got becquerels per cubic meter in there. We've got micrograms per cubic meter. You put them together and you get becquerels per microgram.

Okay, now we have a very special magic, that's the magic number. We have becquerels per microgram of finely divided dust in the air, all right.

Well it's those becquerels per microgram that are being deposited on the filter. So all of a sudden we're

saying, okay, we put these many becquerels on the filter and we know the specific activity of those becquerels not even including the filter, just the becquerels per microgram of dust sitting on the filter.

When we looked at it we first said well listen, this stuff when it crumbles is going to become airborne. But that's going to dilute it because what you have is the becquerels per microgram which really is what's going on in the filter.

Now it's on the filter and if the filter crumbles what that does is dilutes the becquerels per microgram. It lowers the concentration.

So we say we're not going to go that route because that's too claimant, that pushes it toward claimant favorable. Let's make it different.

Let's assume the filter doesn't crumble which is believe it or not a better thing in terms of Matt getting a higher dose. We're going to say we know that we have a certain number of becquerels per microgram, okay, sitting on the filter.

And we pull the filter, okay, we're going to assume that you have a lot of that becquerels per microgram on the filter become airborne. Not a little bit, a lot.

And we said, there's a lot of history to this number. You really can't work in an environment where there's more than 100 milligrams per cubic meter.

We have enough publications, independent work that shows you get up there you can't really work very long in that area, okay. So we're saying, all right, let's assume then that whether it's once a quarter or once a half a year or once a year there's a guy that's going to go in there and he's going to be exposed to 100 micrograms per cubic meter for an hour every time he changes out the filter

We used an hour, okay. And on that basis we said, okay, we calculated what would his inhalation rate in

terms of becquerels be because we know the becquerels per cubic meter now.

You're with me, because we know the becquerels per microgram and we know the micrograms per cubic meter and we get his inhalation rate. So now what we've done is we've bypassed the whole filter problem.

We just said we are putting this guy in a situation where he's going to be inhaling these many becquerels in that our every time he changes out that filter. If he changes out the filter once a year he's going to inhale the becquerels that are per microgram, becquerels that have been loaded over the course of a year.

It turns out if he does it every half year it's going to be half that amount that has accumulated. So it's sort of a way that says it really can't be worse than that.

And the doses we're getting I think that this is the number right here 1.77 millirem per hour. I did not expect it to be that low, but that's what we came out.

And now, you know, we say what other assumptions could have been used that could increase that? Interestingly enough you could get a higher dose if you assumed a chronic airborne dust loading in the room is less than 200 micrograms per cubic meter.

Right now in this room it's about two micrograms per cubic meter, okay. We go in an occupational setting it goes up. And we did a lot of work and there's a lot of publications of 200 micrograms per cubic meter is a pretty good number.

But and I'm saying where's the vulnerability in this analysis. Well I could say that well if we lowered the mass dust loading from 200 chronic mass to let's say 100 which would be a good number too, well what that would do is it would double that dose.

So going, getting a lower mass dust loading increases the specific activity because you're putting the same becquerels on a lower amount of dust. It's sort of a brain teaser. I can see you got it. You got it.

And so where I'm headed with this is that I think the model mechanistically works then it becomes a matter of judgment on two factors. Really we know we have some things that we can hang our hat on.

We know the contamination on the surface. We know by using ten to the minus five per meter as a resuspension factor we're going to get a good high number of becquerels per cubic meter as your chronic long term dust loading in the air, okay.

And we, and then we say, okay, the other question here's where the judgments are made. Well what is the mass dust loading chronically in the air?

We picked 200. We could have picked 100. I don't think you go down to two because in a working environment it does not go to two. That's what it is in this room.

So we pick a number. So where I am on this is I think that we have the data because we have good swipe data. We have a resuspension factor which we could all agree on whether it's ten to the minus five or ten to the minus six.

You go with the ten to the minus five you're putting an upper bound on it, okay. And you have this mass dust loading 100, 200 micrograms per cubic meter. You pick it but it's in that kind of ballpark.

And once you're there you've got your estimate of the internal dose to the guy who is working in the HVAC system expressed in units of millirem per hour. And I think that it's a scientifically sound strategy.

But which number you pick in terms of resuspension factor, which number you pick in terms of airborne mass dust loading is a judgment call. So I considered

this to be a tractable problem just a matter of coming to agreement on what the best default assumptions are.

We picked the numbers we picked. And the most important thing here is we're talking about very small doses.

Mr. McCloskey: Yes, you maximize a lot of the assumptions there because, for things we didn't know about we maximized. Good morning, Mutty.

Mr. Darnell: Yes, one other thing to remember is that we're not actually assigning dose per hour to the worker. So we don't expect the worker to remember I worked for six hours this month and this year on filters.

Any worker in that maintenance category, which includes many of those different occupational categories that we use, are assigned a full month of exposure for both HVAC and for the subsurface model.

So there's two months a year that every worker in the maintenance category gets higher exposure than the remainder of the year, the ten months. They get the rate that's assigned by the ER, right.

So even taking the, well to be fair two weeks, you've worked there for three days we don't care. We're going to give them 173 hours, 22 work days based in that stuff each year.

Mr. McCloskey: Are we ready to move on to subsurface?

Dr. Mauro: Something that you all just pointed out to me that I didn't emphasize enough. While the guy is changing the filter during the chronic time period while this stuff was always there we can go into 200 micrograms.

But when he's changing the filter it's 100 milligrams.

That's because things get really dusty.

And so for that one hour or two hours, whatever time you want to pick, we picked an hour, that dust loading is way up there because it's important to make a distinction between those two numbers.

Mr. McCloskey: Yes, that's an airborne level that people can't tolerate.

Member Kotelchuck: Dave, question. Where do you get the data for the gross alpha activity, the swipe samples? Where do you get it from and when?

Chair Beach: There were 82.

Dr. Mauro: No, there was a continuous characterization of the swipe data during operation. It's, during operations there was swipe data collected.

The degree to which it carried over I don't think that there was swipe data being collected for radiological purposes in the residual period because --

Mr. McCloskey: Not that we can use. It was for a different project that's not covered.

Dr. Mauro: Yes, so we, now you're going back in time now. But the Classic approach to doing residual period is you collect all the data you can at the end of the last year of AWE operations which sometimes includes air sampling data and sometimes includes swipe data.

And we had, I remember had lots and lots of swipe data. And the swipe data represents the activity that's on surfaces at the end of operation which means the beginning of the residual period, okay.

Now what you do is you say, okay, that's at the beginning. So that's the stuff that becomes airborne during the residual period and when you model the amount of that stuff that's on surfaces that becomes

airborne you use this thing called a resuspension factor.

And depending on the setting you could use a high resuspension factor or a low resuspension factor. We use the high, one that puts a lot of dust into the air so that's where, and there was an abundance of that swipe data.

So that's how, that's the rock we're standing on, that swipe data.

Member Kotelchuck: And the, and you let that, you keep that constant during the period or you --

Dr. Mauro: Yes, I think we did keep it. We did not do the .000. We kept on going constant the whole time.

Member Kotelchuck: That's what I thought, okay. All right, thanks.

Dr. Mauro: Yes.

Chair Beach: So any other questions on, thanks, David, Loretta or Henry?

Member Anderson: No, I don't.

Member Valerio: No, I don't, Josie.

Chair Beach: Okay, thanks. Pardon me, yes, back to Pat.

Mr. McCloskey: Okay. So continuing on in that White Paper on Page 7, actually, no. Let's go back to, yes, Page 5. The subsurface inside of Building 10.

So Building 10 is where the radioactive control work happened at Metals & Controls. And as the building aged they would have drainage problems.

Usually when it would rain the rain water would collect on the roof, go down into the roof drains down into pipes through the building and down into the

flooring to main trunk lines to leave the building. But for various reasons those sewer lines would get clogged.

Water would start coming up. You would see it on the floors inside of Building 10. I'm getting all of this from the interviews.

So it was necessary for this same pool of workers and maintenance workers to unclog these drains. People couldn't just slosh through puddles while they're working.

And so they would snake out the drains where they could bringing up sludge and occasionally need to break the concrete and go in and access the clay pipe sometimes, sometimes cast iron and replace them.

But the Petitioner, [identifying information redacted], not related to Michael Elliott who is on the phone they are both petitioners, is a good example of someone in the maintenance pool that would be drawn upon to go do a lot of these activities. In his affidavit he describes them.

But so we were pointed to this need to model the subsurface work and we got a document where the residues inside, the worst case, so they prioritized the drains inside of Building 10 in accordance with the amount of blockage or material that was inside of each pipe and the amount of radioactivity that was in each pipe.

And then they prioritized them priority one, two or three, priority one being the worst case drains. Those are pretty well characterized in a document known as Texas Instruments Incorporated Attleboro Facility Building Interiors Remediation Drainage System Characterization.

In the introduction to that document it says that the drainage system investigation was performed immediately after the Pilot-Scale Interiors Remediation Project and prior to the full-scale

Interiors Remediation Project.

An aggressive investigation schedule was implemented in support of NRC license termination and to assess the potential for inadvertent exposures to non-rad workers performing routine drainage system maintenance.

So that was the intent of this characterization to model exposures to maintenance workers is what they were, what was said in the introduction to it. So we and SC&A used, relied upon this document largely to characterize the subsurface environment inside of Building 10.

And in our initial version of this model we used the 50th percentile of the volumetric sample data taken from this characterization document. Because the discussions at the May meeting where Josie and others brought up the point about, you know, a lot of that sludge during the years was taken out of there.

By the time you go in to characterize it you're not maybe seeing the worst case contamination. So maybe the 50th percentile could miss some of it.

And John is, SC&A in their review of this model even mentioned that we substantially upgraded our model and we moved to using the 95th percentile to accommodate that. So we take the 95th percentile of those samples and, I guess I'm not following along with the White Paper.

I'll get to the calculations later. I just talked about those areas first. On Page 6 we talk about the subsurface areas outside of Building 10.

Chair Beach: Can I ask a question why you're -

Mr. McCloskey: I'll come back to the calculations later.

Chair Beach: -- on those priority?

Mr. McCloskey: Sure.

Chair Beach: Because in Area 7 in your paper that you just referenced, is Area 7 a screen print room? Was that an area you couldn't use because there was one that was 100,000 dpm?

Mr. Darnell: They're two different measurements. The two thousand picocuries per gram is volumetric. The other room is this sort of an examination room. But so they would be used differently in the calculations.

Chair Beach: So this was just the reading on the pipe not the actual material. Is that what it was? I was just trying to understand that.

Mr. Darnell: I don't remember that one specifically. But if it was surface contamination level that would be used in a resuspension model and treated as dose.

Chair Beach: Okay, it was actually, yes, it removed 15 feet of that line. So I was curious about that reading, okay.

Mr. McCloskey: Yes, to model this we would have used just soil to model exposures to people that are digging in soils, not surface contamination. Okay.

The subsurface areas outside of Building 10, following along on Page 6. So primarily the Waste Burial Area is an area that the site was allowed to bury radioactive waste for a period of time between Buildings 12 and 11, I believe.

So, and also the area surrounding Building 10 we have volumetric sample data from there. The metals recovery area, all of these are referenced.

This a place where they would have burned some waste and recovered the precious metals or actually maybe the uranium after burning and recovered them. The Stockade Area, Outdoor Storage Area, the Railroad Spur Area and the Building 12 West and

South Lawn Areas all provided us with volumetric sample data that we can use in our model.

Now we're talking about the bounding subsurface exposure model on Page 7. Let's see, so OTIB-70 provides a way to do this to create a model with volumetric sample data.

It has some assumptions that we felt were not bounding for our model. So I'll talk to you about that. We have created, we have enhanced the model somewhat and went outside of OTIB-70 guidance.

Chair Beach: So you're not actually using OTIB-70 or just parts of it?

Mr. McCloskey: Just parts of it. The guidance book of OTIB-70 but not the default assumptions that are in it.

Chair Beach: Okay.

Mr. McCloskey: So the subsurface environment inside Building 10 is characterized with 20 sediment samples collected from the drainage systems in '95 prior to remediation. They were analyzed for uranium with iso ID. They were compared on the spreadsheet where we calculated the geometric mean at 185.52 picocuries per gram. The GSD was 9. And then we go on to say that drain system required frequent maintenance that included, during the residual period included the years prior to characterization.

And since this maintenance could have potentially removed sediments with the highest remaining concentration and made the GM value under-conservative, NIOSH calculated the 95th percentile concentration of 6,887 picocuries per gram. So this is where we dramatically increased our model from our prior release of this using the 95th percentile.

Now let's talk about what we did on outside areas. We, the first version of this we used some math

where we combined some averages and didn't use the raw data.

In this most recent iteration of this outside model we went back and pored through a FOIA document that had thousands of pages and we found all the raw data so that we could do a more mathematically sound model. And so --

Chair Beach: Wait, can you go back. What did you find, what document?

Mr. McCloskey: It was the raw data in a FOIA document that was --

Chair Beach: Okay, and that was, got you.

Mr. McCloskey: It's referenced here, Josie.

Chair Beach: No, I have it. I have it. I'm just trying to keep track of what you were using.

Mr. McCloskey: We did a faster approach the first time to get this out. But the second time we used a team of data entry folks and they spent a significant amount of time coming up with this model.

But it's more robust. And so we took -- used those samples from all those outside areas and it amounted to 2,391 soil samples collected prior to remediation.

Member Anderson: So those were all collected over just a couple of days?

Chair Beach: Is that the '82 or '83?

Mr. McCloskey: There were several reports written. So they would go and do each one of these areas as a separate project, mostly. So, you know, I can't say exactly how long it took to collect the samples though right now. I could look it up.

Member Anderson: Okay.

Mr. McCloskey: So they were analyzed for gross

alpha and 762 were analyzed for uranium and thorium using iso ID. So we had some of different categories.

And what you do is you, the gross alpha you can use in both the uranium model and thorium model. They can go either way. I'm just saying all the gross alphas or even uranium depending on which model you're creating, but the iso ID ones they specifically were, they belonged in the uranium and thorium model.

So you compound in a spreadsheet and for uranium we calculated geometric mean of 9.54 picocuries per gram, GSD of 4.61. Because again, we enhanced this model in the past we used, we would have stayed right there with that geometric mean.

But because maintenance over the years could have depleted some of the available radioactivity that have been sampled to accommodate that we moved to using the 95th percentile and came up with 117.86 picocuries per gram that we used to bound the exposures.

So that's for uranium. And for thorium we have, we calculated a GM of 4.57, GSD of 6.02. Same scenario where we thought the GM might have been under-conservative.

Substantially improved our model. Used the 95th percentile and came up with 87.55 picocuries per gram. So that's the sample data.

And what you do with OTIB-70 is you would combine that with a dust loading factor puts it up into the air. So you have your contamination. Now you need the dust loading to see how much goes airborne.

We felt like the OTIB-70 model was not representative of the progressive type of work that occurred during this subsurface work. So we looked at, elsewhere to see where someone had modeled excavation type work to see what kind of dust loading

could be created from that work.

And there was a project done at the Mound facility that we felt was representative of the same type of excavation done at Metals & Controls. We are required to use -- what is the OTIB method?

Whenever we use surrogate data we have to use OCAS-IG-004 to validate that you can use, you know, a surrogate model and that it's viable, it's valid to use it at your site.

So the next few pages of this document talk about how the dust loading study that they did at Mound is similar to our work. I won't go through that unless you guys want to.

Chair Beach: That work went on in what spring of '97 and we're, is that correct, the Mound work?

Mr. McCloskey: Let's look at it.

Chair Beach: Yes, it was during the spring of '97, okay.

Dr. Mauro: It might be helpful to --

Mr. McCloskey: We used the 95th percentile of that dust loading and that puts it at 220 micrograms per cubic meter which is above or which comes in real close.

Dr. Mauro: We were pleasantly surprised that, we completely did it differently and we came up with 200 you came up with 220. Our 200 came from a very, very thorough research of the NUREG/CR-5512 literature on dust loading for mediation projects.

Just what kind of dust load you get when you were out there digging around, remediating for dust. And the number that we picked was 200.

I have little table that we'll get to later comparing the differences of assumptions. And they're remarkably similar, okay. And so I'm just trying to point out that

I know the use of the Mound data, someone can say well that's a surrogate approach.

Okay. And when we saw that said well we didn't do that. We didn't look there. We completely did something different and, lo and behold, we come in at about the same place.

Mr. McCloskey: Independent, yes.

Dr. Mauro: So that's the really good news.

Mr. McCloskey: Yes, thanks for reminding me, John. I forgot. Okay, so we also do some other things in this paper to validate the model.

We talk about some urinalysis results that we have from D&D workers who actually worked with some of these worst case soils. We have a model that shows how much uranium would have been in urine if a worker worked in our model what they would have produced and looked at what was actually produced from some of the workers.

It did some of the D&D work and it compares favorably.

Chair Beach: That was during the later years, the '90s?

Mr. McCloskey: Yes. That's on the bottom of Page 10, that discussion. Okay, so therefore the default, I'm reading from Page 11 now, therefore the default OTIB-70 dust loading value will be increased to the 95th percentile value that we just talked about, the 220 micrograms per cubic meter for the Mound project studies.

And when multiplied with the 95th percentile, now this is our upgraded amount we used in our percentile we came up with air concentrations listed there 1.52 E minus 12 microcuries per milliliter for inside uranium. Outside uranium is 2.59 E-14 microcuries per milliliter and outside thorium of 1.93 E minus 14

microcuries per milliliter.

So those are the air concentration we projected the workers would have breathed during that work. Let's see, is there anything more to say about that.

We're going to talk about some other things we've enhanced with this model which would be the occupancy rate which is the amount of time that these workers we predict spent doing the work. We're going to get to that at the end of this paper.

So now let's move on to the Building 10 roof and overhead area. I think Rose refers to it as the roof and rafters method. So during the, so this is another one of those maintenance type scenarios that was brought to our attention both from the petitioner and/or the interviews we conducted.

