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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL
SAFETY AND HEALTH

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ADVISORY BOARD ON RADIATION AND
WORKER HEALTH

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WORK GROUP ON WELDON SPRING PLANT

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TUESDAY
OCTOBER 19, 2010

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The Work Group convened in the Cincinnati Room of the Cincinnati Airport Marriott, 2395 Progress Drive, Hebron, Kentucky, at 9:00 a.m., Michael H. Gibson, Chairman, presiding.

PRESENT:

MICHAEL H. GIBSON, Chairman
RICHARD LEMEN, Member*
ROBERT W. PRESLEY, Member

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ALSO PRESENT:

TED KATZ, Designated Federal Official
NANCY ADAMS, NIOSH Contractor
RON BUCHANAN, SC&A
MEL CHEW, ORAU Team
JOE FITZGERALD, SC&A
DAVE HARRISON, ORAU Team
MONICA HARRISON-MAPLES, ORAU Team
STU HINNEFELD, DCAS
EMILY HOWELL, HHS
KAREN JOHNSON, Weldon Spring Petitioner
MARY JOHNSON
JENNY LIN, HHS*
ARJUN MAKHIJANI, SC&A
JOHN MAURO, SC&A*
ROBERT MORRIS, ORAU Team
MARK ROLFES, DCAS
TINA TRIPLET, Weldon Spring Petitioner

*Participating via telephone

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C-O-N-T-E-N-T-S

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

(9:02 a.m.)

MR. KATZ: So good morning, everyone in the room and on the line.

This is Ted Katz with the Advisory Board on Radiation and Worker Health. This is the Weldon Spring Work Group. I'm the Designated Federal Official for the Advisory Board. And we're going to get started in a minute.

Before we go on record, we're going to do roll call. And let's begin with Board Members in the room with the Chair.

CHAIRMAN GIBSON: Mike Gibson, Chair of the Weldon Spring Work Group.

MR. KATZ: And please speak to conflict.

CHAIRMAN GIBSON: No conflicts.

MEMBER PRESLEY: Robert Presley, Board Member. No conflict.

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MR. KATZ: And on the line, Board Members?

MEMBER LEMEN: Richard Lemen. No conflict.

MR. KATZ: Welcome, Richard -- Dick.

Okay. And now NIOSH ORAU Team in the room?

MR. HINNEFELD: Stu Hinnefeld, Interim Director of DCAS.

MR. ROLFES: Mark Rolfes, health physicist with DCAS. No conflict of interest.

MR. HINNEFELD: Yes. No conflict on my part, either.

MR. KATZ: Any NIOSH ORAU Team on the line?

DR. CHEW: Mel Chew, ORAU Team. No conflict.

MR. KATZ: Welcome, Mel.

MR. MORRIS: Robert Morris.

MS. HARRISON-MAPLES: Monica

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Harrison-Maples, ORAU Team. No conflict.

MR. KATZ: Okay. So we have Robert Morris and Monica --

MS. HARRISON-MAPLES: Harrison-Maples.

MR. KATZ: Harrison-Maples. I always get those switched around. But thank you.

MS. HARRISON-MAPLES: That's okay.

MR. KATZ: And both of those, no conflict?

MR. MORRIS: No conflict for Robert.

MR. KATZ: Right. SC&A in the room?

MR. FITZGERALD: Joe Fitzgerald. No conflict.

DR. BUCHANAN: Ron Buchanan. No conflict with Weldon Spring.

DR. MAKHIJANI: Arjun Makhijani. No conflict.

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MR. KATZ: And SC&A on the line?

DR. MAURO: John Mauro, SC&A. No conflict.

MR. KATZ: Welcome, John.

Very good. And federal officials or contractors for the feds in HHS and other agencies in the room?

MS. HOWELL: Emily Howell, HHS.

MR. KATZ: And on the line?

MS. LIN: Jenny Lin, HHS.

MS. ADAMS: Nancy Adams, NIOSH contractor.

MR. KATZ: Welcome, Jenny and Nancy.

MR. HARRISON: This is Dave Harrison, ORAU Team with no conflict.

MR. KATZ: Oh, thank you, Dave Harrison.

All right. Finally, there are no members of the public in the room.