During AWE operations from '52 to '68 major portions of Building 10 were engaged in the manufacture of nuclear reactor fuel for the Navy and the commercial power and AEC research reactors along with various components of natural and depleted uranium.

With the exception of HFIR these operations were concluded in '68. The building area used for the concluded operations were -- okay, HFIR is an operation conducted at the Metals & Control facility that is not considered covered work but it stands for the High Flux Isotope Reactor in Oak Ridge, Tennessee.

It's not a weapons related project. Let's see, we're contributing with the candidates that were interested in bounding exposures for.

M&C AWE operations involved numerous metal finishing operations including melting, forging, extrusion, rolling, chemical milling, machining, welding, and assembly. Several of these operations generated fumes and aerosol particulate emissions captured by the local exhaust ventilation and deposited that material on the roof, on roof-mounted

equipment.

In addition, some of the contaminants generated during AWE ops that may not have been captured by ventilation were resuspended and accumulated in the overhead area. So that's how we got the dust where it became a problem for workers that would go up into that overhead area.

Let's see what I want to talk about next here. So the next couple paragraphs talk about how the building is laid out, the ventilation system that was installed, how the NRC came in to help Metals & Controls close out their license. They wanted to do that in 1982. They did some surveys to validate the work that Metals & Controls did.

So this discussion just talks about where our surveys came from that we used in this characterization of the overhead area. At the bottom of page 13 we talk about the construction of the roof.

There's a diagram on the top of page 13 of how the building was laid out during some of these surveys. The bottom of page 13 we are talking about construction of the roof, the makeup, how it was built.

And then at the top of page 14 I'd like to read during the residual period, while performing maintenance work in Building 10 overhead area and on the roof, M&C workers were potentially exposed to contamination remaining from the AWE operations.

Their work included installing pipe racks, replacing lights, welding supports to the trusses to fortify the roof, cutting and drilling up through the roof to make penetrations for running services to rooftop equipment such as air conditioning systems, recirc water, chilled water supply and return, steam and condensate return, and installing equipment on the roof.

This is another one of those types of maintenance

activities that someone like [identifying information redacted] did a tremendous amount of. You can see his discussion on it in his affidavit.

Now we go on to say that we were aware that there was some cleaning that occurred up in the overhead area. But for the most part the consensus was that it was extremely dusty in the overhead area. So we didn't take any credit for that cleaning.

Now we talk about the Building 10 roof and overhead area bounding exposure model on page 14. What Metals & Controls would do is they would grid off the areas that they wanted to survey and come up with the average and the max contamination levels per grid.

And now we're talking about surface contamination, units of disintegrations per minute per 100 centimeters squared. We're done with volumetric sample. We're moving on to surface contamination for this part.

The surveys were done with direct probe measurements. As we're done in the ER we say that ten percent is an NRC guidance document that allows you to assume that ten percent of fixed contamination is removable.

So that's the amount we say would be available to go into the air, to be resuspended. That's that part of the calculation. And these surveys come from, you know, the conduit lines going across the ceiling area, the bus ducts.

Bus ducts are square aluminum casings that hold electrical lines. You know, I'm sure you guys are seen them in your facilities. That also is surveys of the wall areas above I think the two meter height in the ceiling area.

So it has surveys of all of those areas. And then we also, and so all of those are gridded out. We take the average of those survey grids.

There's also surveys on the roof itself, surface measurements and they take them in a circular pattern out from the exhaust.

Member Kotelchuck: This is Dave. Surface measurements made on the roof made in 1982, right?

Mr. McCloskey: I think that's true, yes.

Chair Beach: I was going to say are you combining surveys in the '82 and in the later years or because I thought the '82 was a more smaller area not the whole, like you're kind of describing it as the whole area.

Mr. McCloskey: This is all the '82 time frame.

Member Kotelchuck: Could I ask, Dave, I mean what, you're taking data from the roof in 1982 and that's going to characterize '67 through beyond '82, into the '90s. I don't, I haven't looked at roof surveys, but is there any consideration of weather? I mean heavy storms, northeast weather. I mean why would 1982 be more than a picture of 1982 and be able to be universally applied for decades?

What, how do you know it didn't occur right after a storm? The inside I understand storms, that's protected area. But the outside data I just don't understand how weather folds into it.

Whether that weather, was it looked at, should it be looked at?

Mr. McCloskey: Well, that's a great question, I mean a fair question. There obviously is going to be some reduction because of the environmental factors that you just mentioned.

Member Kotelchuck: Yes.

Mr. McCloskey: And I mean it's largely fixed contamination, right. It's, even though we take

credit for ten percent of it being loose it was there by direct probe measurement and we select the 95th percentile of it to --

Member Kotelchuck: Right, but that 95th percentile is, I mean, if you will, better than the 50th percentile. But I don't, I'm not sure that -- I mean you're arguing that it's in the grain of the roof and the roof attached physically somehow to the roof tiles or tar or it's not superficial.

Mr. Darnell: The contamination used, this is Peter Darnell, that were used were of fixed contamination. We assume an amount of that fixed contamination becomes used for worker exposure.

But those surveys were done by direct readings. Put the probe on the surface. Come up with the contamination level that was there.

Chair Beach: So and I'm reading the '82 area survey then it seems pretty limited. It says the surveys were limited to 67 of the 214 grid blocks of the HFIR area located in Building 10 that tells you the figure two of the four grid blocks located in Building 3, nine of the 31 in Building 4.

So and then around the vault area. So I'm wondering was there more than just what their paragraph said they, it looked like a pretty small area in 10 and I didn't, it didn't mention the roof at all in that '82, '83 report.

Mr. Darnell: You also have to realize where most of the radioactive work was done.

Chair Beach: No, I know. I understand that. I know exactly where it was done. But --

Mr. Darnell: These surveys the concentration is in that area.

Chair Beach: Sure.

Mr. Darnell: Then there were other surveys taken out. So we used 95th percentile of the worst case area and applied it to everything else.

Mr. McCloskey: There is certainly more than what I just heard you read there. And Pete --

Chair Beach: That's just one part of it. I quickly looked through this last night.

Mr. McCloskey: Pete emailed three spreadsheets to all of us.

Chair Beach: Got it.

Mr. McCloskey: Is that what you have open at the moment?

Chair Beach: Yes.

Mr. McCloskey: So that's --

Mr. Katz: That's not the spreadsheets.

Chair Beach: No, I have the spreadsheets across the top. No, I was looking at the paragraph that he used from the spreadsheet. This actual document.

Mr. McCloskey: To find specifically where we got the survey points from, the SRDB document you can go right through the spreadsheet and it shows you what page we took them from and you can find them all.

But certainly more than what we just read there, Josie.

Chair Beach: I looked those up too. But I looked up the header just to see what their overall was and then I didn't have time to go through all of these. I'm sure SC&A has, Rose has got them.

But I was just trying to see kind of what their focus was and where their focus was and like Dave was asking what time period it was done in.

Mr. Darnell: I have it here and we could go through this document and try to explain it.

Chair Beach: There's also some --

Member Anderson: There's also what season and what was the date of it?

Chair Beach: I think it was in March, February, March time frame, I believe, wasn't it, Pat?

Ms. Gogliotti: There's also only certain areas where you would expect to find the contamination because there's only certain, where the roof was exhausting. You're not going to find it far.

Chair Beach: Sure.

Ms. Gogliotti: So we focused around where the exhaust was.

Chair Beach: You can go back to see how many squares of roof they took out in '96 because it was contaminated. And that stuff spreads.

I mean if it's a rainy day and it's exhausting it can spread to different portions more than just below. But I mean I understand where the main concentration would be. But there's variables.

Dr. Mauro: So I'd like to really sharpen what the issue is. In the 1983, '82 time frame the NRC comes in, wants to get an idea of the kind of residual radioactivity might still be here because you can't terminate the license without convincing themselves the place is clean.

Chair Beach: Right.

Dr. Mauro: And part of the things they did is go up to the roofing locations whether it was indoor or outdoor I can't say for sure. Rose just indicated to me that included both, indoor/outdoor.

Certainly the issued raised by David well the outdoor

data is certainly suspect because who knows. The wind could have blown and whatever. The indoor data less so.

Member Kotelchuck: That's correct.

Mr. Darnell: That's not actually true. Once you fix contamination unless you have a fairly significant event like removing the tiles like tarring over or something fixed contamination is fixed contamination. It's going to stay there.

Chair Beach: Did they go all the way to the layers or did they just go to the top of the gravel because I know there was gravel and tar? So they went down to that tar surface above the roof.

Mr. Darnell: They took the probe.

(Simultaneous speaking.)

Mr. Darnell: They studied all the direct from all the layers.

Chair Beach: But did they put their probe at the gravel or did they swoosh the gravel aside and go to the tar layer where it would be fixed? So I mean there's --

Mr. Darnell: Being an ex-health physics technician I can tell you they did not.

Chair Beach: So, anyway --

Dr. Mauro: So the important question is, the takeaway from this is a number of 8.99 dpm per 100 centimeters squared is the block you're standing on as being a number that represents that upper 95th percentile contamination level that was available to be resuspended and inhaled by workers who might be involved in working up there near the roof and the rafters.

And then what was done with that, which is the upper 95th percentile the argument being well that's

probably conservative. That is the people that actually did that work probably experienced and here's the argument for better or worse.

Probably worker was lower than that on average when they were out there. But we're going to go with this upper 95th percentile number. And on top of that they did something that we really like and we talked about.

They used the highest resuspension factor you folks have ever used in 14 years.

(Simultaneous speaking.)

Dr. Mauro: Used ten to the minus four per meter as being that because we're saying this is about as nasty as you can get. And we put that up and, did you ever use a bigger one than that? I don't think so.

Mr. Darnell: We are not trying to set a precedent just by doing this.

Dr. Mauro: As an auditor when I saw that the bell rang.

Dr. Neton: I think we may have used Linde for some D&D.

(Simultaneous speaking.)

Dr. Mauro: So, you know, herein lies where these judgments come in. I mean we will, you've got a window of time and a few weeks I think or whatever days in the 1980s when the NRC comes in and they decide we're going to go pick a few places and go poke around because this place may still need some remediation.

Now I'll operate on the premise that they went to the place that they thought would be most indicative of where there might be some problem, okay. Now whether they missed some is a good question, who knows.

But that's a judgment they made. And they picked it and that data is available. There's a lot of numbers. The number of measurements made, here we, we've got hundreds of alpha beta-gamma surveys where they surveyed and we've got 150 plus swipe samples.

There's a body of data that we have. And it was all collected, I believe up near the rafters or the roofing of Building 10 unless I got it wrong.

Mr. McCloskey: One thing I'll say about the roof, you know, surveys of the roof, I had that spreadsheet open that Pete sent to all of us. And so there's like 288 lines on that spreadsheet.

And it's just the final six lines that are the exterior, outside samples that were rolled into the larger body of samples that we don't have concern about. So they are a fact, you know, in that large group is somewhat diminished right there.

Dr. Mauro: I think that's a good point that we should record otherwise the issue that was raised by David is one that we did not explicitly talk about. That is there might be a difference in the kinds of levels you see in protected areas versus unprotected areas and the degree to --

Member Kotelchuck: I mean if there are only a limited number outside and that's what I was wondering because I recognized that some were outside and some were inside --

Mr. McCloskey: Six outside.

Member Kotelchuck: -- drop them.

Mr. McCloskey: We could do that. I mean --

Member Kotelchuck: Drop them and see, you probably will get similar results at least you wouldn't have to deal, I think, with the issues about the roof.

Mr. McCloskey: We had the data available to us.

Petitioner said they drilled through the ceiling up into the roof. Material would come down from there.

We had only used samples closest to the exhaust which would have been your worst case which is the 95th case percentile of those. So, you know, we took steps to maximize our assumptions. But we could look at that if --

Let's see, I think John stole a little of my thunder here. We used the survey results --

Dr. Mauro: I couldn't help myself.

Mr. McCloskey: -- came up with a GM.

Chair Beach: And you let him.

Mr. McCloskey: And GSD. The Building 10 overhead and roof areas required frequent maintenance. I'm reading from Page 14 toward the bottom there.

Required frequent maintenance during the residual period including years prior to the surveys used to characterize the area. Since this maintenance could have potentially removed accumulated dust with the highest uranium concentration and made the GM value under-conservative we calculated the 95th percentile contamination and used it to bound exposures.

The workers that went up there performed aggressive operations, for example, cutting and drilling that would disturb the heavy accumulated dust in the overhead area therefore NIOSH will apply unprecedented ten to the minus four for this work and the resuspension and apply that to the 95th percentile.

And the GSD and resuspension factor determined the air concentration that the roof and the overhead maintenance workers were exposed to of 4.05 E to the minus fourteen microcuries per milliliter concentration.

Dr. Mauro: I'd like to add something to that. We went one step further. So what kind of doses are you talking about? We get a .01 millirem per hour.

Dr. Neton: Well that was going to be my point, you know, that those were pretty small even given all the very conservative assumptions.

Dr. Mauro: And I think we've got the fact, you know, yes, we've got these uncertainties on what's the best number, what's the best resuspension factor and we're talking about .01 millirem per hour.

How many hours up there? They did, you know, we can talk about that too. But this is an overall, I mean, the extent to which the Board wants to factor in as a weighting, making judgments they've done it before where they said, you know, we're getting into some of the granularity on what's the best assumptions.

But always keep in mind that, you know, given the degrees of freedom you have and the different assumptions we're actually talking about a fraction of a millirem per hour. So I don't want to lose sight of that.

Mr. McCloskey: Good point, John. We move on to ingestion rates on the next page, Page 15. We used the NUREG guidance that allows for two milligrams of ingestion per work day.

We used that for the subsurface work. And then when we start talking about surface contamination we will use a different factor ten to the minus four per square meter per hour will be applied to surface contamination levels for the roof and the overhead workers. So two different types of ingestion rates based on the NUREG.

For external rates we again used the film badge data taken at the end of AWE operations. We used all of the data from 1967, the last year of AWE ops.

Those film badges were processed quarterly by

Landauer. We determined the quarterly GM dose and the GSD. And in the next paragraph we're talking about occupancy rate.

But since the maintenance work lasted no more than two months per year external exposures would be assigned at the rate of two-thirds of that quarterly dose determined from the beginning of the residual period using the GM dose and GSD.

No source-term depletion was applied because of the maintenance areas not being reduced by environmental reduction factors or cleaning. The occupancy rate, this is another place where we significantly upgraded our approach since the first White Paper we only allowed for one month of exposure for maintenance workers.

We went back and we looked at the interviews and we determined that, yes, the one month criteria that we came up with was mostly associated with the subsurface making it out of Building 10 primarily and maybe didn't accommodate some of the other maintenance activities such as HVAC maintenance and work on the overhead and thought it would be prudent to double that occupancy up to two months per year like Pete alluded to earlier with the remaining ten months of the year not left at a zero.

But we give them, we used the ER's method of bounding those exposures and that's the resuspension of contamination, residual contamination.

Dr. Mauro: I'd like to add an item that is important. We know that not the same person was always doing all this stuff. We're assuming, we listened to the workers on October 24th to the 26th last year.

And they made it very clear that different people were sent in. In fact, it was one of those things where I don't want to go, you go.

Mr. McCloskey: Junior guys.

Dr. Mauro: Junior guys said we're going to send you in a barrel. You're going. So what we did here we realized that in any given year whenever any types of these kinds of dirty work, especially the subsurface work indoor/outdoor was done they sent someone in that was available that was, but it usually wasn't always the same guy.

So we assumed it was always the same guy.

Mr. Darnell: We assumed everybody in that worker Class did it.

Dr. Mauro: Did it, so --

Mr. Darnell: Each one of them did the two months a year.

Mr. McCloskey: From '68 to '90.

Dr. Mauro: Right.

Ms. Gogliotti: Why 173?

Mr. McCloskey: Say that again, I'm sorry.

Ms. Gogliotti: Why 173?

Mr. McCloskey: Hours per year.

Ms. Gogliotti: You said 22 days. But that would be 176, so where's the disconnect?

Mr. McCloskey: So that's 22 work days per month. Go ahead, Mutty.

Dr. Neton: Is it a calendar year versus the --

Ms. Gogliotti: Just a couple hours difference. I was curious.

Dr. Neton: I think if you normalize it for calendar year you end up with --

Mr. Sharfi: I think it's 1/12 of 2,000 versus four weeks. Is that right?

Dr. Mauro: When I originally was listening to the story it was clear that we were trying to elicit from the 12 folks, the ones we knew of, how much time, you know, because, you know, they had to think back.

And I remember, you know, we're talking about the equivalent of one month a year or two month a year, you know, and it was sort of a fuzzy. And so what I would, when we did our work, quite frankly I didn't, I just said let it go 200 hours per year.

You know, because it sounds like it rings true from that. But that doesn't mean that's the best number. And then --

(Simultaneous speaking.)

Mr. Katz: You were fine. You were talking. But there's crosstalk here some.

Dr. Mauro: All I'm saying is I hear where you're going.

Mr. Darnell: It's normalized for vacation, that's why.

Mr. Sharfi: Actually normalized for no vacation. So it was 40 hours a week, 52 weeks a year divided by 12 months it's 173 hours per month.

Chair Beach: Some of those interviews I read said they were here seven days a week, lots of overtime. So, I mean it depends on what you, which interview 12 was.

Mr. Sharfi: I mean that's the basis of the 173. You could argue whether or not that number could be, you know, adjusted.

Chair Beach: It's a guess. And it's a Site Profile issue.

Mr. Darnell: You're talking about extremely low, low doses. So if you give them --

Chair Beach: I'm not concerned about that extremely low, low dose.

Mr. Sharfi: So what you're saying is they were physically doing eight hours a day of trench work for 40 hours a week or, you know, per --

Chair Beach: Some of them were. So some of them were digging trenches from outside in the burial ground --

Mr. Sharfi: With no breaks or --

Chair Beach: -- based on interviews. Well you're going to have a lunch break.

Mr. Sharfi: We're assuming no breaks, no time off, no clean-up, no prep time to --

Dr. Neton: You had it right. So it's a Site Profile issue, right.

Chair Beach: This is. So I'm not worried about the eight hours or months. Once we get to that point if we do then we'll hash out that.

Mr. Sharfi: That would only affect the internal because the external is based on dosimeter badges.

Dr. Neton: Dosimeter badges.

Chair Beach: Right. But did you ever get your question answered why the 173?

Dr. Mauro: Well, what I'm saying is you've got to pick a number. What we're going to pick sounds like, you know, it's using an informed judgment whether we're talking about 170, 200 or more or 300, whatever it is.

It will need to be justified. It is a Site Profile issue. It is certainly not an SEC issue. So to me, yes, we've got to still work on that.

When you finally put the final product out with your

procedures that will all be worked out. But I think it's more important to acknowledge whether or not that strategy for coming at the problem seems to be reasonable and do we have sufficient data upon which to build on that strategy.

The particular number we pick is a number that, you know, we will settle on eventually.

Chair Beach: All right. Does that conclude where you're at?

Dr. Mauro: Yes.

Chair Beach: Any questions from Board Members on the line? Loretta --

Member Anderson: No, I think we've been covering it. It's a lot of, how do I say it certainly those decisions made are, you know, upper bounding. The question is more the reality of it.

Chair Beach: Right.

Member Kotelchuck: Yes, Dave. On external rates coming back to it let me understand. The film, I just, I want to make sure that my understanding is correct.

They took the film badges at the end of the AWE operations. Now because maintenance were not considered to be exposed the film badges were for operational people they did not include any maintenance people, right?

Mr. Sharfi: Right.

Member Kotelchuck: And so to take care of the maintenance I'm not talking about the occupancy rate. But it was decided to say maintenance is two-thirds of the operational people, right. But that's --

Mr. Sharfi: No, that's incorrect.

Member Kotelchuck: But there's not a maintenance

worker in that group from which you decided to take two-thirds.

Mr. Sharfi: That is incorrect. The two-thirds is only going to count that the badges were quarterly and so that two months of a quarter is two-thirds of the quarterly dose.

So we're assuming 100 percent equivalency. We're just saying the occupancy is two-thirds of a quarter.

Member Kotelchuck: Okay, I see what you're saying. All right, that's, so you're assuming maintenance is the same as operational at the beginning of the period?

Mr. Sharfi: Correct.

Member Kotelchuck: There is no maintenance measurement wheel. But it's, they couldn't have, you know what I'm saying, you can't have gotten more than the operational people, correct?

Mr. Sharfi: Right.

Member Kotelchuck: Who were at their jobs being exposed eight hours a day or ten or whatever.

Mr. Sharfi: That is the argument.

Member Kotelchuck: All right, okay.

Dr. Mauro: Dave, this is John Mauro. You just brought up the single issue that I have my greatest concern with and we will be talking about that.

Member Kotelchuck: Okay.

Dr. Neton: I don't think I have an answer.

Mr. McCloskey: That was a good format where you were able to chime in on parts of this that --

Dr. Mauro: Yes, I just try to, you know.

Member Kotelchuck: Yes, good.

Chair Beach: So what do you think before John starts does anybody want a break?

Mr. Katz: A couple hands went up. So we'll take a ten minute break. Is that enough for everybody? Ten minutes. So about ten we'll restart.

(Whereupon, the above-entitled matter went off the record at 9:51 a.m. and resumed at 10:01 a.m.)

Mr. Katz: Okay. We are back. We have, I'm assuming we have Dave back on the line and Andy and --

Member Kotelchuck: Here I am.

Mr. Katz: And, Loretta, are you there? Maybe you're on mute. Loretta, are you with us? Why don't we give her a minute.

Member Anderson: I'm here, Andy.

Mr. Katz: Thanks. We're just waiting on Loretta and then we'll get going again.

Member Anderson: Okay, I was on mute.

Member Valerio: It's Loretta. I'm here.

Mr. Katz: Okay. Great. And we're off. We're off. John?

Dr. Mauro: Hey.

Chair Beach: Yes. Yes, we're on to --

Mr. Katz: John's up.

Dr. Mauro: Okay. We received the October 24, 2018 report, I think it was early November, and we got to work on it. And the people that did all the hard work, Bob Anigstein, who's on the phone, and Rose, who's here. And I was the one that sort of dreamt up some of the strategies that we would use and, but the going, what I call the actual deep dive, going into the

data, assembling it and making spreadsheets, that sort of thing, the hard part, Rose and Bob did, and conceptually, the approach that we took, to a large extent, were my ideas to the degree, and the main mission that I had was, can I -- do we have enough data?

Big, the big thing is, do I have enough data to allow us to build models that one could consider, yes, you could reconstruct these doses, what the actual dose is you will use, and derive what assumptions will be performed. I call that a Site Profile issue. The bigger ticket item is how do you do it. Do we have enough data representing all of the different circumstances we might have encountered, that somehow you could build these models?

So I mean, and in fact, that's the, what I did was after I sent out our report, that I believe everyone received, and you can tell that it has not gone through our technical editor because there's a -- there's a misspelling in the title, but that's okay. What we did here is, normally the process we go through is after the document is drafted, which is really a combination of Rose, myself, and Bob, then goes for independent review, which it did, to the extent we could because it was done over the weekend, the independent review. And then, it usually goes to our technical editor, Anne Brophy, who makes sure that it's formatted correctly, syntax is correct, spelling's correct, and it meets 508 compliance. It didn't go through that.

So what you have in front of you is what I call a preliminary draft, intended for use for this meeting only, and based on the outcome of this meeting and what we learn, we probably will reissue the final digital version that will go on the record for public distribution. Okay? So sort of give my excuses up front.

What I did then is I realized that not everyone's going to have a chance to read the whole thing, and I have

a limited amount of time to tell my story. So before I caught my flight, I put together a briefing paper, a briefer version. Am I correct that everyone has received this other document, which I'm going to use right now to flip through and tell my story? Okay? It's a slide, but it's not really slides, I just used Word. I didn't use PowerPoint. I don't like PowerPoint.

Status of Any Remaining SEC Issues

Dr. Mauro: Okay. The first -- I'm just flipping pages. I apologize. I forgot to put page numbers on it, but the first page, you'll see the heading says Major Perspectives, okay? And that was the point I was making earlier, from the big picture standpoint, we're sitting here with the Work Group, and the way to look at what we're going to talk about is SEC issues and Site Profile issues.

Sometimes they blend and they're hard to separate, but the more, I think the most important thing we can take away from this is, are we at a place where we think doses can be reconstructed in a claimant favorable way and with sufficient accuracy, or not? And that goes toward the SEC issue, a judgment that's made by the Board.

In this write up, you will see me use words like scientifically sound and claimant favorable. That's the implication that we think it's okay, but whether or not it means what's called sufficient accuracy, which is part of the regulations, that's a judgment call made by the Board. You know, notwithstanding what we say about scientifically correct or, ultimately, the real trigger, is it -- does it meet the criteria for sufficient accuracy, which is a judgment call made by the Board. I guess that, then, is a recommendation made to the director of HHS.

So when we look -- go through this material, it's a good idea to think in terms of SEC issues versus Site Profile issues, which is what we did a lot of already, okay? Right underneath that, you'll see something

that says major sections.

I've organized this material in a way that I felt was easier to tell my story, and in my mind, our takeaway from this is that, as you -- originally, when the first SEC Petition Evaluation Report was issued by NIOSH, it focused in on what I call a conventional residual radioactivity pathways.

A good example of that is at the end of operations, AWE operations, what happens is, and what happened was, they remove all of the fuel. No more fuel onsite because they were -- they -- up through '68, they were doing fuel manufacturing. They were doing it for the -- I believe the Navy, and they were doing it for the weapons complex. The -- the workers that were involved with the weapons complex are considered to be AWE workers, and they were granted an SEC, and the reason they were granted the SEC, because of the inability to reconstruct internal doses for thorium. So we've got an SEC for these workers up to 1968.

Then the next step in the process was -- and the report was put out. NIOSH said this is how we're going to do it, and it was a fairly conventional strategy that was used on many AWE residual period analyses.

The, as, you know, as we discussed earlier, the claimants rightly pointed out, you guys missed the boat. During the AWE period -- I'm sorry. During the residual period, there was a lot going on. There was all sorts of maintenance work going on, and refurbishing work, which means that they tore up the concrete, they dug holes, they replaced conduits and piping, and people were deep down inside, and they were doing all this work, there was a large team of people doing all this work from 1969, I guess, right into the 1990s, and all of this time, they were doing it under the impression there was no radioactivity down there.

Chair Beach: So you meant '68 through --

Dr. Mauro: '68, I think --

Chair Beach: Yes.

Dr. Mauro: -- they distributed that, but whatever the date is.

Mr. Darnell: John?

Dr. Mauro: Yes?

Mr. Darnell: They were working under the impression that they -- there was -- there was no impression. They weren't told there was, they weren't told there --

Dr. Mauro: Right. Right.

Mr. Darnell: So you can't -- they were working under the impression. There was no --

Dr. Mauro: Fair enough, yes. There was -- when we talked to them, the impression they left with me is that they did not -- no one told them that there might be radioactivity down there. They just did their job. Okay. Now, and this was -- there's an interesting side to this is that, these folks came in, 12 of them came in, each one sat with us for at least an hour or two, and they just explained what they did, okay?

And it was up to us to collectively figure out what is it that they did that could very well have resulted in them experiencing some type of exposure, external or internal. And it was up to us to say, okay, we, SC&A, and in parallel NIOSH, came up with four potentially significant exposure scenarios, the ones that are listed here on the page, okay?

So the question we have to ask ourselves, do we have sufficient data, and can we reconstruct the doses, perhaps assign bounding doses, for people that were involved in each of these four different scenarios? This is over and above the base scenario that was

originally done, where everyone was exposed to residual radioactivity that settled on surfaces, that became resuspended. That's your baseline.

This is really superimposed on top of that because the workers at the site that we interviewed said you guys missed these, and they -- and we sorted it out this way as being, okay, these are the categories of exposure scenarios that we missed, and that now we've got to ask ourselves, can we reconstruct them? Okay? And the way I've organized this is -- think in terms of this.

For each scenario, you're concerned with external exposure and internal exposure, and also you'll see that we make a distinction between working indoors and working outdoors, and that's all going to emerge as we discuss this matter.

Oh, one more thing. Also, working aboveground and working belowground, okay? So you've got all these different boxes that you want to hit. Can we -- can you do all of that? The next slide is called Building 10 HVAC Maintenance. This is where we opened up with. Remember I was telling my little story about the dust, the specific activity, and the inhalation doses? And I think enough was said on that. It was described very well by Pat.

I added my two cents in, and we came up with these doses associated with changing out the filters, okay, and how we did that, and what kind of doses we got, and that -- so we don't really need to spend too much time on that. I think it's been well-covered.

So we're going to move on to the next category of exposure scenario. Okay, now we're talking about what I call the building roof scenario. This is where people were doing maintenance work up on the roof. And again, as was pointed our earlier, in 1982, the NRC came in for a short period of time and collected -- and we're going to be following these bullets, that might be helpful -- and collected data.

It included survey -- hundreds of alpha beta gamma surveys, and according to our work, 154 swipe samples. By the way, Bob Anigstein did this work. He's on the phone, and, Bob, if I say anything that's incorrect, or you would like to add more, please jump right in.

So Bob dove into the data that was available to us with the understanding that, yes, this captures the important data of what the contamination levels were. And, okay, so there's the rock we're standing on.

Do we have enough data characterizing the levels of contamination, recognizing that it was collected by the NRC over a short period of time in particular locations, I believe in Building 10, and they collected that data and determined that there was some contamination here that could be a problem. So we used that as our starting point for that scenario, that is for those workers whose job it was to occasionally go up to the roof, go up to the rafters, and do some maintenance work.

And in the process of doing that, they could have been exposed to the inhalation of resuspended activity. It turns out NIOSH's report summarized the data, and in the end, they said, well, we're going to pick the upper 95th percentile contamination level that we observed. So -- understanding that you'd use the survey data, not the swipe data, the survey data, and said -- and got a DPM per 100 centimeters squared, and picked 10 percent of that because 10 percent of the total activity is resuspendible from Reg Guide 1.86, which we agree with. Okay?

You could have theoretically gone with swipe data, which was another set of data where you actually took a swipe and counted it. Bob Anigstein said, okay, let me check to see if that makes sense. He went through everything, okay? And his takeaway was, well, we got some different numbers. Bob, how different were our numbers? Do you remember?

Dr. Anigstein: About, maybe 20 percent higher.

Dr. Mauro: Okay, so we came in 20 percent higher.

Dr. Anigstein: I'm just -- I'm just looking it up, the difference, in the computer right now. Just a second.

Dr. Mauro: Sure. Doesn't have to be precise. I just want to give a sense --

Dr. Anigstein: Yes.

Dr. Mauro: -- that we know. It's not like that we came up with 10 times higher, or 10 times lower.

Dr. Anigstein: No.

Dr. Mauro: We came up with something pretty close, which in my world, ain't bad, and when we're independent --

Ms. Gogliotti: It's how we treated zeros, the difference in it.

Dr. Mauro: Oh, yes, that's right. Bob, in fact, it's written, by the way, that point is written up nicely in the main body of the report. I didn't capture it in my slides.

Mr. McCloskey: What we did with those zeros there, just so you know, is the spreadsheet, there are comments in the spreadsheet that tell you what we did about the zeros, and the lowest value that M&C or the NRC recorded for these surveys was 1.7 picocuries -- or no, 1.7 D per M per 100 centimeter squared. So we replaced every zero with the minimum value that they recorded.

Dr. Mauro: Okay. I can't speak to that. Bob, you know, all I can really, the best I can do right now is say that we did our thing looking at the zeros, and doing our own crunching, our own numbers, and our own work. And that, when we come out at the back end of the process, we're about 20 percent different than you are. You know, what can you say about

that? So --

Dr. Anigstein: Yes, well, there was the problem --

Dr. Mauro: Go ahead.

Dr. Anigstein: Just go ahead without me for a second. I've got to quickly find this.

Dr. Mauro: Okay, I'll keep going. Break in whenever you have a -- you want to qualify that a little bit. So that's the Building 10 roof and overhead scenario, okay? And flip the page. Now we're going to go through what I consider to be the single most important step.

Dr. Anigstein: So I got this memo that I wrote to you.

Dr. Mauro: Go ahead.

Dr. Anigstein: We just could not reproduce that NIOSH data, that we looked at the PDF. There was a list of PDF references with the document numbers, page numbers, and I'll just read from the memo that I sent to you on November 12th.

It says NIOSH stated there were, quote, 285 readings. I counted 339 results, including zeros. Including zeros, there were 265, so we could not, we could not figure out where they got the 285. And then the NIOSH -- then my second comment was that NIOSH listed the geometric mean of the readings. So you cannot have a geometric mean if you include zeros.

Mr. McCloskey: We didn't include --

Dr. Anigstein: -- can't take a logarithm of zero. So if they leave out the zeros, again, you don't have 285 results. And then I did a non-parametric -- it's a very simple arithmetic procedure that, it's embedded into Excel, where you simply interpolate and -- where would be the 95th percentile, looking at these upper

range of values, and I ended up with 12.4 instead of 8.9, so it's more than 20 percent.

Dr. Neton: So it's a difference of fitting the geometric -- the log-normal distribution versus interpolating the 95th percent.

Dr. Anigstein: Excuse me?

Dr. Neton: Is this really just the difference between fitting the log-normal distribution like we did versus your method of interpolating the 95th percentile?

Dr. Anigstein: Well, I did it both ways.

Dr. Neton: Okay.

Dr. Anigstein: I did a, first, I did interpolation. Then I simply did a log-normal of the non-zero values.

Dr. Neton: Yes. Yes.

Dr. Anigstein: Without using the zeros. And with that, we got 10.5. However, I did not go to the trouble -- there was supposed to be a quicky of doing -- orders to say -- which we are equipped to do. But that would give you even, if you added -- if you put in the zeros and there was a procedure for plotting the -- as if it was log-normal --

Dr. Neton: Yes.

Dr. Anigstein: -- and then simply -- putting in zeros at the bottom pushes the upper values up to a higher percentile.

Dr. Neton: You don't put zeros in, you put the --

Dr. Anigstein: So we get more than 10.5. So we still have no idea how we -- how to get 8.99 out of that.

Dr. Neton: Well, I think we need to get together on this and --

Dr. Mauro: And I'm going to say something about

this, okay? I'm going to be a little bit of a wise guy. I'm a biologist. Bob is a nuclear physicist. You just heard the difference between a biologist and a nuclear physicist. The biologist looks at this number and says we think about 20 percent. And the doses are 0.01 millirem per hour.

As a biologist, I don't care, okay? Eventually, no, I apologize, eventually, you do have to put out a document that's scientifically sound, completely documented, and used scientific techniques that are important and consistent, and everyone would agree with. But for the -- my goal here and what my job is, is to take away from here, are we okay here, or do we got a problem? I say we're okay here. We've just got to polish the apple a little bit. All right?

Mr. Darnell: One thing that I would like to point out, Bob, is that the zeros that you're saying that we used, we actually did not. Those were replaced with 1.7s. Is that right?

Mr. McCloskey: It's in the spreadsheet we sent to the entire Work Group.

Mr. Darnell: Yes.

Dr. Anigstein: I'm sorry, they were replaced by what?

Mr. Darnell: 1.7, which was the lowest found.

Dr. Anigstein: Oh. I --

Mr. Darnell: So each one of the zeros was replaced with that.

Dr. Anigstein: I would like to say -- I would just like to politely, but -- if I could make it polite, saying that is not a valid -- that is simply not a valid procedure.

Mr. Darnell: Based on?

Dr. Anigstein: It's a -- it's a -- it's not statistically, scientifically valid.

Dr. Neton: I think we're arguing something we've already -- this --

(Simultaneous speaking.)

Dr. Anigstein: -- the site, and we critiqued it.