But on the line, any members of

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the public who would like to identify themselves?

MS. K. JOHNSON: This is Karen Johnson, one of the petitioners.

MR. KATZ: Welcome, Karen.

MS. TRIPLET: Tina Triplet, one of the petitioners.

MR. KATZ: And welcome, Tina.

MS. M. JOHNSON: Mary Johnson.

MR. KATZ: Mary Johnson. Thank you.

Very good. So let me just ask for all of you on the line, please mute your phones except when you're addressing the group. For those of you that don't have a mute button on your phone, if you hit *6, that'll mute your phone. And then if you hit *6 again, it'll unmute your phone. So *6.

And please, do not put the call on hold at any point, but hang up and dial back in because the hold will disrupt the call for

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everyone else.

Much thanks. And Mike, it's your agenda.

CHAIRMAN GIBSON: Okay. Hope everyone's got a copy of the agenda. Sorry I was late getting it out. But it's pretty straightforward, I think.

We have a few documents to go over but I thought, to start off, maybe we could have someone from DCAS just give us a brief overview of the Weldon Springs ER report and the original SEC petition, just to get us back up to date.

MR. ROLFES: Sure can. And I just had it pulled it up, and I need to pull it back up here. I just accidentally closed it. If you could just give me a couple of seconds.

Okay. Sorry about that.

Okay. This is just a brief update on SEC-00143. We received the petition in

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April of 2009. It qualified September 11, 2009 and the price evaluated by NIOSH was all employees of the Department of Energy, Department of Energy contractors or subcontractors who worked in any area of the Weldon Spring Plant or Weldon Spring area during the covered operational period from January 1, 1957 through December 31, 1967.

The Evaluation Report was approved in April of 2010 and the feasibility determination was that the documentation and records that we have allow us to do accurate dose reconstructions -- dose reconstructions of sufficient accuracy for both internal and external sources of radiation exposure.

Would you like any additional details?

CHAIRMAN GIBSON: Are there any other questions about the petition or at least what we're starting from here today?

(No response.)

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CHAIRMAN GIBSON: If not, we can get right into the -- SC&A has prepared an issues matrix for the Weldon Spring Site Evaluation Report and the SEC petition. So if we're able to take off with that, we'll go there.

MR. FITZGERALD: Yes. Let me just preface -- Ron's going to go through that.

We sent that matrix out yesterday afternoon. And again, it was in DOE for clearance for a bit. So hopefully everyone has a copy of that now. We use that as a sort of set of talking points.

MEMBER LEMEN: This is Dr. Lemen. I didn't get a copy, if you sent it out yesterday afternoon.

MR. FITZGERALD: It's on the CDC computer. But you don't see it?

MEMBER LEMEN: Well, I have trouble with the CDC computer. I'm not cleared for it for some reason. I'm trying to

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get cleared for it. But maybe if you sent it to my regular email.

MR. KATZ: I think we're going to try to figure out how to forward that to you.

MEMBER LEMEN: Okay. Thank you.

MR. FITZGERALD: I guess with that, as we do on these initial work group meetings, we're going to walk through what we see are some of the issues that either are, in our mind, a technical question or areas where I think we need clarification on the evaluation. I mean, these are all created equal. But we want to make sure at least there's a complete listing at this point in time.

MR. KATZ: Dick, Mike's emailed it to you, so it should arrive soon.

MEMBER LEMEN: Okay. I should get it in a few minutes if he did because I can get it from Mike.

MR. KATZ: Thanks.

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MR. FITZGERALD: It's ten pages, Dave.

MEMBER LEMEN: Okay. Thank you.

MR. FITZGERALD: So we're just going to go ahead and walk through this. And Ron's done the yeoman's job so I'm certainly going to turn to him to go through the issues we have.

You want to just tick through?

DR. BUCHANAN: Okay. Before we get started on the individual issues, just to bring everybody up to speed, I think we ought to cover a little bit about what the whole facility was about and why we have an SEC.

Okay. Weldon Spring was the uranium processing plant, and it operated from 1957 to 1966. It took over the job of the Mallinckrodt downtown uranium plant in downtown St. Louis. There was a slight overlap -- a year and a half or so -- that they both operated. The Mallinckrodt -- a lot

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of you are familiar with that downtown plant. I know Arjun is and he worked some on that.