Dr. Neton: We can get together on this, but I think we know what we're doing. We've got documented procedures of how to handle these log-normal distributions. We've done this for years. If you take the lowest, the first positive value, and you develop a cumulative probability distribution from the first positive value, so in other words, if your first positive value is the 48t percentile of the distribution, you generate the cumulative frequency distribution, fit a curve to that, and then you estimate what your geometric mean and GSD are. I mean, we've done this for --

Dr. Anigstein: Yes, but there is a -- but there is a NIOSH procedure. I forget, it was in one of the OTIBs --

Dr. Neton: Yes.

Dr. Anigstein: -- which specifically allowed -- the regression of order statistics allows you to take, to consider the zeros, and is an -- it is a statistically acceptable method. And it gives you -- it's simply different.

Dr. Neton: Okay, well, we --

(Simultaneous speaking.)

Dr. Neton: We can -- we can deal with this. I mean, this is a matter of --

Mr. McCloskey: Yes.

Mr. Katz: It's a Site Profile matter that we'll work out and don't need to beat to death today.

Dr. Anigstein: I agree. I agree with that.

Dr. Mauro: Yes.

Dr. Anigstein: Certainly not today.

Dr. Mauro: It's on the table. You got it.

Dr. Anigstein: Yes.

Dr. Mauro: We'll move on now, okay? All right. Now we're going to move on. Okay. So the next slide is called Subsurface Building 10. In my mind, the single most important subject we have to talk about. And originally, you folks had your way of doing it where you work with median values, and from the very beginning, we felt that we had our own approach, which has its strengths and limitations. Okay?

But just for the purpose of a slide, I said, okay, let's compare fundamental assumptions and outcomes between what you did and what we did, okay? The most important number of all is the contamination level that is the picocuries per gram that's in this soil to which people working in the subsurface environment might have been exposed to, up close and personal. Okay?

We came up with 5,800 picocuries per gram. You came up with 6,800 picocuries per gram. As far as I'm concerned, they're the same number. I'm being -- I'm being a little -- you understand. All right.

So now, but we're going to talk about that a lot more in a minute, because that's the rock we're standing on, and it's the thing that I believe is most of great interest to the Work Group because that's the rock we're standing on. Where did we get that number, and can we trust that number as being a good surrogate or replacement number? Because that number was gathered, as I understand it, mostly during the 1990s.

In other words, during the 1990s, work was done in the subsurface environment to characterize Building 10 and every place else, because they were getting

ready for a cleanup. So what we're talking about is a number that is collected in 1992, but we're going to use it now to --

Chair Beach: Was it '92 or '94 or -- '94 or 5?

Dr. Mauro: '94 or 5. But the point being, we're going to use that, do exposure to subsurface workers, M&C workers, that were doing subsurface work in Building 10 in the 1970s and '80s. Therein lies what I can -- consider to be the single most important SEC issue that we have to deal with. Can you do that? All right? To finish the list up though, of course, as -- once you've got your concentration in the -- in the soil, the subsurface soil, you need to get a dust loading. We independently did our review. Actually, there's an appendix to our original report, which is fairly thick, our original review of the original ER, which summarizes what we consider to be comprehensive review of dust loading data that's out there in the literature.

There may be more, and we -- our takeaway from this was a good number that -- what I consider to be upper bound is 200 micrograms per cubic meter. So if you know the picocuries per gram in the soil, you assume that that's the stuff that's being resuspended.

You assume it's the airborne chronic concentration to which the worker's exposed while he's up there digging in the hole is 200 micrograms per cubic meter. You -- now you know what his, you know, airborne dust loading is while he's doing his work, okay?

And by the way, I consider this to be a conservative value because the discussion with the 12 workers, a lot of them said that soil was moist. It was a pretty wet environment. You don't get too much resuspension when something's wet. So as far as I'm concerned, that's a pretty good number. It's up there. It's probably lower than that.

Mr. McCloskey: It wasn't always wet, but it was usually wet.

Dr. Mauro: Oh, good.

Member Anderson: But the other question is where the samples were taken, how -- what was the saturation of water in the soil?

Dr. Mauro: I don't know. Yes. All we have is picocurie per gram numbers, which are usually dry weight. That's your --

Member Anderson: Right.

Dr. Mauro: -- picocuries per gram. That's how you do this analysis. You know, you grab a sample, you dry it, you count it. And so given that, and then saying, okay, we're going to assume that that's the activity in the soil, which was probably moist, and the real activity, in terms of picocuries per centimeter cubed was probably lower because it was moist, and the actual activity is the dry weight activity. But in any event, we went ahead and said, well, that's the activity.

That's being resuspended, and here's our dust loading, and we think that that's pretty good based on the arguments we make in our report. NIOSH independently did it a completely different way. They went with -- I believe it was -- was it Mound, where there was some work going on that was, in many respects, excavation and remediation work going on at a site that had a nice curve with a distribution of concentrations. I believe they picked off an upper end value, and their number is 220 micrograms per cubic meter. So the dust loading is what I consider to be pretty close, very, and independent.

Mr. McCloskey: As a 95th percentile?

Dr. Mauro: As a -- and you picked a 95th percentile too. Okay. We -- I just used my judgment.

Mr. McCloskey: Sure.

Dr. Mauro: I didn't pick a 95th percentile. I said I'm going to go with this number because it makes sense to me. You went with a more refined approach where you picked off a 95th percentile.

Mr. McCloskey: Yes, they actually had hundreds of air samples where they collected dust. They weighed the samples after an amount of volume had gone through, and they saw how much dust loading actually occurred on their samples, and of that data, in terms of 95th percentile.

Dr. Mauro: Okay. So, but I mean, what we're coming to in those first two lines, we're on the same page. All right? We're going to get back to the question of whether or not you've got a problem with surrogate data or not here, and that's going to be really important. That's going to be the next slide.

But let's go, keep -- finish this slide up. Breathing rate, because once you've got the airborne concentration, you've got to get a breathing rate, and Rose and I had a lot of discussion about this, and Rose convinced me that, you know, what have we got here?

We've got a guy in a hole, all right? And he's got a shovel, and he's shoveling away, all right? He's getting down to the pipe, and he's shoveling away, and he's cutting the pipe, and he's replacing the pipes in a hole. He's working pretty hard, all right? Normally, we'd use your number, 1.2 cubic meters per hour, because that's your Classic number.

Mr. McCloskey: Reference manual.

Dr. Mauro: Your reference. And, but there's also --

Mr. McCloskey: Perfect worker.

Dr. Mauro: -- in the same, and there's -- in the same documents, the Exposure Factors Handbook, EPA

puts out an Exposure Factors Handbook, and they actually have a range of numbers for people that are under a more stressful working condition, where they're working harder.

Mr. Darnell: Wouldn't this be a Site Profile?

Dr. Mauro: It's absolutely a Site Profile issue. Oh, don't get me wrong. The only SEC issue is the first line, and we're going to talk about that in a minute a lot, but I wanted to get through this to show we're on the same page. So there is a difference, a factor of 2, on this breathing rate. You're not going to get an argument from me.

We went with that higher number, judgment call, and for reasons we just -- I just gave you, for better or worse. Exposure duration, we came up with -- remember this one month business we talked about, and there was some chatter about how do you get hours out of that?

Me, I've got to say, Rose and I were discussing that, so let's just go with 200. You know, just use 200. You know, because this, I don't -- sometimes I don't like to put such a fine point on a number that we know we don't really have a fine point for. So I would've just picked 200, so we went with that, okay? And anyway, bottom line is we went ahead and we took it a step further.

We figured, well, how many becquerels per year of U-234 would that be? And the outcome of that would be an -- you know, for that exposure duration, there's your becquerels per year. 15.6 millirem per year effective dose commitment. We're -- again, that's your dose that we came up with.

Of course it will change somewhat, depending on what, for example, if we went with the 1.2 meters cubed per hour instead, which I, you're not going to get a big argument from me, it would be half that value. But we're talking about low millirem per year

numbers. Do with that what you may, okay?

Mr. McCloskey: Some factors, we were higher; some, you were higher.

Dr. Mauro: Yes, right. Let's move on. All right. Now we're going to get to what I consider to be the single most important issue we're here for, why we're here today. Surrogate data. I call it surrogate data.

We all know that the surrogate data has a very formal definition. It actually pertains to using data from one site as applied to another site. We're actually not doing that here. We're using data collected, in many cases, in the 1990s, and we're applying it -- and not in all cases, sometimes it's 1980s, and we're applying it to the 1970s and '80s.

So the question is, as brought up earlier, well, what things could've happened in the 1970s and '80s that changed the subsurface situation so that what they saw in the 1990s is lower, possibly. Probably not higher, but lower, because they may have inadvertently removed some material, not realizing it, but they were doing their job, and they were moving stuff out, okay? But it turns out, I have a code here that's in the report, and I put it in bold on this slide that you're looking at.

There's a slide, the heading of which says, Substitute (Surrogate Data Issues), and I want you to read it because it's an important statement. The NRC concluded that fixed and removable contamination inside the AWE areas measured during their inspection, which I believe was during the 1980s, were comparable to those in the M&C closeout survey, which was in the 1990s, okay?

So all this does, it's part of the weight of evidence that says, well, it looks like at least between the '80s and the '90s, the two sets of numbers seem to be ringing true. That is, there really is no big change. So if there was a lot of stuff that was removed in the

'80s, the numbers you would have seen in the '90s would have been different, but lower.

But this is just one piece, one piece of information amongst a number of items, which are on the next page that argue, to me, that you can use the data from the 1990s, the 1980s, as a substitute or surrogate for what was going on during the residual period.

Chair Beach: Okay, so let's hold for, I think --

Dr. Mauro: Yes.

Chair Beach: -- Rose had something, and then --

Dr. Mauro: Please.

Ms. Gogliotti: Oh, I just wanted to point out that what you're quoting from is -- was published in the '80s, so I believe they're talking about the '60s data --

Dr. Mauro: Oh.

Ms. Gogliotti: -- that confirms it.

Dr. Mauro: Okay.

Dr. Neton: Even stronger.

Dr. Mauro: Even better. I -- then I got it wrong. Thank you.

Mr. Katz: You might want to just clarify that for people on the phone.

Chair Beach: Yes, please.

Dr. Mauro: Yes. Yes. What I just read to you, I thought represented an NRC statement made in the '80s.

Ms. Gogliotti: You thought it was from the '90s.

Dr. Mauro: From the '90s. Now, this, so the -- help

me out here. Go ahead, please.

Ms. Gogliotti: The statement came from a document published in the '80s, so they were actually referring to the closeout that happened in the late '60s.

Dr. Mauro: Okay. So the -- this changes the story a little bit, which is important. So they're making the statement about the '60s, and what they saw, as compared to --

Ms. Gogliotti: The '80s.

Dr. Mauro: -- the '80s. Okay. So it's not between the '80s and the '90s, it's between the '60s and the '80s. Okay. I think the point being that it's still a valid piece of weight of evidence.

Mr. McCloskey: It's relatively unchanged --

Dr. Mauro: It's relatively, it's --

Mr. McCloskey: -- regardless of the work that's being done --

Dr. Mauro: Right. Okay. I --

Mr. McCloskey: -- during the residual period.

Dr. Mauro: Yes, I misrepresented what I read, but thank you for clearing that up.

Chair Beach: Okay. And so the surveys in the '80s, the early '80s, that was the ceilings, the roof, the surface. They didn't get down into the subsurface until the mid-'90s.

Dr. Mauro: The subsurface is different, yes. This is -- that's a different issue. But --

Chair Beach: Okay.

Dr. Mauro: -- no -- I only point that out as one of a number of things that lead me to where, and now let's go to the next --

Chair Beach: Okay. Before we do that, any questions from Board Members on the phone? Please jump in if you have a question, but we'll try to stop.

Member Anderson: Yes. My only question is, we're talking about roof measurements that are external, where you have more chance for, you know, rain and wind and whatever, versus the sampling that's done on the rafters and the ceiling on the inside of the building. If it wasn't a cleanup, you'd expect the inside not to change much. So what do we see if you just use the roofing material wipe sample?

Ms. Gogliotti: Well, I think right now we're just talking about --

Member Anderson: -- if we, if we include everything together, if the roof samples are lower than the interior samples, then you're going to have a distribution that's somewhat lower.

Ms. Gogliotti: I think we're going to get to that.

Member Anderson: Because the --

Ms. Gogliotti: However, right now, we're just talking about the subsurface inside of Building 10, which is --

Member Anderson: Okay.

Ms. Gogliotti: -- what was going on below the concrete.

Mr. Darnell: One thing to keep in mind for the surface is we took no credit for any cleanup that went on. So if you take the 1967 data that we moved forward to derive our exposures to the workforce, we never said anything got cleaned up. There's no depletion of the source term, so whatever was there at the beginning was there at the end, as far as NIOSH's dose calculations go.

Chair Beach: It all got washed down below anyway,

mostly.

Mr. Darnell: We didn't take credit for that.

Chair Beach: Right.

Mr. Darnell: We treated it as if it was still there.

Chair Beach: Right.

Dr. Mauro: The next page, titled, Substitutes, Surrogate Data Issues, Continued, I consider this to be an important information, okay, for Josie, and the rest of the Board.

Chair Beach: Thanks, John, I appreciate that.

Dr. Mauro: I was thinking about you when I put this together.

Chair Beach: Yes, we talked about this before we came in.

Dr. Mauro: Because I understand the challenge that the Work Group and the Board has in using limited data -- I mean, think about what we've got. We've got -- we're trying to reconstruct doses to people that worked in the '70s and '80s, using data that was collected in the '90s, and using some data that was collected in the '80s.

And we're saying somehow we could use that data and reconstruct doses to people doing all these different things in the '70s and '80s, okay? That goes to the heart of the SEC, and is there enough data that's representative that we have -- that one could say, yes, that is representative of the state of affairs that existed at the site in the '70s and '80s while these workers were doing their repurposing and maintenance activities? That's the heart of the question. All right?

So I've made a list of bullets of what convinced me that we're probably okay, but that doesn't mean everyone would agree, okay? Okay. Number one,

NIOSH is using the high end of the 1990 data, 95th percentile, 95th, which comports with surrogate criteria two.

I -- one of the things I did here is I attached to the back of our main report the surrogate data criteria. I said, because, in a way, that's what is used, as well, why don't we okay when we use surrogate data?

Now, granted, this is not really surrogate data, but it's -- you got the idea. So in effect, this, because we're going with this high end number, we're accommodating, the reality is we're going with surrogate data. That is, we're going with data that really doesn't nail it, but it's -- it's a different time, unlike the surrogate data which is a different place. That's what it was written for, but now we're, now we're saying, well, we're actually working with a different time, all right? But --

Chair Beach: So are you, let me just be clear.

Dr. Mauro: Yes, sure.

Chair Beach: Are you talking about the data that they're using from onsite, or the Mound data --

Dr. Mauro: No. No, I'm sorry, I have to make myself clear.

Chair Beach: Okay, because it's kind of --

Dr. Mauro: And so --

Chair Beach: -- it's kind of mixed in here.

Dr. Mauro: Yes. Yes.

Chair Beach: So I want to be clear.

Dr. Mauro: Let me clarify. I am saying that what we have is, right now, I'm talking only about the subsurface work in Building 10. That's what I'm talking about.

Chair Beach: Okay. But, and I was under the impression that NIOSH's 220, no -- yes, their 220 came from the Mound data. Is that not clear?

Dr. Mauro: I -- I'm not --

Chair Beach: And so it's -- but you have it as, in your points.

Dr. Mauro: Yes.

Chair Beach: So that's why I'm getting --

Dr. Mauro: No. The --

Chair Beach: -- confused.

Dr. Mauro: Yes. Let me see how I can unconfuse that. I'm --

Mr. McCloskey: He rushed to do this.

(Simultaneous speaking.)

Chair Beach: And I -- and I appreciate that. I just want to make sure --

Dr. Mauro: No. I think it's -- I think it's clear, okay? I think it's clear, but maybe obviously not.

Chair Beach: Go ahead.

Dr. Mauro: All right. Yes. The point I'm making here is when we're talking about the subsurface environment in Building 10, where the people were working, and we have data that was collected in, you know, in the 1990s, and there's a lot of data characterizing the concentrations, and we have those distributions and all those numbers they range from up to 50,000 picocuries per gram, all the way down, and we picked the upper 95th percentile number, which was not that, remember our table earlier, which was not that far. Yours was 6,000; ours was 5,000 picocuries per gram.

Now I'm saying to myself, all right, now, but we all know that that is almost a form of surrogate data, because that data was collected in the '90s. This is Building 10 subsurface environment, okay? That's where we are right now, which is what I consider to be a very important scenario.

The fact that the 95th percentile value was selected is a way in which you account for the fact that you're using surrogate data, and it comports with what's called the exclusivity requirements that are associated with when you decide to use surrogate data, one of the things that we're going to look at is what's called exclusivity requirements.

It's, what are you doing to sort of accommodate the fact that you're actually not working with data that is right on target? You're working with data that is either from a different place or, in this case, a different time.

Chair Beach: Or a different purpose? Does that come into play?

Dr. Mauro: Well, the purpose, I'll tell you why purpose doesn't have a play here. In the 1990s, they were trying to characterize the subsurface environment as best they can, including what's in the pipes and everything else, for the purpose of cleanup.

Now, in my mind, that characterization, if in fact you were going to do a characterization in the 1970s, that's exactly what you would have done. So in other words, what you do when you want to characterize the nature and extent of the radiological contamination is what you did in -- is what the CPS and Weston did in the 1990s. And if in fact they were brought in in the 1970s to go in and characterize the place, that's exactly what they would have done. The same thing.

So as far as I'm concerned, though the -- so though the purpose in the 1990s was for cleanup, they did

exactly what you would do, and it's to characterize, before you go in and clean-up, you want to say, what am I dealing with?

Well, if you were going to go in in the 1970s, let's say we pose a different question. Let's say we're in the residual period. We want to go in and characterize the subsurface environment because we're going to have people working down there, okay? You would have done exactly the same thing, okay?

So as far as I'm concerned, the -- and if in fact you did -- stay with me now a minute -- let's say they actually did go into the subsurface environment and characterize it completely, then you would be using different judgments on what concentrations you would use. You would say, well, we know they went down and they did this over here, and they did this over here, and they did this over here, all right, then what would you do? You would say, oh, now we really know what the real concentrations were.

Mr. McCloskey: You might not select the 95th percentile.

Dr. Mauro: And you may not pick the 95th percentile. You got it. Second one, we used what I call, well, NIOSH used 220 -- in other words, here's the guy in the hole, all right? He's sitting in a hole with a concentration of uranium in the soil. Is that 6,000 DPM -- sorry, picocuries per gram, and he's digging, and he's kicking up dust.

Now, we're talking the inhalation exposure now. All right. We said, well, the dust loading that he would be chronically, for that hour or two while he's in the hole, is that 200, you said it's at 220 micrograms per cubic meter, we used 200, okay? Now, I'm comfortable with that because I looked at the literature of what are the dust loadings. You're comfortable with it because you looked at it from a different perspective. You had other data. You had --

Mr. McCloskey: We canvassed the entire project from our side, and said --

Dr. Mauro: Right.

Mr. McCloskey: -- surely someone's done excavation in the past. Has anyone modeled it? We found someone that did, and we --

Dr. Mauro: So two different approaches, and now what --

Mr. Darnell: One thing I'd like to point out about that model though is, you had Mound work was being done in this large area, using large equipment and large surveys, and everything was a lot bigger than what you had inside of Building 10 with one little Bobcat going.

Dr. Mauro: Yes.

Mr. Darnell: So there's conservative ---

Dr. Mauro: Well, it's a whole different, you're right.

(Simultaneous speaking)

Dr. Mauro: There are differences. This guy was actually down there with a shovel. I mean, they explained it, no, they had somebody come in first, crack it open, but then the guys that went into the hole, they had, they had to go find the pipe, or whatever the problem was, and they did that with a shovel.

Chair Beach: Well, they did both though, they did, they had a --

Dr. Mauro: That's, again, that was the originally --

Chair Beach: -- Bobcat, yes.

Dr. Mauro: -- to crack it. You know, they actually had a contractor come in, as it was explained to us. Brought him in, specialty guy, bring in the backhoe,

crack through the concrete, get the first few layers of dirt out.

And now, when you started to approach the area where the maintenance was needed to be done, you send the guy in the hole with a shovel, and he goes and finds the place that has to be repaired. Okay? So that's the picture. So there, we got dust loading.

And again, I am comfortable because I believe that that's a pretty good number for soil that is generally moist, and perhaps not always. You want to pick a different number, I mean, that's, you know, that's what I picked.

Here's a big one. NIOSH and us are assuming that the same person is always the person going in that hole. Time, every time somebody had to go in the hole and do a repair or maintenance, it's the same guy, okay? That's not what happened. We know that's not what happened, but I'm -- so again, it's a tendency to bound it, okay?

And it accommodates this issue that is, we're going out of our way to make sure that we're not underestimating the dose, because we do realize we're working with 1990 data, and we're applying it to 1970s and '80s. So you say that sort of helps to give a little more assurance that we're not underestimating the dose, okay?

Now, this next item here is the data collected in 1993 compares well with 1990s. That is not a correct statement any longer, I believe, and I'm looking at Rose.

Mr. Darnell: Well, actually, that statement is true.

Dr. Mauro: It is true, because I may have misread what I --

Mr. Darnell: Yes, I think what you mean to say here is it compares well with the 1970s --- '60s.

Dr. Mauro: '60s.

Mr. Darnell: '60s.

Dr. Mauro: Yes, that, so I have to fix that, all right?

Mr. Darnell: But --

Dr. Mauro: The idea is, the idea still is valid, the concept. Next bullet, notwithstanding all these bounding assumptions we're still talking about very low doses. And finally, which is, I know that originally you folks hung your hat on the bioassay data that was collected during remediation in the '90s, and you showed that, what the doses were.

So you were saying that, well, these guys were down there digging away, cleaning up the dirt, the hot spots, the piping, and everything, and therefore, what they were doing, physically, this goes both indoors and outdoors now. Right now, I'm talking Building 10, but this also applies to outdoors. What they were doing is sort of the same kinds of things that the repurposing and maintenance people were doing. They were poking around underneath the ground.

Now, interesting situation. The petitioners say, well, wait a minute, hold the presses, and there's validity to this position, listen. The people that were doing the work in the 1990s, they were under a health physics control program. They had people who were watching with survey meters, air samplers, et cetera, et cetera, but the people that were --- you may want to, if there's something here you got that you want to interject --

Mr. McCloskey: At some point you, well, that's a picture of the controls that were in place for the workers, taking out the worst case priority-1 drain lines under --

Dr. Mauro: This was in the '90s.

Mr. McCloskey: Yes.

Dr. Mauro: Oh, okay.

Mr. McCloskey: So you're making that link, so it's good to --

Dr. Mauro: Okay, yes. You've got a picture of it. Good.

(Simultaneous speaking.)

Chair Beach: And the priority-1 drain line that's bagged up and they bagged it, pulled it out, correct? Yes, and it tells us that.

Dr. Mauro: Okay. Now, so I respect that position that is, in one case, the work was being done under a health physics control program, and the other case, it isn't, and they're doing more or less the same kinds of things, digging around underneath the ground and playing with pipes.

The fact that you're under a health physics control program puts you in the position where you're going to make sure no one is exposed unnecessarily, and you keep exposures as low as reasonably achievable. That's in the '90s. In the '80s, you're not doing that, okay?

On the other side, some go, well, hold the presses. The guys that are doing the clean-up are deliberately sticking their head and their bodies and their backhoes and their shovels and whatever they're doing, where the radioactivity is, because that's what they're doing. They're cleaning it up. So therefore, they are making a point to be engaged with the contaminated material. In the case of the 1960s, '70s, and '80s, it's an inadvertent thing. That is, they're going down there to do their maintenance work as best they can to get the job done so that they can keep operating.

The degree to which they may or may not have

encountered radioactive material is unknown, okay? So you have offsetting factors here that the one point could argue. But we did not, our decision was not to use any of the bioassay data for the purpose of estimating both internal or external exposures.

Mr. McCloskey: We didn't use it to estimate exposures either, just as a --

Dr. Mauro: A point.

Mr. Darnell: A foundation.

Dr. Mauro: Good.

Mr. Darnell: A perspective.

Dr. Mauro: So we're in the same place on that.

Mr. Darnell: Yes.

Dr. Mauro: But, so these bullets, Josie and the other Board Members on the phone, these bullets are the ones that argue to me that it's okay to use 1990s and some 1980 data to -- as a surrogate for the exposures that workers during the, M&C workers, during the 1970s and '80s might have experienced, okay? This is a judgment call purely to be made, no sufficient accuracy issue. But I -- my takeaway is this ain't bad, okay, if I were, somebody asked me to do it, I would say this is a good way to place a plausible upper bound on the exposures. And this would be internal exposures for people who were working subsurface in Building 10, okay? So we're just focusing on that, but that's an important scenario, okay?

Mr. McCloskey: It was substantially, to use your word, upgraded from our previous subsurface model because of comments made during the May meeting where, you know, the 50th percentile we used maybe didn't -- missed some of the contamination, and comments made by the petitioner. So this incorporates that, those concerns.

Dr. Mauro: And we also argue that, well, listen, the guys that, in a funny way, we could say, and this is Rose's point, she goes, it was Rose that picked the 95th percentile. She said, and we had a debate over that. I said, well, wait, why are we picking the 95th percentile? She says, what? The problems were the clogged drains, okay, and the leaking drains. That's what had to be fixed, because that's what was preventing them from operating.

They couldn't use the drains, and the conduits and everything else that was under there, because it was a mess. So they had to send maintenance workers in to go do that work, okay? So I said, well, it's the stuff that's inside the drains, okay? You know, that's not the stuff that necessarily was in the soil, all right, and that would be resuspended. It's different, right?

Rose said, no, no. You know, we're talking about drains that were leaking and cracked, and the stuff that was in the drains was coming out of the drains and leaking, so that's, so now what's really going on is that the guys that are doing the maintenance are going there. They're going to that place underground where the pipes were leaking and clogged or cracked or whatever they were, where the -- not only the stuff inside the pipe, but the stuff that leaked out of the pipe, is. So we're putting the guy that's doing the maintenance work right there. 95th percentile, and that's where he's doing his work. I like it, all right.

Chair Beach: Does that cover all the manholes and different, those different areas where they were working, and --

Dr. Mauro: Well, a lot of it was snaking also.

Chair Beach: Right, right.

Mr. Darnell: Most, a lot of the work didn't actually include breaking up the cement, getting down into the soil, whatever it was, until they did the final remediation when there was health physicists there.

Chair Beach: Yes.

Mr. Darnell: Most of the time they go down and clean out the drains with snakes, have to replace plugs. There were times when they, where they cut the cement and went in and --

Chair Beach: Yes, that's a different, than what I just asked. Yes.

Mr. Darnell: Using the 95th percentile covers everything as if they cut the cement and went into the hole every time.

Chair Beach: Yes. I was just reading some of the worker comments, and on one of them, the talked about the manholes. They spent a lot of time in manholes. Did anybody know if there's manholes --

Dr. Mauro: No, I didn't --

Chair Beach: -- inside 10 or outside?

Dr. Mauro: I did not look at that.

Chair Beach: There was a lot of work that went on through --

Mr. McCloskey: That was a discussion by the one maintenance supervisor who did a lot of electrical work, and did go into a lot of manholes outside.

Chair Beach: It wasn't really clear. That's why I was asking.

Mr. McCloskey: Yes, that's why the inside --

(Simultaneous speaking.)

Dr. Mauro: Well, I mean, to get to that issue, is there a reason to believe that the guy that went into the manhole to do whatever he had to do, whether it was indoors or outdoors, would be worse than this?

Ms. Gogliotti: No.

Mr. Darnell: There's no survey, no data to support that at all.

Dr. Mauro: Okay, let me go on.

Chair Beach: All right. So before you move on to the next subject, any questions of Board Members on the phone?

Member Anderson: No.

Member Kotelchuck: No. Dave.

Member Valerio: Loretta. No questions, but when they speak, if they could speak just a little bit louder. I'm having trouble hearing Pete's responses.

Chair Beach: Okay. Thank you for that comment, Loretta.

Dr. Mauro: Loretta, are you okay with me? I usually speak pretty loudly.

Chair Beach: You're fine.

Dr. Mauro: I'm okay? All right.

Member Valerio: Yes. Yes.

Dr. Mauro: Okay. Now we're going to move on, remember, what we just did is talk about internal doses from the guys in the hole in Building 10. Now we're going to talk about external exposures to the guys in the hole in Building 10, okay?

Now, here's where we have a problem, okay? Now, and there's been a lot of internal discussion at SC&A about this, and I've been holding the line. I'm the one who's been the hard head on this one. NIOSH elected to use film badge data collected in the 1968 time period, with certain adjustments to it --

Chair Beach: I thought it was '67.

Dr. Mauro: '67? '67.

Chair Beach: Last year of operations.

Dr. Mauro: The last year of AWE operations.

Chair Beach: Right.

Dr. Mauro: That's the point, whatever that date is, and took a portion of that year, and said, somehow, that film badge data could be used as a surrogate for exposures that were experienced by workers during the residual period, and place a plausible upper bound on external exposure. I can't buy that. And the reason I can't buy that is, now -- and this is how I see it.

Now, I may not see it right, but this is what I see. At that time period, when those film badges were collected, the exposures that workers were experienced, one, were the workers who were doing radiological work, and their radiological work at that time included the handling of fuel, the assembling of fuel assemblies, and maybe some of them were also doing maintenance work, including, and maybe even some repurposing work. So it represents a saying that the important part is, the reason they were wearing the badge, it was still an AWE operation. There was still fuel onsite, and therefore, once you've left that, and all of the fuel was taken away, and it was actually, as I understand it, a degree of clean-up and removal of equipment once the AWE activities stopped, you've just left that domain of the, what I call the AWE domain, and now you're moving into the residual period domain. And in my mind, the film badge data collected during the AWE period in no way can be used as a surrogate for exposures experienced by M&C workers involved in repurposing and maintenance. Can't do it.

So not that it doesn't bound it. Don't get me wrong. I'd be the first to say, well, listen, these guys are handling fuel, and in addition to whatever else they were doing. That probably is an upper bound, but -- and Bob argued with me that, over and over, no, it's

an upper bound. That's all we really care about.

I said, no, just because it's an upper bound doesn't mean it's right. And it is unlikely that the guys doing the maintenance work would ever be exposed to the same levels that the guys that were handling uranium. But --

Mr. Darnell: John, I've got no arguments with you whatsoever ---

Dr. Mauro: Okay, here's the point.

Mr. Darnell: -- that's a Site Profile issue.

Dr. Mauro: Oh, no, it's not.

Mr. McCloskey: Well, I think I can --

Mr. Darnell: If we can upper bound the SEC, that's what we --

(Simultaneous speaking.)

Dr. Neton: Well, hang on. Hang on, one second. In 2005, EEOICPA was specifically amended to address this issue, and I'll just paraphrase briefly, but there's, they amended the paragraph on what's considered radiation doses for certain Atomic Weapons Employers, and the definition says, in part A of that amendment, any dose of ionizing radiation received by that employee from, essentially, covered exposure. You know -- any weapons related to work as covered exposure for an Atomic Weapons Employee. But then, part B of that subparagraph says, any dose of ionizing radiation received by that employee from a source not covered by part A, which is covered, that is not distinguishable through reliable documentation from a dose covered under part A. In other words, if you can't tell the difference, you've got to include it all, whether it's covered exposure or not covered exposure. It was specifically added in 2005.

Dr. Mauro: I heard what you said, and I don't quite get it, but I heard what you said. But to me, I go, my thinking about this is very simple. You know, they were, there was no fuel there, so --

Dr. Neton: Well, there's still radiation exposure there, right?

Dr. Mauro: Yes, but --

Dr. Neton: So you've got two sources of radiation exposure. You've got covered exposure and not covered exposure.

Dr. Mauro: Yes.

Dr. Neton: The film badge cannot distinguish between either of those.

Dr. Mauro: That's correct.

Dr. Neton: And that's exactly what this subparagraph B covers. Any dose received by the employee from a source not covered, not covered by a covered exposure, that is not distinguishable through reliable documentation, e.g. film badges, from a dose covered by subparagraph A. Meaning, if you can't tell the difference between covered and non-covered exposure, you've got a film badge where you'll just use it all, and we've done this before at fuel facilities where, you know, there's commingled exposure. It's typically applied in situations where you have mixed contamination.

Dr. Mauro: At the same time.

Dr. Neton: Yes.

Dr. Mauro: Yes, but this isn't the same time.

Dr. Neton: Yes, it is.

Dr. Mauro: No, one is during a, what is --

Dr. Neton: No, this exposure, it doesn't matter

whether it's a residual contamination period or covered period. Exposure during residual contamination period, you can't tell the difference between commercial activities and noncommercial activities. It doesn't matter. You use it all.

Dr. Mauro: Okay. Stay with me for a minute. I'm going to, I'm going to explain what I would consider to be a common sense argument, all right? I hear what you just said.

Dr. Neton: Well this is a law ---

(Simultaneous speaking.)

Dr. Neton: --- doesn't mean it has to make sense, right.

Dr. Mauro: No, no, no. Okay. You see, think of it like this. They're two different worlds. We've got a world called the AWE operations, okay? It just so happens to be the same Building 10, all right? Then we have a whole different world where that's not being done anymore.

Now, they're moving into commercial operations, doing something completely different, okay? Bears no resemblance to what took place before, all right? We have a different, whole -- and there are scenarios now that took place in the residual period that may not have even taken place during the AWE.

We don't know that they were repurposing, because I suspect, I mean, right or wrong, repurposing was done because they were repurposing. They weren't going to do AWE anymore. We're going to do this. We're doing something else. We've got a new contract that's going to come in to do this and this, and therefore, we have to install new pieces of equipment, and we have to rebuild.

So therefore, the kinds of things that were going on during the residual period, in my mind, may not bear any resemblance to what took place during the AWE

period. So notwithstanding the language you read to me, it doesn't make sense.

Mr. Darnell: So now, to try and make sure I'm understanding, your thoughts then is that, because they dug in a hole during the residual period --

Dr. Mauro: Yes.

Mr. Darnell: -- say they dug right at the 53,000 picocurie max value, that the exposure, external exposure to that 53,000 picocuries from the time that that worker was in the hole overrides the dose from a full year of operations?

Dr. Mauro: No, I'm saying that you've got to model the doses that took place through the scenarios that occurred during the residual period. And there's no reason to believe that the activities that took place during the residual period bear any resemblance toward the activities that took place during the AWE period.

Mr. Darnell: Well, what I'm trying to understand is how much dose, and you're coming up with this question, how much external dose was that worker getting?

Mr. Sharfi: He's agreeing it's bounding, he's just saying --

Dr. Neton: Well --

Mr. Sharfi: -- it's not an adequate ---

(Simultaneous speaking.)

Dr. Neton: -- I don't know how more clearly this can read, myself.

Dr. Mauro: I know, but --

Dr. Neton: You have to go back and look at the --

Dr. Mauro: No, I hear what you're saying. And

listen, if that, if you, if you folks are all comfortable with that --

Chair Beach: Can you write up a memo to that so that John has it in writing, and --

Dr. Neton: Yes, we can put that in writing.

Chair Beach: -- because it is a, it is a question, it was not addressed very well.

Dr. Neton: Yes ---

(Simultaneous speaking.)

Chair Beach: --- came up in the last meeting.

Dr. Neton: -- I just chimed in with this now. I agree.

Chair Beach: Sure.

Dr. Neton: I'm springing this on you today, but --

Chair Beach: Okay.

Dr. Mauro: No, and I ---

Dr. Neton: -- but it's true. I mean, we've done this in places that say, processed commercial uranium, and then they also did a small project for the AEC, for a weapons-related activity. And that ongoing commercial process continued. We conclude that ongoing commercial uranium activity in the dose reconstruction if we can't tell the difference.