And then the Weldon Spring took over, and it was more of a directed, engineered plant to process uranium ore concentrate. It essentially took the uranium ore concentrate, did chemical processing on it, put it into a furnace, melted it down into uranium metal mostly and shipped it out to other areas -- other labs and stuff to be made into reactor fuel elements. There were some other products, but that was the main product.

As far as SC&A can find and then NIOSH has found, it used mainly uranium ore concentrate. It did not use pitchblende or the other material that came in with a lot of the byproducts of the decay in it. And so it received these in drums in something like a 55-gallon drum. They dumped uranium ore.

After the chemical processing at the mills, it came in looking something like a

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yellow cake, so that they called it yellow cake. They sampled these, weighed them, put them in a hopper. And then that material went down through a chemical separation process. And then I don't know all the details as far as the chemistry goes, but they created a green salt and then they put that into a furnace -- in a bomb, they called it. They had to use magnesium to heat it up. And out of the bottom of the container then came the molten uranium which they called an ingot. And then that was screwed into rods, and then rods in the machine and cut into certain lengths. And those were then shipped out. That was their end product. That was in `57 through December of `66.

They also used some thorium -- did some thorium processing from `63 to `66 in certain buildings at Weldon Springs.

December 31st in 1966 was the official cut-off date, I guess. They decided

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that it was no longer economically feasible to run Weldon Springs. And so they closed it down. It started a decrease in productivity and worker count in the 1966 year. And then the 1st of January of '67, it appears that there was no real work being done there.

Now in '67 and '68, it was an Army site to begin with. It was turned over to DOE for the uranium processing. It was turned back over to the Army for manufacturing Agent Orange herbicide. It never was done. However, there was some work done in '67 on some of the buildings and '68 to renovate it for the production of a herbicide. And that will be one of the issues we talk about a little later.

And so I wanted to give you a background on what it's function was. According to records and according to NIOSH, they received mostly uranium from the United States and Canada, received recycled uranium

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starting in -- and this is another issue, what date is not sure -- it's around '61 -- and Fernald mainly as some of their work. It also received enriched uranium in a one- to two-percent range from Fernald also in the later years.

And so, what SC&A did, we did worker interviews about a couple years ago. We also evaluated the Technical Basis Documents 1 through 6 that were issued in 2005. We evaluated those and sent that report in in February of '09 with 28 issues as far as TBD issues go. And as Mark says, the ER then was issued in April of 2010 -- somewhere around that. And so we were charged with looking at the ER and evaluating it to see if it was technically correct.

And so we did that. And I created the matrix with nine issues to be resolved on it. I do apologize for getting it in late. I know I hate it when I receive something at the

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last minute. SC&A did send this in around the 1st of October. It took quite a while to clear and so it didn't get out to your computers until yesterday, apparently. And so we made extra copies for anybody that needs it here. However, I realize that this doesn't give you a chance to look it over beforehand.

So we'll try to go through each issue and explain why we bring these issues up today since some of you hadn't had a chance to study it.

And we have nine issues that we'd like to bring forth to the Working Group for them to consider that need resolving and what can be done to resolve these issues. And we'll just start off with, are there any questions at this point on the function of Weldon Spring or where we are at this point?

MR. ROLFES: Ron, just before we start, I want to make sure that our contractor's on the phone so they can follow

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along.

MEMBER LEMEN: This is Dick Lemen. I do have it now.

MR. ROLFES: Okay. Mel, Bob and Monica, do you have copies of the document? We're going to discuss the site Special Exposure Cohort evaluation matrix that we received yesterday. So I just want to make sure that you have that before we start.

DR. CHEW: This is Mel. I do.

MR. ROLFES: Okay. I realize we haven't had time to prepare responses. So this is sort of going to be on the fly. So we'll certainly hear what you have to say. And just keep in mind that we haven't prepared responses to these and that we're going to need to do some additional research to formulate our official responses.

MR. HINNEFELD: Yes, I think our conversation today is more for questioning to make sure we understand the nature of the

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finding and what would be expected for the finding to not be a finding -- those kinds of things -- if we have any questions.