Dr. Mauro: All right. You show --

Dr. Neton: Surface contamination --

Dr. Mauro: Okay. I'll tell you the compromise where I could accept it conceptually. If we knew there was repurposing activities going on throughout the AWE period, very similar to the repurposing activities that took place during the residual period, I'd buy the argument.

Dr. Neton: What do you mean repurposing activities?

Dr. Mauro: That means we're going underneath the ground, digging everything up, taking out old dirt, and putting in new, all new equipment, because we --

(Simultaneous speaking.)

Dr. Mauro: No, I agree that there's ongoing maintenance, but the big deal was the, see, when they described their repurposing activities ---

(Simultaneous speaking.)

Dr. Neton: There are exposures to uranium in that facility. There are external exposures, admittedly small, but if you can't tease those apart, between what's measured in the HFIR versus a maintenance guide, going around, you know, working on equipment and what not ---

Participant: Apparently in the '60s, that --

Dr. Mauro: You see --

Participant: -- piping still was getting clogged --

Dr. Mauro: Okay.

Participant: -- and they still had to do maintenance and go and dig them out and --

Dr. Mauro: Okay.

Participant: -- re-fix them, and --

Dr. Mauro: As a health physicist saying, all right, wait a minute, okay, I heard your argument. Then, I said, but wait a minute, do we, do we have any idea of what the exposures were, external exposures were to the people doing the repurposing activities and the maintenance activities during the AWE period?

And you're saying, well, we could use numbers that

were, the film badge data that was collected, for the reasons you just argued. And I say, but as far as we're concerned, no one has ever, for example, modeled or evaluated what kind of external exposures took place during those repurposing activities.

All we have is some film badge data. The degree to which it represents repurpose activities is unknown. So why not do, and that's what I said, and I was very careful with the words I used in my report, supplement your evaluation. Use your numbers --

Dr. Neton: What you're arguing is you can differentiate between the two somehow --

Dr. Mauro: Let's just take a look how --

Dr. Neton: -- and model --

Dr. Mauro: Let's make sure, okay? I've got, in other words, in my mind, okay, good. But you know what? I think we have an obligation to take a look at, well, let's see if we could figure what those, what might've -- because we have a lot of information these guys gave us on repurposing that may or may not, you know, it's just, I think, --- I think we, I think we have an obligation to say, can we reconstruct those doses, external doses, associated with repurposing?

And the answer is yes, I think we can. And not only that, I think we have an obligation to do that, and we can't just walk away from this and say, oh, we could use the data, even though you read that, legal words you gave me, and --

Dr. Neton: Well, the operative word is, is it indistinguishable? Can we not distinguish between the dose received from, what you call repurposing activities, and the dose received from general exposures in the plant, including the HFIR area, which is where you have your biggest measurements.

Dr. Mauro: And I'm going to -- I'm going to give you

the reason why we can't do that. What happens if they were working with tons of cobalt-60 during the, during the AWE period?

Dr. Neton: Okay.

Dr. Mauro: All right, and then I got rid of it later. All right. Would you be okay with that?

Dr. Neton: Well, no, but wait, wait, wait, wait --

Dr. Mauro: Please, we can't do that.

Dr. Neton: What do you mean tons, during the --

Dr. Mauro: During the AWE period --

Dr. Neton: Yes.

Dr. Mauro: -- let's say they had cobalt-60 onsite because they were doing some radiography, and they were, who knows what was onsite.

Dr. Neton: But wait, but these badges from, we're using, are not from the AWE period, is that right?

Dr. Mauro: Yes, they are.

(Simultaneous speaking.)

Chair Beach: These are last year. They're last year.

Dr. Neton: From the last quarter, okay.

Mr. McCloskey: For most of these sites, the activities, the work activities dramatically change from, at the end of the AWE operations --

Dr. Mauro: Yes.

Mr. McCloskey: -- and we always take whatever information or data we have from the very end of AWE operations, and model a work activity that's dramatically different than the AWE ops.

(Simultaneous speaking.)

Mr. Darnell: Well, I guess, I guess we have a difference of opinion, and what NIOSH would like is for you to show us somewhere, some reason, some numbers, as to --

Dr. Mauro: I did.

Mr. Darnell: No, you told us your thought experiment.

Dr. Mauro: But no, no, I just, I just --

Mr. Darnell: Have you done a dose assessment --

Dr. Mauro: We could do it.

Mr. Darnell: -- from one of those things --

Dr. Mauro: We could do it. We didn't do it, but we could do it. I mean --

Mr. Darnell: Okay.

Dr. Mauro: -- we know what the upper 95th percentile is.

(Simultaneous speaking.)

Dr. Mauro: I'm saying you could do it.

Dr. Neton: What doses are we assigning here? I mean what are the levels ---

Mr. McCloskey: External.

Dr. Neton: I mean, what are the levels of, what are the levels of the doses to be used?

Mr. McCloskey: They're in the, the best place to find them are in the issues matrix.

Chair Beach: So I've got a question why you're doing that. So you said you always model using the last year or --

Mr. Sharfi: We have.

Chair Beach: But you didn't model this one in particular. You're just using the badges?

Mr. Sharfi: We used it.

Dr. Mauro: For the external. For the external.

Chair Beach: It's not modeled, because Pat said we model it --

Mr. Sharfi: Oh, yes.

Chair Beach: -- and it's really not.

Dr. Mauro: Well, for external, only for the residual activity deposited on surfaces, which makes total sense. But when it comes to external exposure, you tell me that during the --

Dr. Neton: Well, let me, let me just find out what we're assigning here, and then we can talk. Is it 10 millirem, 50 millirem, 200?

Ms. Gogliotti: They're small.

Dr. Neton: See, that's my, I don't know if I'm getting at it. This is a small dose to begin with, and if we're using the, what percentile 50th, 95th percentile?

Mr. Darnell: 50th.

Dr. Neton: 50th percentile.

Mr. McCloskey: Well, for the --

Mr. Darnell: For the external it's 50, because it's, we set the --

Mr. McCloskey: Yes, because it's not rebounding, right. So --

(Simultaneous speaking.)

Dr. Mauro: Yes, the 95th would be unrealistic --

Dr. Neton: So we're using the 50th percentile, and if

I remember correctly, the 50th percentile may be close to the missed dose you would assign, based on just assigning missed dose on the badges. Because probably most of those doses that were reported in there are less than detectable to begin with.

Mr. McCloskey: 48.3 millirem.

Dr. Neton: Okay.

Dr. Mauro: We're coming in lower.

Dr. Neton: You can't get much lower than that, based on the --

Dr. Mauro: But we're coming in lower, right? We're coming in at 15 millirem per year.

Dr. Neton: Okay.

Dr. Mauro: So we were, that's --

(Simultaneous speaking.)

Dr. Mauro: Oh, I'm sorry, I just crossed, I just crossed wires on it.

Dr. Neton: But what I'm saying is if the 50th percentile is almost totally based on missed dose from the badges, and presumably, if maintenance workers were wearing them that weren't working in HFIR, those are representative of the maintenance activities.

Dr. Mauro: I don't see your point.

Dr. Neton: You've got, you've got multiple operations --

Dr. Mauro: You're saying that the film badge data that was collected during the AWE period --

Dr. Neton: Right.

Dr. Mauro: -- reflects maintenance activities?

Dr. Neton: I imagine they weren't just HFIR workers wearing the badges.

Ms. Gogliotti: Well, then you could throw in a CTW correction if you needed to also.

Dr. Neton: Wait, wait. No, what I'm saying is we need to look at the distribution, and if the bulk of the 50th percentile is mostly represented by missed dose, meaning there was nothing detected --

Dr. Mauro: Okay.

Dr. Neton: -- zeros, all badges were zeros --

Dr. Mauro: Okay.

Dr. Neton: -- then that's as good as you're going to get. If you have, if you have badge workers -

Dr. Mauro: During AWE operations.

Dr. Neton: -- during the AWE period, but if it's zero it's zero, you could have badge data after the AWE operations and you still would come up with --

(Simultaneous speaking.)

Dr. Neton: That's my point.

Mr. Darnell: So what happened is, NIOSH, we took a look at the five and a quarter year period of work at HFIR, and the average highest dose was 48.3 millirem per quarter. Per quarter. That's updated 12 millirem per quarter for workers outside of HFIR.

Dr. Neton: See, these were outside of HFIR.

Dr. Mauro: Well, HFIR was doing the same thing AWE workers were doing during the AWE period.

Dr. Neton: Well, if it's outside of HFIR, 12 and a half millirem per quarter, is that what we're assigning them?

Mr. Darnell: Yes.

Dr. Mauro: Yes.

Dr. Neton: Okay. So --

Dr. Mauro: Oh, I agree.

Mr. Katz: One at a time. Please, speak one at a time, just because it helps the court reporter.

Dr. Neton: So what we've done is we've taken the workers that were not working on the HFIR project --

Dr. Mauro: Right.

Dr. Neton: -- which presumably, are doing things like maintenance activities around.

Dr. Mauro: They were handling, they were handling fuel, just like the HFIR workers were, only they're, it was AWE work.

Dr. Neton: And how much in the last year?

Dr. Mauro: Okay, we can talk about that. Now, I tell you what --

Dr. Neton: But you're talking 48 millirem --

Mr. Sharfi: But that was the argument, I think, last time was that if you look at the inventory in the last year, it dramatically drops which is likely just left of, what's the HFIR material left. And so really, I don't know if you're really talking about non-HFIR people really handling fuel in the last quarter before the contract's already done.

Dr. Mauro: And that was the point Rose was making, because I'm the one that was the hard, I'm the one who's been taking a hard line on this, all right?

The reason I'm taking a hard line is that there's fuel onsite during the AWE period, okay? There's no fuel onsite during the residual period. And it's so simple. You can't use film badge data that reflects exposures

to spent, to fuel as being representative of --

Mr. Sharfi: But if it's non-HFIR, then it's not necessarily badges associated with fuel handling. If they're non-HFIR people.

Dr. Mauro: Well, why do you say that?

Mr. Sharfi: Because it's --

Dr. Mauro: Because we know it, we know that AWE activity went on when, if you go back ---

Mr. Darnell: If you look at the response to Observation 5 in the issues matrix, and the fuel was removed near the end of the AWE operations. Not at the end, near the end.

Dr. Mauro: Oh, okay.

Mr. Darnell: M&C was required and performed surveys of --

Dr. Mauro: Oh, now you're making a point that I could buy, all right? You're saying that the film badge data that was collected at the end of the AWE period was for workers not involved with fuel.

(Simultaneous speaking.)

Mr. Darnell: --- not involved with HFIR.

Mr. Sharfi: HFIR fuel. The only fuel left onsite was the HFIR fuel, and we're using non-HFIR workers.

Dr. Mauro: Well, I --

Mr. Sharfi: So they were non-fuel handling people.

Dr. Mauro: I want to hear you say that the film badge data that you have, I don't care where it comes from, is dealing with workers who were not handling fuel but were likely involved in other activities such as repurposing and maintenance. You tell me that, I say, okay.

But I don't have that -- in fact, we, Rose and I talked about this. Rose went back to the, you know, dove back into the dumpster to say, listen, do we have any evidence that those last few months of when they were badged there was no fuel onsite?

Mr. Darnell: SRDB 168-315.

Dr. Mauro: You make that case --

Mr. Darnell: 168-315 --

Dr. Mauro: Okay. Okay.

Mr. Darnell: -- talks about the HFIR remaining onsite for that period.

Dr. Mauro: Okay.

Mr. Darnell: And then SRDB 169-85 talks about the surveying that was done outside of the HFIR areas for the M&C workers.

Dr. Mauro: But was there AWE fuel onsite at that time? AWE. Forget about HFIR --

Mr. Darnell: AWE fuel was removed at the end of D&D operations in 1967, so there may have been some fuel there.

Dr. Mauro: Okay.

Mr. McCloskey: There were 694 kilograms of uranium present in '66. None of our dosimetry data comes from that year. 172 kilograms were present in '67. That's when our dosimetry data was used.

Mr. Sharfi: And our belief is that 172 is HFIR, is HFIR material.

Mr. McCloskey: It's a four-fold decrease.

Mr. Sharfi: So, therefore, we don't believe that there was AWE material onsite during the period that we're taking the badges from.

Dr. Mauro: Good. I think that you're halfway home. So, if you're saying that really the exposures that we observed on the film badges were really not dominated by the fuel that might've been AWE fuel onsite, it was dominated by other activities that were going on, which may very well have been repurposing and maintenance work, such as the work that took place. Okay. Now --

Mr. McCloskey: They were also dominated by zeros.

Dr. Mauro: Okay. Yes. Now --

Mr. McCloskey: 45 percent of them were.

Dr. Mauro: We may be overanalyzing this, but, see, I hear the workers tell me that, for 20 years, they're doing all these repurposing activities, and they describe it in detail, and we have an understanding of it, and we have some understanding of what the levels of contamination were, so we could go right to the issue.

In other words, rather than using the surrogate data for film badges at the end of '68, we say, you know, good, but let's say, yeah, good, you've got it. But you know what? We've got to convince ourselves that there wasn't anything going on in the '70s and '80s that might've been different than what took place at the end of '68 or '67, whatever it may be. Do you see where I'm headed? You've got to address the --

(Simultaneous speaking)

Mr. Darnell: -- the situation is, the highest level of contamination, the highest level of exposure, would have occurred in 1967. And then there would have been some drop-off over time --

Dr. Mauro: Yes. Yeah.

Mr. Darnell: -- because that's just physics, the way things work. We don't give them credit for any of

that drop-off. We say it stayed at 1967 forever.

Dr. Mauro: Listen, maybe I'm just a hard-head, but, to me, you've got scenarios that were described by these workers during the residual period, and we've got to try to estimate what they were. And to use the film badge data, which we don't even know what it represents --

Mr. Katz: Okay, so, one solution to this would be, SC&A, go ahead, model it --

Dr. Mauro: I did.

Mr. Katz: Do you have the numbers?

Dr. Mauro: Yes, we -- oh, the external? No.

Mr. Katz: That's what I'm saying.

Dr. Mauro: Oh, no. We could do that.

Mr. Katz: I was going to say, one solution to this would, SC&A, go ahead and do that work, estimate it, and then you can talk about how that compares to the bioassay data being used from the end of the '60s.

(Simultaneous speaking)

Mr. Katz: The badge data, sorry.

Dr. Mauro: No, I mean, we have a solution.

Chair Beach: Okay. And so that can be added to this paper before you release --

Dr. Mauro: We will add that. And we will do a scoping. We will do a -- in other words, we will say, listen, what's the kind of external exposure that might've been experienced by M&C workers during the residual period who were down in the hole, and given our understanding of what was down in the hole, and we may very well find that --

Dr. Anigstein: Excuse me. This is Bob. Bob Anigstein.

Dr. Mauro: Go ahead.

Dr. Anigstein: We actually did that. We did the limiting -- I did the limiting exposure, taking the 95th percentile concentration of radioisotopes of uranium --

Dr. Mauro: Good.

Dr. Anigstein: -- in the pipes, and assuming that it leaked out into the ground and that same high concentration was spread uniformly over a large expanse of ground --

Dr. Mauro: Good, that's what we need.

Dr. Anigstein: -- and that a worker was standing on that.

Dr. Mauro: Okay.

Dr. Anigstein: And if I remember correctly, the number, the doses actually come out fairly -- this is at 2,000 hours a year, and the doses come out -- external doses come out fairly close to the 95th percentile of the film badge data.

Ms. Gogliotti: Bob, isn't that the external, the outside Building 10 that you're discussing?

Dr. Anigstein: Excuse me?

Ms. Gogliotti: You're talking about outside of Building 10, correct?

Dr. Anigstein: No, no, I'm talking about inside Building 10, the pipes.

Ms. Gogliotti: Oh, I haven't seen those calculations.

Dr. Anigstein: Yeah. It's in -- it's buried in the original report from earlier in the year.

Dr. Mauro: Good. We've got the numbers. We will include that in our final draft.

Dr. Anigstein: And, John, what you did was you said that's unrealistic, and you divided by 12 to --

Dr. Mauro: Oh, yeah, that's right. I remember that.

(Simultaneous speaking.)

Dr. Anigstein: But I'm saying that --

Dr. Mauro: Right, that's what I did.

Dr. Anigstein: I'm not arguing that my number is the correct number. I'm saying I did that to show that the film badge data --

(Simultaneous speaking.)

Dr. Mauro: Oh, so you used it to --

Dr. Anigstein: -- but that the film badge data was bounding. And it wasn't particularly high, nor was it lower. It was in the right ballpark.

Dr. Mauro: Okay. What I suggest we do is take his numbers, put them --

Dr. Anigstein: So we have another way of calculating the external exposure without using the film badge data as a limiting case, and we get doses on the order of less than 300 -- or the order of 300 millirem a year or less.

Dr. Mauro: Okay.

Mr. McCloskey: It's not an SEC issue.

Mr. Katz: But it's attractive. Anyway, it could be addressed in your report, since you got --

Dr. Mauro: Right. No, because this was an SEC issue. Up until this conversation, this was an SEC issue, as far as I'm concerned.

But if we have a tractable way that could place a plausible upper bound on external exposures beneath Building 10, using the methods that Bob just described, and by coincidence it turns out to be pretty close to the numbers you came out with, that's fine with me. But at least we explicitly addressed it.

Mr. McCloskey: It addresses your fuel issues, so it's not SEC.

Dr. Mauro: Yeah.

Mr. Darnell: Well, that's not a problem at all.

Dr. Mauro: I knew this was going to be a tough one. All right. Okay. Let's move on.

Chair Beach: Okay. Do you need that memo or anything --

Dr. Neton: No, no, I think this is more online with where we need to go.

Chair Beach: Okay, I was just making sure.

Dr. Mauro: Okay.

Chair Beach: Great. You're going to move on to external -- any questions from Board Members?

Member Anderson: I agree it's time to move on.

(Laughter.)

Chair Beach: Does anybody want or need another comfort break?

Dr. Mauro: I've got 10 minutes and I'm done.

Mr. McCloskey: We're almost there.

Dr. Mauro: Ten minutes and I'm done.

We hit the hard one. That was the hard rock.

All right. We're going to move outside now. We're

going outside now. We're leaving Building 10, we're going to go outside, all right?

Chair Beach: Outside Building 10?

Dr. Mauro: Outside Building 10, and we're going to be talking about internal exposures first, okay?

Okay. Now, the bullets will speak for themselves. Basically, we've got a lot of data. We both data in the surface and subsurface data.

I actually give the numbers of measurements: 2,391 soil samples.

For example, you've got soil sample data. We have a nice table that Rose put together at the back of our report that actually summarizes, which is a great addition. Thanks, Rose. If someone happens to have my report --

Chair Beach: I do. It's on page 11.

Dr. Mauro: It starts on page 11. You're going to see a table that summarizes all of the different outdoor areas where there was contamination, and what the data say for each of these areas.

And so, therefore, we have an understanding of the range of contamination that was observed outdoors for all these different locations, a point that you made earlier, that, listen, what about all these other locations, not just outside Building 12? Or, I mean, not just the burial area.

We find out that the burial area is limiting. Okay, that's what this table shows us, all right? Given that the burial area is limiting, we went ahead and said, okay, well, then, theoretically, what you could do is, for internal exposures -- now, we're talking there's internal exposures aboveground, and there is, because you're standing on contamination soil outdoors, you can get some resuspension. We know what to do with that.

If you feel that you've got a pretty good idea of the range of exposures for all these different areas, we find out that the nasty -- the worst area was likely the burial ground area. We've got a range of values, and what I would say you use, this is what I'm suggesting, you use an average value, because this guy is outside now, right? He's walking around. He's not just standing at the 95th percentile location. He's walking around.

So you pick the average outdoor picocuries per gram. You go with a dust loading of 200 micrograms per cubic meter. You go with an inhalation rate of 1.2 cubic meters per hour, and you use 2,000 hours per year, and you've got your internal dose to outdoor workers at the site. And if you want to go with a more conservative approach, rather than -- I picked the average because the guy is walking around.

Mr. McCloskey: So, we didn't hear that the workers stayed out, the same pool of maintenance workers they drew upon, we didn't hear that a maintenance worker stayed outside for 2,000 hours a year.

Dr. Mauro: Right.

Mr. McCloskey: So, if we capture it with the two hours of maintenance, and then the additional 10 months they were inside of Building 10, were the lion's share of radioactive material work occurred, because we never heard that someone stayed outside for 2,000 hours.

Dr. Mauro: Okay.

Mr. McCloskey: We wouldn't have added that part, what you did there.

Dr. Mauro: No problem. We did that saying, man, maybe there were people out there working, they're outdoors. They're outdoors for some reason, and they're there for -- they may not have been, but --

Mr. McCloskey: You're assuming a full year of

exposure, but you're tacking in 2,000 hours of being outside.

Dr. Mauro: Well, that would be for that scenario. There may be some workers out there. All I'm saying is there may have been some workers that were outdoors working a lot of different locations where they were being exposed to this residual radioactivity.

Let's go with the spent fuel area -- the burial ground area, and let's do that one. And since it's the burial ground area, we go with the geometric mean, rather than the upper 95th percentile of the burial area, because he's not going to stay in one -- the reality is, if he's outside for 2,000 hours per year, he's probably not only in the burial area. But maybe he is. I don't know.

But, you see, what we have is a tractable problem. It's just now a matter of judgment, where do you want to put the guy for how long? And so, as far as I'm concerned, we didn't -- we don't have any numbers, but I think that you actually -- my last bullet here is that you actually use this fundamental strategy. That's what you did. I don't know, you know --

Mr. McCloskey: Yeah, we used the 95th percentile.

Dr. Mauro: Okay.

Mr. McCloskey: The 200 hours is something we debated earlier.

Dr. Mauro: Well, now we're going underground. Now we're aboveground.

Mr. McCloskey: Oh.

Dr. Mauro: I'm separating aboveground from belowground.

Mr. Darnell: Doesn't that method come out on page

11, where it's saying that 6.8 millirem?

Dr. Mauro: We have a number. We have some -- yeah, that's external exposures belowground.

Mr. Darnell: That's belowground?

Dr. Mauro: In other words, the first, the page that we're -- the third page from the last is outside internal exposure. And all that's laid out here is a strategy that we think is reasonable.

Mr. Darnell: I'm looking at Section 2.4.2, where it says external exposures outdoors.

Dr. Mauro: Okay. In your report?

Ms. Gogliotti: No.

Mr. Darnell: Your report.

Dr. Mauro: Our report? Give me a page number. Give me a page number.

Mr. Darnell: I'm on page 11 of 16, Section 2.4.2.

Dr. Mauro: Okay.

Mr. Darnell: And it's talking about external exposures in Building 12 and other outside areas, and it gives a 200 hour per year effective dose of 2.08 millirem. And then if you spent 90 percent of that working time there, 6.87 millirem. So how do we effectively bound that with the --

Dr. Mauro: It's done. It's done. It's done in our report. I didn't -- we did it, okay? When I made my little summary, I neglected to put that in there. So, it is there. We have the numbers. And they're low, okay?

Mr. Darnell: And I just want to make sure I was thinking the right way, that this was the right section.

Dr. Mauro: Okay. The next, see, I try to break it up

into these different categories to make sure that we capture indoor, outdoor, aboveground, belowground, internal, external. And that's why the way I structured this, but you correctly point out that I actually left out, in my summary, exactly we did do the analysis. It says there.

So, to finish up, we're still outdoors now, but now we're talking external exposures aboveground and external exposures belowground, which is also -- what you just read addresses those areas. In other words, we're fundamentally saying the same thing.

And to get conceptual again, once you have a handle on the activity in the soil, aboveground and belowground, and you feel fairly confident regarding that you've got enough information, it then becomes simply a matter of what's the dust loading, and what's the exposure duration? For internal.

For external, it's simply a matter of what's the, what's the exposure duration?

So it's all tractable. And my conclusion, I'll read it. SC&A concludes that the doses to M&C workers during the residual period, including the workers involved in maintenance and repurposing activities, can be reconstructed in a scientifically sound and claimant-favorable manner by using upper end values of contamination levels measured during the 1980s and 1990s, along with appropriately conservative assumptions regarding airborne dust loading exposure durations.

So, this whole long story, my take-away from this is that this is a tractable problem. What the exact assumptions are, what durations, what dust loadings, things of that sort, are to be worked out.

But as far as I'm concerned, the surrogate data issue is the key issue that goes toward the SEC. And there's that one slide that I had here, that I listed the bullets of why I think it's okay to do that, that we can

extrapolate from either the '90s information supplemented with the '80s information in order to do all these calculations. And that's the end of my story.

Chair Beach: Okay. So, questions from any Board Members?

Member Kotelchuck: Dave. Lots to think about, and I would like to read carefully the SC&A response, which I haven't had a chance to do in detail.

Chair Beach: Yeah, and you don't have the full version. You have the quick version. So that'll be updated and sent out.

I think, so, our next topic is status of any remaining SEC items. I think that we won't discuss that until we get through and have SC&A's paper. So --

Member Anderson: Yeah, I think that's a good idea.

Chair Beach: Any questions or comments or anything before we move into the petitioner's comments and concerns? And we have a letter to read into the record. Ted will.

Okay. So we're going to move into the petitioner's comments, starting with the letter from Congressman Kennedy that I got yesterday.

Petitioner's Comments & Questions

Mr. Katz: Okay. So, dated November 20th, to Josie from Joseph Kennedy. He's a congressman.

"I represent the 4th Congressional District of Massachusetts, which includes the city of Attleboro. During the 1950s and '60s, Metal & Controls Corporation performed government-sponsored work as a nuclear fuel plant. The government contract ended in 1967, and the radioactive material was removed, and the plant was declared decontaminated.

"Texas Instruments acquired and occupied the facility. Further evaluation indicated the area affected by radiation was, in fact, not properly cleaned before Texas Instruments moved into the facility.

"Due to the high levels of radioactive materials and improper cleanup of the factory, many workers from both Metal & Controls Corporation and Texas Instruments have had, or are still experiencing, cancers due to their exposure.

"In 2001, the Energy Employees Occupational Illness Compensation Program Act, or EEOICPA, was created by the federal government to compensate qualified workers or workers' families for their exposure to radioactive materials and to their related cancers.

"However, the men and women who regularly maintain the buildings that were contaminated by radiation, but were not assigned exclusively to those buildings, were not included in the cohort of qualified workers. These workers regularly came in contact with potentially hazardous materials in the duct work, pipes, and other recesses of the building.

"Since taking office in 2013, I have sought to assist the distribution of benefits to former TI employees who have fallen ill as a result of working at the site in Attleboro. I have met with several of these employees and have heard many stories about the pain they and their families have experienced as a result.

"Furthermore, it is my understanding that the terms of the Radiation Exposure Compensation Act, 22 U.S.C. Section 2210, Note 212, do not require claimants to establish the causation of their disease. Rather, the claimants qualify for compensation by establishing a diagnosis of a list of compensable disease.

"I understand that there is this agreement among

Members of the Work Group you chair as to how to evaluate the extent of the radiation these workers were exposed to in order to ascertain their eligibility for compensation. It is my hope that the Work Group takes a broader view and considers the cases of these workers in their final determination.

"Thank you for your work and consideration of this request. Please do not hesitate to let me know if I can be helpful at all. Sincerely, Joseph B. Kennedy III, Member of Congress."

So that's the letter. And now I think we're ready for the petitioner's comments.

Mr. Elliott: Yes. This is Mike Elliot. Would you like me to comment now?

Mr. Katz: Yes, absolutely.

Mr. Elliott: Okay. Great. Thank you. Thank you again for the great work that the Work Group is doing. I continue to be impressed with, you know, all of the work by certainly Josie, as the leader of the Work Group, Dr. Mauro, and all his team at SC&A, and the folks at NIOSH. And, you know, it's really -- it's quite an impressive process to witness, and I feel very fortunate to have an opportunity to speak.

So, there were a number of things, was it Dr. Pat, is it Neton, who was speaking about the White Paper that --

Mr. Katz: Pat McCloskey.

Mr. Elliott: Oh, excuse me. Pat McCloskey. Sorry. Sorry, Pat. That the White Paper that NIOSH issued on October 24, 2018, a number of issues, let me jump to one of the ones that I think is perhaps of high importance.

On page 11 of that document, Mr. McCloskey was describing the volumetric sample data inside Building 10 and how a bounding subsurface exposure model

was established. And he referred to the drain surveys, which we all agree were pretty extensive. And he mentioned that, at the time, you know, one of the concerns we had when we did -- let me just mention, we were shocked and surprised to find -- when we started looking at the building interiors in 1994, we assumed that everything in the building interiors had been decommissioned in the 1980s.

It had all been released for unrestricted use, so we weren't expecting to find anything. So, you know, when we started to find stuff on surfaces in areas that, presumably, in the 1980s had been released from restricted use, had, you know, received confirmation sampling by the NRC, it really raised concern just how well that work had been done in the 1980s.

And then, you know, we did look down some of the drains, and we started finding some elevated levels.

So we were concerned about two things. We were concerned about potentially disturbing material leading to a criticality event, and we were also concerned with determining -- you know, we knew that we had maintenance workers who had been working in these drains for years. Their offices are right on top of the areas where we finding this stuff. Or their work stations. They're not really offices, they were, you know, work areas where they would keep all their maintenance equipment and what not. So, it was a major concern.

Now, those surveys, it's very important, they're probably the most comprehensive surveys we did during the entire decommissioning site characterization work, because we were right above the criticality issue, triggering a criticality event. But you need to understand, we really didn't appreciate that thorium -- you know, none of us had been around during the operational period, so we really didn't know what radionuclides were used during the atomic weapons, AWE period.

So we really didn't look for thorium. We only looked for isotopes of uranium, and there is absolutely not a single piece of isotopic analysis for thorium in the drain surveys.

And when I look at, you know, the net results of all of the work that NIOSH did with this data, in the middle of page 11, they list three bullets there, which are the, I guess, 95th percentile values, specific activity of the applicable volumetric sample data results in air concentrations of -- they list inside uranium, outside uranium, and outside thorium.

There is no inside thorium listed because -- I'm guessing here; I don't know for a fact -- but I'm guessing that NIOSH cannot estimate what the inside thorium airborne concentrations would have been, because nobody measured thorium in the drain surveys.

So I think that is a major gap in the data. You know, and there's probably others, but that's just one of them that jumps out at me, okay?

Mr. McCloskey: That's captured in the issues matrix.

Mr. Elliott: There was quite a bit of discussion about the Building 10 roof and overhead areas that followed. I highlighted that, you know, I guess a couple things. One, that we know that the -- on this call, Josie and other Members of the Board brought up the fact that the surveys of the overhead roof areas at the end of the HFIR operation in the 1980s was limited. And, you know, we definitely found, I don't remember exactly what the square footage was, but we found significant portions of the roof decking that was contaminated.

So I don't have any confidence in the 1980 survey data. And, you know, when Dr. Mauro was, in other portions of the discussion this morning, was saying that, you know, NRC found that the 1980s survey measurements were comparable to the survey

measurements at the end of the operational period, you know, 1967 timeframe, that doesn't give me any confidence at all.

Not to mention the fact that none of the surveys that were conducted at the end of the operational period, or at the end of the HFIR operations, included any of the more remote locations or the subsurface drains. And Josie brought this up, so I know that she's right on top of it. But, you know, there are some clear differences.

I'd also point out another thing about the roof work. I heard a lot of emphasis, and I appreciate that folks have taken into consideration some of the roof work, like cutting into the roofs, and cutting up through the roof and dust falling down onto the workers who are doing this work. But it wasn't just airborne dust.

I can tell you that, and my colleague and my co-petitioner, identifying information redacted], has documented that. It wasn't just cutting and sawing and drilling through the roof. It was also -- there was a lot of welding going on up there. So, even if the fixed residual contamination was indeed fixed and not removable, once you start welding, you're creating metal fumes, and, you know, it's highly respirable at that point. I have not heard any talk about welding.

But that, I can assure you, anytime they were installing new equipment, and, you know, there were some points of attachment that were done with welds, there were also times when they were repairing equipment on the roof, under the roof, in the rafters. They were welding up there quite frequently.

I'm not done. I'm sorry, I'm just flipping through my pages here.

Chair Beach: Take your time.

Mr. Elliott: You know, on several occasions, I heard

Dr. Mauro refer to the distinction between the -- what do you call it? The SEC questions versus Site Profile issues. And often, he would say, you know, we had to pick a number, so that's a Site Profile issue.

You know, and then he spent quite a bit of time talking about this whole surrogate issue of using 1990s survey data to try to reconstruct what the exposures were to maintenance workers in the '70s and the '80s. And I think he's really hit on a really key topic there, and I know he's really highlighted that. So I applaud him for that, and I completely agree with him.

I would, again, remind you that, you know, one of the things that Dr. Mauro said in, you know, the reasons why he feels we can have a fair amount of confidence in this surrogate data that was used, the 1990s survey data, to reconstruct what was happening to maintenance workers in the '70s and '80s, is that, you know, he says that the 1993 data compares well to what was done in the '60s.

I don't know where he comes up with that statement, because the 1990s data was characterization surveys of many remote locations and subsurface areas and drains and trenches and roofs that just simply wasn't part of any of the surveys that were done at the end of the operational period. They just didn't put forth the effort. Not systematically surveying, certainly. I'm not aware of any subsurface sampling at all, or volumetric sampling.

You know, apparently there was some work in the '80s in the overhead areas of HFIR and around a couple of the roof penetrations, but, you know, that is not the kind of systematic surveying that we saw done, and volumetric subsurface sampling that we saw done, in the 1990s.

So I agree with him. I don't think the surveys from 1990s can be used to estimate a bounding dose to

the maintenance workers who were working in these same areas in the '70s and '80s. I don't know. I guess, you know, I come away from this, I think Dr. Mauro has done a really nice job defining for the Board what their challenge is, as far as, you know, he has come to the conclusion that there is sufficient data, in his opinion, to, you know, conduct dose assessment with a sufficient level of accuracy and in a claimant-favorable manner, but -- I'm trying to remember how he put it.

He said the Board has the duty to determine if there is, you know, if there's sufficient accuracy, in their judgment, to be able to make the recommendation to Human Health and Services.

And I would just, you know, repeat what I said in my remarks, in my comments, my written comments on August 29th that I submitted to the Board. You know, when you look at all of the uncertainties and the gaps in the information that is used to estimate the bounding dose for this Class of workers, there is a lack of adequate source term characterization.

I think that can still be said, even after everything I heard today. There's incomplete knowledge of the nature, frequency, and duration of jobs performed in intimate contact with the source term. I don't think it's adequate to say, "we just picked a number," "we have to pick a number."

And there's complete absence, never forget this, there is a complete, absolute absence of any measurements or monitoring of the workers who are the subject of this petition. To me, that is the big elephant in the room that cannot be overlooked.

So, with that, I will certainly, you know, send some hopefully more articulate comments in writing. You know, I'm still trying to make sense of everything I've heard this morning, but, again, thank you for this opportunity.

Mr. Darnell: Mr. Elliot, this is Pete Darnell. Are you still there?

Mr. Elliott: Yes, I am. Hi, Pete.

Mr. Darnell: Hi. I think one thing that might help us the best with making sure that we are appropriately responsive to your comments, if you take a look at the issues matrix that's online on the Metals & Controls website, you have all your issues listed as part of that document so that we can make sure we keep track of them and respond to them.

If you have something new to add to that stuff, if you send it in writing, it helps us out so that we're more accurate and more timely in our response.

Mr. Elliott: Yes, of course. Thank you. Thank you, Pete. I will do that, and actually, I did skim through that document. And in my quick skim, I mean, I noticed one of the things that I did put in writing in my last submittal to the Board was that, you know, there is a little bias in the gross alpha sampling, or analytical method that we use for identifying the waste characterization studies. I did not see that addressed, but I saw most of my other comments were addressed. I assume you're going to tell me that, you know, the fact that you chose the 95th upper percentile is going to take care of our low bias issue.