MR. KATZ: Ron, maybe as you go through these, if some of these issues are overlapping with issues that were raised in the TBD review, that might be helpful to know, since the TBD review was done back in February.

DR. MAURO: Ron, this is John Mauro.

And Stu, just a quick question. I'm looking at the matrix and I see that in the far right-hand column -- the fourth column -- gives the SC&A summary of the issue. But the middle one has a NIOSH ER position. Is this write-up something that NIOSH prepared or is it something that we prepared based on our understanding of the NIOSH ER?

DR. BUCHANAN: John, this is Ron.

Yes. The latter is correct. This

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is SC&A's reading of NIOSH's position the way we understand the ER.

DR. MAURO: Okay. So we don't have before us, then, NIOSH's own response to our concerns?

DR. BUCHANAN: No, because they haven't seen our concerns yet.

DR. MAURO: Very good. Thank you.

DR. MAKHIJANI: Well, we have with the ER. We have NIOSH's Evaluation Report.

DR. BUCHANAN: Right. And in the third column, this is the way we understand what they're saying.

DR. MAURO: Okay.

DR. BUCHANAN: In my interpretation. So if it's incorrect -- as we go through this, if there's anything that you wanted to clarify or correct, please free to interrupt me.

MR. FITZGERALD: This has been standard practice because clearly when we

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present the matrix for the first time, one issue is making sure we're reading it right.

DR. BUCHANAN: Sure.

MR. FITZGERALD: And the second question is the actual technical issue itself. So -- yes.

DR. BUCHANAN: And some of these issues are perhaps SC&A's questioning the TBD and the ER to see if they match each other. If something has changed between the two, then we want to know which way will be used in actual dose reconstruction. And so that's one reason for us putting down what we understand NIOSH to be saying and so we can clarify which method is going to be used.

So if there's no other questions, we can get right into the heart of the matter, and that's on page two of the matrix -- issue number one -- is accuracy of records not sufficiently verified. And A and C are together -- internal and external. A was

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expounded on a little bit more in the ER than C. But we had the same questions on both.

First of all, can NIOSH tell me -- the CER -- how is it used in dose reconstruction and why was it compared to the CER? Why was Weldon Spring's hard copy data compared to CER?

MR. ROLFES: Well, I'm going to defer to Monica on this one because I believe she was the one who had gone and looked at the CER records.

Monica, did you hear Ron's question regarding the comparison of the CER data?

DR. CHEW: Mark, this is Mel. Monica had to step out to take another call here from another petitioner. I just got an email from her. Maybe you want to defer it until she gets back.

MR. ROLFES: Okay. We'll certainly do that if we can if that's okay

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with you, Ron?

MS. HARRISON-MAPLES: Mark?

MR. ROLFES: Yes?

MS. HARRISON-MAPLES: Yes. I haven't left yet. I'm getting ready to leave. I have about six minutes that I can address this question real quickly.

MR. ROLFES: Great.

MS. HARRISON-MAPLES: Sorry about that. I couldn't get off of mute.

The CER database is an electronic record of the data that ORAU collected early on for epidemiology studies having to do with Weldon Spring -- the studies having to do with Weldon Spring. The purpose of comparing the two sets of data had to do with verifying that the electronic records and the -- verifying the pedigree of the records, basically. We from an SEC perspective were not looking at it in terms of how the data was going to be used for dose reconstruction directly because the

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SEC process doesn't really look into individual dose reconstructions that way. But we do need to verify that the data that the project has available to it -- both hard copy and electronic -- we were comparing them for consistency to make sure that what we had was accurate and met our pedigree requirements.

As far as for dose reconstruction, the dose reconstructors, to the best of my knowledge, have in their procedures that they will always go back to the hard copy record if there is hard copy information available. So the comparison -- you're looking at it from two different perspectives when you talk about how is it going to be used for dose reconstruction. This comparison will not be used for dose reconstruction.

Does that answer the question?

DR. BUCHANAN: Well, Monica, this is Ron.

Will the CER database be used for

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dose reconstruction?

MS. HARRISON-MAPLES: The CER database will only be used for dose reconstruction in the event of an individual dose reconstruction where there is not a copy of a hard copy record.

DR. BUCHANAN: How did the CER get -- just for clarification -- how does the CER get data if there wasn't hard copy to put it in originally?

MS. HARRISON-MAPLES: There would have been a hard copy record originally. ORAU received the information directly from Weldon Spring back when they were doing this epidemiology study, and they digitized the records. They made the database directly from the records.

Now, if at some point in time that record was destroyed somehow, CER would still have that electronic database. That is probably not going to happen. We don't see

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that very often. What is more likely to happen is that the CER database would be used in the event where there is no record for someone, and they would look at it from a co-worker kind of perspective.

DR. BUCHANAN: Now the CER database is not complete. It doesn't contain all the records from Weldon Spring? Is that correct?

MS. HARRISON-MAPLES: It contains all the records that CER was able to get for Weldon Spring.

DR. BUCHANAN: Okay. But the way I understand the comparison in the ER, some years it might have contained 30 percent, some 60 percent, sometimes 90 percent when you made a comparison. So the CER generally cannot be used for dose reconstruction because it's not complete. Is that correct?

MS. HARRISON-MAPLES: I'm not really sure I'm understanding your question.

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You're talking about for an individual dose reconstruction?

DR. BUCHANAN: Yes.

MS. HARRISON-MAPLES: If a person's record -- an individual's record are in the CER database, then yes, it could be used for dose reconstruction. If an individual's records are not in the database, then they might be able to look at similar workers, similar job titles and do a co-worker study based on the CER records.

I'm not an expert in the co-worker studies. I don't know if there might not be a period where a partial reconstruction might or might not be able to be done. But that's generally how the CER database will be used.

For the most part, for individual dose reconstructions, though, they will look at the records of the individual.

DR. BUCHANAN: Okay. Now for Weldon Springs, when they have a claim and a

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dose reconstructor request data, where does that data come from to that --

MS. HARRISON-MAPLES: I'm sorry. I didn't quite understand the question.

DR. BUCHANAN: When a claim is submitted and NIOSH processes that claim and does a dose reconstruction for Weldon Spring, where do they get that data that they use to actually do the dose reconstruction? Do they get hard copies from where? Or electronic database?

What I'm trying to establish is the data they use today has been verified it is complete and accurate from the original data that was recorded for that worker 40 years ago.

MS. HARRISON-MAPLES: I'm not sure that I can answer your question fully. I don't work on the dose reconstruction side of it. I believe I understand the procedures, but I work SEC side.

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As I understand it, we have out for the record for Weldon Spring, we have a storage of records from Weldon Spring. And that would be searched to find records for the individual. That would include copies of the hard copy record for the individual, if we have them. They might look through the database. And this comparison of the database with the hard copy is basically a verification that we got these records at one time in the past, we're comparing them to what we get again, and we're verifying that they are the same in order to establish a pedigree of the information.

DR. BUCHANAN: Okay. So for example on page 49 of the ER, it shows -- 49 or 50 -- it shows that for 1957, for example, that the SRDB results captured in a CER database was 61 percent. So this tells me, number one, that the CER does not contain all the records, obviously, if it contains only 61

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percent for that year. So the SRDB database -- this is an electronic database that was copied from the hard records? Or how did the --

MS. HARRISON-MAPLES: No, no. You're confusing the purpose of the SRDB database.

Mel, can you speak to this a bit? I have to go. I have to pick up this other call. I apologize and I will be back on this call as quickly as I can be. But we have a petitioner from another petition that I set up a call for and I've got to go.

MR. ROLFES: Thank you, Monica.

MS. HARRISON-MAPLES: I'm sorry. Thank you.

MR. ROLFES: No problem. Thank you.

Mel, did you want to answer Ron's question regarding the Site Research Database or should we wait for Monica?

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DR. CHEW: I think we should table this thing, Mark.

MR. ROLFES: Okay.

DR. CHEW: I'm not so sure I understand exactly where Ron is going with this question, anyway.

MR. HINNEFELD: This is Stu.

Well, one question that comes to mind is what is the origin of the exposure record we receive when we get an exposure history from a Weldon Spring worker. Weldon Spring is not there anymore. Does this go to Legacy Management, and what record do they pull out? What do they rely on to tell us what the exposure record is? I mean, that's one question.