Mr. Darnell: I've got to go back and look at it first before I answer that question.

Mr. Elliott: Yeah.

Chair Beach: But it is captured now, Michael, and they'll add it to workers' comments and concerns.

Mr. Elliott: And I think it's especially important now where, you know, we're relying so much -- you know, this gets back to Dr. Mauro's surrogate issue -- we're relying so much on this 1993 to 1995 site characterization data to estimate bounding dose to

these employees in this cohort. So --

Mr. Katz: So, Mike, you might just, I mean, you might want to wait a little bit just to get a hold of the SC&A report that we've been talking about before you respond, because that might be helpful to you, too.

Mr. Elliott: Yes, thank you.

Member Kotelchuck: Dave. Although I do think -- I mean, the welding issue, the question is whether there is data that's being used that somehow takes the welding into account. I haven't heard any discussion about the welding.

Certainly, it's true that it raises all sorts of contamination, you know, as you weld the metal. I don't know quite how -- if Mound would certainly be -- they're using Mound data would certainly --

Chair Beach: No, it's totally different, Dave.

Mr. Katz: The Mound is the external excavation, et cetera, work.

Chair Beach: I think Mutty's got something where they mention the welding, and I think they're looking for it right now.

Mr. Sharfi: Pat, when he discussed, he did mention the fact that one of the things that they did do in the rafters was welding. So, I mean, that was something we do mention in our White Paper.

Member Kotelchuck: Oh, okay.

Mr. Sharfi: So that is covered --

Member Kotelchuck: I'll look again at that.

Mr. Sharfi: And that's another reason why we bumped that resuspension factor all the way up to minus-4, was to account for a much higher fraction of possible resuspension due to some of the activities

that they were doing.

Member Kotelchuck: Okay.

Dr. Mauro: We ran into welding as an issue on Bethlehem Steel, remember? Where they were cutting -- when I say welding, they were actually using a torch. That's different than welding, so --

Dr. Neton: That was uranium rods --

Dr. Mauro: Right, yeah. I'm picturing an acetylene torch as opposed to a welding --

Dr. Neton: I think there are data on welding on contaminated surfaces. I can't come up with a reference off the top of my head, but I think we can look into that.

Mr. Darnell: Mr. Elliot, I just want to make sure that you know --

Member Kotelchuck: You certainly mentioned welding in terms of operations that were carried out, whether what the impact was, if we have data on it, it would be nice to see or reference.

Mr. Darnell: Mr. Elliot, I just wanted to make sure you know that NIOSH has also snail-mailed you a copy of our latest White Paper.

Member Kotelchuck: Oh, okay.

Mr. Darnell: If you haven't received it yet, you should be shortly.

Member Kotelchuck: Oh, actually, I have your White Paper.

Mr. Katz: No, that's not to you, Dave. That's to the petitioner.

Member Kotelchuck: Oh, yes.

Mr. Darnell: To Mr. Elliot.

Member Kotelchuck: Yes, of course.

Mr. Katz: We need a plan for the Board meeting.

Chair Beach: Yes, we do. So any other comments, petitioner -- or not petitioners, Board Members. Loretta? Henry? Before we move to the actions.

Member Valerio: Josie, this is Loretta. I do have a question for Pete.

Chair Beach: Okay, go ahead.

Member Valerio: On the spreadsheet that he sent for the Building 10 roof and overhead area contamination memo, on line item 181 and 184, the values are, at least to me, appear to be significantly higher. So I guess I just need a clarification. Are those numbers on the inside of the roof or on the outside of the roof area?

Mr. McCloskey: They are on the pipes. So if you scroll up to line 151, Loretta, it says it comes from page 76 of that SRDB document.

Member Valerio: Right.

Mr. McCloskey: And it was a survey on the pipes in the overhead. So it's inside the building. The only surveys on this spreadsheet that were on exterior surfaces of the building are found at the very bottom of the spreadsheet, beginning with line 283, and it goes through line 288. Those are the only exterior surveys.

Member Valerio: Okay, I'll go back and look at them. I had trouble getting into the SRDB this morning. I was getting in last week, but I had trouble getting in this morning. So I'll go back and look at those.

Mr. McCloskey: That's a good question. Let me know if you need anything else on that.

Member Valerio: Okay, thank you. And the other, it's not a question, but it's a statement, more. I still

have a lot of concerns about the internal exposures, so I think that's something that we -- at least I need to go back and look at and review. But there's still a lot of confusion, on my part, for the internal exposures and how they're going to be bound.

Chair Beach: Okay. And, again, if you have questions on any of that, I'm sure you can get a hold of NIOSH or SC&A. If you have something written, that would help you.

Member Valerio: Okay.

Action Items, Path Forward, Meeting Plans

Chair Beach: Path forward, I think I only have an action item for SC&A to update their November White Paper and get that out to the Working Group. I've already sent the letter to Ted so he can distribute the congressman's letter out to the Work Group, and move forward.

As far as the upcoming meeting in December, I am assuming that I'll just do an update to the Board. And does anybody --

Mr. Katz: But do you want someone to prepare? It's a lot of -- I think at this point, given how far we've come, it's useful to keep the Board substantively, not just process terms and form. So, would you like some help with putting that together?

Chair Beach: Yes. That thing was quite a mess last time, so I think -- sorry, that's me speaking for myself, but --

Dr. Neton: So, if Josie provides a report, NIOSH doesn't really need to do anything, other than to comment on --

Mr. Katz: So, NIOSH doesn't really need to necessarily present.

Dr. Neton: Just address any issues or --

Chair Beach: Or questions.

Mr. Darnell: Just to remind everybody, they should now be looking at Christine.

Mr. Katz: Yeah, it doesn't matter. I'm not looking at anyone, really. But, anyway, there's two -- there's several ways we could do this. We have a lot of time. Right now, we have an hour and a half. It's pretty clear that this is not ready for action at the Board meeting.

Chair Beach: No, I agree. I agree.

Mr. Katz: I don't think I'm speaking out of turn to say that, but because the petitioner hasn't even received the latest SC&A report, so it would be quite unfair, I think, to even move this to action so quickly.

Chair Beach: Well, so, I think you're right. I think we need to outline the four SEC items that we've discussed in this Work Group meeting, and then get some background so the Board is up to date.

Mr. Katz: Yes, so my question is whether we could do -- a number of things. One thing we could do is we could have NIOSH sort of bring people up to date with their work. John or someone in John's stead, do a presentation of the SC&A review of that. And you don't really have all that on your back, Josie, but you could just sort of introduce and then summarize where we are and where we're headed in terms of --

Dr. Neton: Yeah. Well, I think it ends up kind of being redundant for NIOSH to present their position and SC&A restate their position.

Chair Beach: I agree.

Mr. Katz: Fine. So then another version is for John to sort of summarize the whole enchilada himself, including the review.

Dr. Mauro: When is that meeting?

Mr. Katz: It's December 12th and 13th.

Dr. Mauro: It's coming up. But where is it?

Mr. Katz: Three weeks away. It's in California.

Dr. Neton: Near Los Angeles.

Chair Beach: And it doesn't have to be in such fine detail --

Mr. Katz: Yeah, it can't be in the same detail that we just had today.

Chair Beach: No, it just has to be an overview so the Board's aware and understands where the --

Mr. Darnell: So will everybody have input on this?

Dr. Neton: Well, yeah, we'll be able to --

(Simultaneous speaking.)

Mr. Katz: If SC&A prepares a presentation, they would circulate it to DCAS to have a look at to make sure it comports with what everyone understood here.

Dr. Mauro: So you have two deliverables. The final revised report, and the set of slides that --

Mr. Katz: A summary slide of where we are, technically, and --

Dr. Mauro: As I understand it.

Mr. Katz: Yeah.

Dr. Mauro: Okay.

Chair Beach: And pretty much just the SEC issues. The rest of it is Site Profile that we'll hash out later.

(Simultaneous speaking.)

Dr. Mauro: -- just the SEC.

Mr. Katz: Yes.

Chair Beach: Yes.

Dr. Mauro: Okay.

Mr. Katz: And a boiled down version, for sure.

Dr. Mauro: Oh, this wasn't boiled down?

(Laughter.)

(Simultaneous speaking.)

Mr. Katz: No, this was good for today, but I mean --

Ms. Gogliotti: It'll be a PowerPoint.

Mr. Katz: Rose can help.

(Simultaneous speaking.)

Mr. Katz: All right, so that's the path forward, then. SC&A will prepare the report.

Dr. Neton: Yes, then we'll review it and NIOSH will forward it with any -- we're trying to allocate resources for attending the meeting.

Mr. Katz: Right.

Dr. Neton: It sounds to me like I should be able to handle any questions with the support of Chris and/or Pete on the telephone.

Mr. Katz: I think so.

Dr. Mauro: In this overview of SC&A's position, the slide, to what extent do I try my best to represent places where we differ?

Chair Beach: Not at all.

Mr. Katz: Well, not where it's not useful in the end.

(Simultaneous speaking.)

Chair Beach: No. But it's not even the status of the -- yeah, it's the status of what the Working Group is discussing.

Dr. Mauro: The status of the Work Group, and where the Work Group is. Okay.

Chair Beach: So the key points are what are the SEC topics for Metals & Controls. Pretty simple.

Dr. Mauro: Just the issues, without our position regarding them.

Chair Beach: No, no.

Mr. Katz: It needs some substance because, I mean, otherwise the Board, you know, when it does come up in April --

Chair Beach: Correct. Correct.

Mr. Katz: -- it's not going to be very easy for the Board to get on --

Dr. Neton: I honestly think it's not unlike what you just presented today, maybe in a PowerPoint format that is more bulletized, and not as granular. But it seemed to me that could be summarized in 10 slides of PowerPoint.

Dr. Mauro: What about, do we engage this film badge thing? You know, we still are sort of at --

Dr. Neton: I think it's an open issue that --

Dr. Mauro: I think that we may have come to a place while we were talking about it. Will the transcript be available?

Mr. Katz: No, not that quickly.

Dr. Mauro: Because there are some nuances that came out during that conversation.

Mr. Katz: Bob presented a method. You have

another way to do it.

Dr. Mauro: Yes. But then we came together a bit on why they both have some value.

Mr. Darnell: Well, I think Jim was going to send out --

Dr. Neton: No, I think, in retrospect, looking at the information, I think what I was commenting on is more appropriately handled by our subsequent discussion, which is the maintenance workers and the last quarter data, that sort of thing.

I had not completely understood that we were only using covered period exposure. I thought that the film badge data started in the beginning of the residual period, which it did not. So my argument was not really as good as I thought it was.

Dr. Mauro: Yeah, okay. So --

Dr. Neton: But I think the subsequent discussion was good.

Dr. Mauro: Because I thought it did go toward that.

Dr. Neton: It does, but I think this is a stronger argument that we went through, this evolution that we went through where we're talking about, you know, Bob had already done a bounding analysis which showed that it's not inconsistent with the film badge data --

Dr. Mauro: Yes, exactly.

Dr. Neton: -- that could be applied to. I think that's a stronger leg to stand on.

Dr. Mauro: I do, too.

Chair Beach: Well, and this comes without a recommendation from the Work Group at this time, because --

Mr. Katz: Right. Right.

Dr. Neton: I think, though, you do need to point out the open issues.

Chair Beach: Yes, exactly.

Dr. Neton: I mean, what are the issues that are being --

Dr. Mauro: Should I show my conclusion, or is that too presumptuous?

Mr. Katz: I don't think so.

Dr. Mauro: Keep away from my conclusion?

Mr. Katz: No, I don't think you have to keep away from your conclusion. It's going to be in your report.

Dr. Mauro: It's going to be in the report.

Dr. Neton: Oh, okay.

Mr. Katz: No, I don't think you have to keep away from that, but that's SC&A speaking, not the Work Group speaking.

Dr. Mauro: Right.

Chair Beach: Right.

Dr. Mauro: Okay.

Dr. Neton: That's true. That's true.

Mr. Katz: I think you should summarize all the way up to where we are.

Dr. Mauro: So, in other words, like, I had a slide here presenting your assumptions versus ours regarding the subsurface Building 10, which was very compelling to me. Until I did that, I said, we're coming out in the same place. I mean, that's --

Mr. Katz: Right, and you can summarize those

things. You just don't need to go into gory detail about how NIOSH did it, and how you did it, and --

Dr. Mauro: All right. You know my slide where I compared the breathing rates, you know, the concentrations? Is that in there, in what I present to the Board? In other words, "by the way, here's how we differ."

Chair Beach: You can put that in there.

Dr. Mauro: I think that's important, but I don't know if you want me to talk about your work.

Chair Beach: Sure.

Mr. Katz: Why don't you go ahead and include what you think ought to be in there.

Dr. Mauro: And then you'll let us know.

Mr. Katz: Josie and others can cut what they think is superfluous or excessive detail, whatever, to keep it at a reasonable length. But, II mean, honestly we have an hour and a half, and so, even if the presentation takes an hour, that's okay. We've got the time.

Dr. Mauro: Let me ask Bob a question. Bob, are you still on the line?

Dr. Anigstein: Yes, I am.

Dr. Mauro: Yeah. The analysis that you did regarding the external exposures that didn't make it in, and made it into an earlier version, are you in a position to lift that and supply me with that? Because it sounds like that's some material that I neglected to include that would be of value at this time.

Dr. Anigstein: Now, are you talking about the Building 12 outside --

Dr. Mauro: No, inside Building 10. Subsurface, et cetera.

Dr. Anigstein: Yeah, that one. That was in the original report from January, February.

Dr. Mauro: Yeah. Anyway, just wanted to -- the reason I ask is that the 12th is around the corner, and I want to make sure we really have everything. It's a matter of stitching it together.

Mr. Darnell: I think one of the important things --

Dr. Anigstein: I mean, you want me to talk with you -- I mean, are you asking me about the numbers?

Dr. Mauro: No, no, no. I'm just asking you whether you have that and you could just provide it to me, or is there more work you think needs to be done?

Dr. Anigstein: No, no, no. I mean, it was something I sent to you earlier in the year.

Dr. Mauro: Good. Okay.

Dr. Anigstein: And it is summarized in the January or February report, whatever the date was.

Dr. Mauro: Okay. We have everything.

Mr. Darnell: One of the important things that we also need to include in the SEC issues is where we are with the petitioner issues. You know, at least a summary of where we are with petitioner issues.

Dr. Mauro: Yeah. Yeah. I made a list of four important issues that the petitioners raised just now. I'll tell you what they are.

Mr. Katz: Let's not. Can we do this --

(Simultaneous speaking.)

Dr. Mauro: That goes in my report.

Mr. Katz: Go ahead and give it a shot, and I mean, you have the matrix, too, to look at for reference. You have the whole matrix to look at.

Mr. Darnell: Mr. Elliot said he was going to take a look at it and send any additional ones.

Dr. Mauro: Any additional ones, okay.

Mr. Darnell: You know, to show that we're being responsive.

Dr. Mauro: Welding. Does welding make it into the story?

Mr. Katz: It didn't get a lot of discussion here. I think you're getting into fine details again.

Dr. Neton: I think you can only summarize up to what, you know, we ended --

Dr. Mauro: We'll just say we talked about it.

Mr. Darnell: It's in the White Paper.

Dr. Mauro: Welding?

Dr. Neton: It's not really. It's mentioned, but I don't get the sense that it was addressed quantitatively at all. I thought we may have to go back and look at it a little closer. But I would think I would summarize pretty much what --

Dr. Mauro: Okay. I asked the question because there were certain questions raised here by the petitioners which I consider to be extremely fundamental. One is welding, and the other is thorium.

Dr. Neton: Well, I think those are sort of new issues that were added to the table. You can probably mention it at the end.

Dr. Mauro: Say they were raised, and that's the and not try to answer them.

Dr. Neton: They've not been discussed yet.

Dr. Mauro: Okay, good.

Mr. McCloskey: When in doubt, include it, and we'll delete it if we -- we'll vote on it, and --

Dr. Neton: Well, we don't vote.

(Simultaneous speaking)

(Laughter.)

Dr. Mauro: Because the reason I asked is that you're looking to SC&A to address that issue quantitatively. There's work there.

Dr. Neton: With the welding issue?

Dr. Mauro: And the 12th is right around the corner

Mr. Katz: Oh, no.

(Simultaneous speaking.)

Mr. Katz: It's not addressing any new issues quantitatively, or any other way, because NIOSH would have to address it anyway, not you.

Dr. Mauro: Okay. Got it.

Mr. Katz: Again, we're not expecting -- we're not putting anything forward for action at this meeting. This is just to update the Board and keep their heads in the game in terms of the nature of this material.

Chair Beach: And I'm assuming after the December meeting we'll get back together as a Work Group via phone, or whatever.

Mr. Katz: We can do that in a conference, I'm sure.

Chair Beach: Yeah.

(Simultaneous speaking)

Mr. Katz: Yes, you don't need to now.

Dr. Mauro: No, we're okay, Bob. I just wanted to make sure you were available. No, no, you're tied up

with some other work, and I wanted to make sure we weren't loading you up to a point where we can't do this between now and just a week before the 12th. That's where we'll be. I guess that would be the target, getting it everybody's hands the week before the 12th?

Mr. Katz: Yeah, because we have to get it posted before the Board meeting, and we have to get it posted and available to the public. Correct.

Chair Beach: Probably maybe want it closer than a week before, or is that enough?

Dr. Mauro: Is that good?

Mr. Katz: Well, everyone else will have to turn it around very quickly, because it pretty much has to go for posting almost a week before the Board meeting.

Dr. Mauro: Twenty days. We have 20 days.

Mr. Katz: It should be okay.

Dr. Mauro: Okay.

Adjourn

Mr. Katz: Okay. Okay, I think that takes care of things, and we're adjourned. Thank you everyone for hanging in on the phone.

(Whereupon, the above-entitled matter went off the record at 12:13 p.m.)