DR. BUCHANAN: That's correct. And what's the chain of custody, so to speak? When it was recorded in 1962 to when the dose reconstructor -- I guess this is the summary of the issue is for external and internal

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records. What is the chain of custody? What is the verification that the dose reconstructor receives? If it's an electronic database, is it a photocopy or whatever, how do we know that that is complete from when that record was recorded in 1962 or whenever the operation's taking place during the SEC? That is what I would like to be addressed.

DR. CHEW: So Mark, let me make it -- I think we need to get someone who was doing the dose reconstruction from Weldon Spring to answer that particular question.

MR. ROLFES: That would be a good idea. I don't know if Dave Harrison might be familiar with that or not.

Dave, did you have anything to add about the source of the DOE records that we received for dose reconstructions for Weldon Spring Plant?

MR. HARRISON: I do not have that information right now.

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MR. ROLFES: Okay. Thank you.

We'll have to get you an answer for that. I was trying to look on my computer here but it's not very responsive at the moment.

MR. FITZGERALD: Yes, the two facets -- and this is sort of a conventional question we raise with every SEC as sort of the source of the database that's being used for dose reconstruction. And the other thing that I think that Ron was getting to is how you validated that the database track was sufficiently complete. And if there were gaps, how did you address the gaps? I mean, that's kind of where we always come from.

DR. MAKHIJANI: Just to add something to that, part of our procedure is to review these. And the Board's guidelines for us were to look at adequacy and completeness. If you're going to do co-worker models, they'll probably come from this electronic

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database. And then we're supposed to verify the adequacy of that electronic database. So if 40 percent of the records are missing in some cases, then you want to know which 40 percent are missing.

MR. FITZGERALD: Right. And how representative would it be if you did --

DR. MAKHIJANI: Yes, representativeness, adequacy and completeness are part of our kind of SEC review guidelines that we need to ask those questions.

DR. BUCHANAN: A lot of these records have been transformed to electronic records through the years. And then that gets put into another system. And so we have some sort of verification from the very origination of those records to the use of dose reconstruction to make sure that they're there and they've been transferred accurately.

So that's issue 1 -- A and C on the records. And the reason I put those in

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there is because the way I understand it is that on B, we might as well pop into that now, it's air data.

I understand that according to the ER and TBD that there is uranium air monitoring data area and some breathing zone area for 1958 through 1966. That's on page 40 of the ER. And for thorium, 1963 to 1966 on page 41 through 45. And am I to understand -- recommend using TIB-5000 and 6000 for using this data which consists of daily weighted averages -- DWAs -- which I understand they would put an air sample there for a certain amount of time, determine how long that exists and then prorate that for like an eight- to ten-hour shift or something?

However, I'd like Arjun to address that since he's addressed this at Mallinckrodt, perhaps, Fernald. So he has some insight and experience in this area.

DR. MAKHIJANI: Yes. I've only

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been marginally involved with Weldon Spring just kind of answering Ron's questions off and on.

And one of the questions was what have we said and what methods have we recommended in using daily weighted average data. And there was a whole analysis in our report to the Board in April 2005 when we showed that the use of daily weighted averages could give you or indicate at least by an analysis that could give you average typical doses for a group of workers. But it certainly couldn't establish bounding values. Very often you have two or three measurements at a job location.

PARTICIPANT: Your broadcast is breaking up here. Could you get closer to the microphone, please?

DR. MAKHIJANI: Yes. Well, in April 2005, we had -- I'll speak a little louder too. In April 2005, we had done an

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analysis of the daily weighted average question in the context of the Mallinckrodt SEC review and pointed out that you can't use daily weighted averages to come up with bounding doses for anything -- maybe typical doses for a group of workers. And there were a number of reasons for that. And we also recommended an approach that you might consider for use of daily weighted averages to develop such bounding doses. But I don't believe it's ever been done.

And we ran it by our statisticians. And the basic issue -- just to remind you -- and I'd be happy to send that report to all of you who may not currently have it; I don't think it's on the NIOSH website -- is that you have two or three measurements taken over a few minutes for each task that was performed over the course of a day. Very often these two or three measurements for a certain task would be

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highly variable. In some cases, many measurements were taken but only the minimum, maximum and averages reported so there's a significant loss of data so you can't actually construct the distribution, or at least what is presented in the database doesn't contain all the information that was originally taken.

And when you try to calculate the variances based on two, three, four measurements, they are of course very large. And then there are different variances for each task. So there are a number of tasks that go into a daily weighted average, and you're confronted with a problem of coming up with a composite distribution that would representing a bounding dose.

It's a non-trivial problem. And it's unclear, with a few measurements over a few minutes which was typical. I haven't looked at Weldon Spring data -- which was the case at the Destrehan Street site -- that you

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could do this. I mean, we didn't offer an opinion so far as I remember. We suggested that if it were going to be used to develop bounding doses that there was a possible approach that could be developed. But we never saw any response from NIOSH, presumably because an SEC was granted at Mallinckrodt and NIOSH didn't have to go there.

But subsequently, I've noted that NIOSH has proposed the use of daily weighted average in the same way and sometimes in moderate variance but never addressed our original criticisms of use of daily weighted averages in the SEC context.

MR. HINNEFELD: What was your report that you -- or what was it related to at --

DR. MAKHIJANI: It was the Destrehan Street site from April 2005.

My government computer has kind of locked up. It's not working right. And I

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have to call -- my whole email has crashed. But I think I can send things out.

MR. HINNEFELD: I can find what you described. I'll be able to find that.

MR. MORRIS: Yes, in 2005, that would not have had a DOE classification review. So you're probably not authorized to handle it over the Internet yet.

MEMBER LEMEN: Hello. This is Dr. Lemen. Can you hear me?

MR. HINNEFELD: Yes, we can hear you, Dick.

MEMBER LEMEN: Arjun, would it be possible for you to send me that report if you can find it?

DR. MAKHIJANI: Sure. I can send it. I have it in my government computer because I have all my files.

MR. MORRIS: But are you aware that DOE has probably not reviewed a 2005 document?

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DR. MAKHIJANI: This raises a point. We are not allowed to send any files prior to 2008 to anybody?

MR. FITZGERALD: It's probably appropriate to send it through DOE for a check before doing it yourself. I mean, just retroactively because we had that issue going back before 2006.

DR. MAKHIJANI: But presumably internal SC&A, we can still see it. Because it's on my --

MR. FITZGERALD: Yes, just for dissemination. I think there's an acknowledgment that there's some documents that go far back that --

DR. MAKHIJANI: Right. Sure.

MR. FITZGERALD: -- there's a limbo status. But we still want to go ahead --

DR. MAKHIJANI: Well, I'm happy to go along with whatever direction CDC has to

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provide. Ted?

MR. KATZ: Yes, that makes sense to me.

DR. MAKHIJANI: So reports that go to the Board and to NIOSH should be run by DOE before sending --

MR. FITZGERALD: If they haven't been screened. That's the protocol. Yes.

DR. MAKHIJANI: Okay.

DR. MAURO: This is John. Try speaking as if you just did very briefly on breathing zone data and daily weighted averages. This has been a subject that's come up as Arjun pointed out on a number of occasions. It also will be an important issue on our upcoming Fernald meeting.

And I just wanted to say something, I guess, more global. The health and safety laboratory which made wide use of this technique and is widely accepted in the industrial hygiene world as an excellent way

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to get a good sense of the kinds of exposures different jobs, different workers and job categories experience.

The way it's implemented, when you actually go through the calculations, you look at the data, it's instructive to actually do one. I've done a couple myself just to make sure I understood how they're done. What you really come up with is a best estimate of the exposure of a worker in a given day for his given job category. And I think that's an excellent metric to characterize the kinds of exposures -- inhalation exposures -- that different classes of workers might have achieved.

But now, it's widely accepted within NIOSH that this is a reasonable approach to take and it's been embraced. We're really questioning whether or not the intent of the DWE approach that has been embraced really meets the intent of EEOICPA,

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which is different than what HASL was trying to do when it invented or applied, or the industrial hygiene community, in general. We think that the number you end up with by way of intake represents a reasonable best estimate for a given category of work or a job category. But there can be many workers that fall within that category that could experience exposures that are substantively higher and perhaps substantively lower since it's a parameter that tries to capture central tendency.

So as applied to this program, the classic approach to doing daily weighted exposures may not really meet the intent -- and the reason I'm bringing this up is this becomes a global issue in terms of, does NIOSH agree that yes, SEC, I think you're right. I think that it gives a good best estimate. But is that really what we're looking for? Aren't we looking for something that provides a

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reasonable bounding estimate so that no worker's exposure is underestimated?

And I think once that distinction is recognized and acknowledged and is explored, NIOSH may decide no, no, SEC, we disagree, this is fine. Or no, you're right. And I think this is something that is so fundamental to the dose reconstructions we've been doing where we rely on breathing zone.

As Arjun pointed out, if it's decided by NIOSH that maybe perhaps we should revisit this concept, we do offer up -- and that's why it's very important that Arjun's write-up on Mallinckrodt is distributed because he actually lays out a statistical approach using the data that will tend to generate an approach of what I would say is more claimant-favorable than the classic breathing zone.

So I wanted to make this point because it might actually be something that

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goes toward one of these global issues because it cuts across many sites.

MR. MORRIS: This is Bob Morris. In response to that, John, I'd ask you a question. Have you guys seen the 9 February 2008 peer-reviewed Health Physics Journal report by Adams and Strom regarding DWE uncertainty and how DWE data may be specifically used in dose reconstructions under this program?

DR. MAURO: I haven't read it. I've seen it but I have not read it.

So I guess you're saying that the issue may be very well aired in that article.

MR. MORRIS: It is a very well done article.

DR. MAURO: I think it's important that we all take a look at that as part of this process.

DR. MAKHIJANI: But you haven't proposed --

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MR. MORRIS: The 2008 Health Physics Journal.

MR. HINNEFELD: Bob, this is Stu. Which journal is that in?

MR. MORRIS: February 2008 Health Physics Journal --

MR. HINNEFELD: Okay.

MR. MORRIS: -- by Adams and Strom.

DR. MAKHIJANI: But you haven't proposed to use that here.

MR. MORRIS: We've used it as underlying a lot of our approach to DWE data. It's inherent in our approach. If you read how we're actually using it in our revised Technical Basis Document drafts and such, you'll see that that's one of our underpinning documents that's referenced.

DR. MAKHIJANI: Yes. Okay. Fine.

DR. MAURO: That's very helpful. I'm going to look at that right away.

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DR. MAKHIJANI: But the only thing I'd like to add from what John said is we didn't actually develop this method because it's NIOSH's to do.

MR. MORRIS: Could you move closer, please?

DR. MAKHIJANI: That's NIOSH's job to develop the method. We critiqued the application of DWE directly and suggested that there could be an approach to develop a method. But we didn't actually ever say that here's the method; this will work. Here's the kind of data that go into it. In my opinion, probably it might depend on a case-by-case basis. If you've got too many tasks with two data points, you might have problems. If you have more data points for each task in a reliable task profile, that might work.

MR. MORRIS: What Strom and Adams suggest in that context is that as those uncertainties go up that the geometric

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standard deviation applied to the data set goes up.

DR. MAKHIJANI: Yes.

MR. MORRIS: So I think there's a logical approach that they've prepared considering exactly those concerns.

DR. MAKHIJANI: I'm aware of the geometric standard deviation issue, and we pointed out the same thing in 2005. But all I wanted to say in this context, just to clarify, is that we indicated a path that was a possible path but never signed off because NIOSH didn't develop it because it was an SEC --

MR. FITZGERALD: Right. And we can certainly review it. I'd be happy to do that.

DR. MAURO: Yes, Arjun, thank you for clarifying that. I know I didn't mean to say that we're offering it up. But there are strategies that could be used.

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Bob, one real quick question for you because you really got my attention. This might be the magic bullet.

When I've reviewed and done some of these, there would be a person that had a particular job category at a facility. And on a given day, he would spend let's say one hour shoveling dirt. I'm making this up. And where I know this -- okay -- this would be the smallest element that makes up this DWE calculation.

So here you have this guy. In a given day we know he spends about an hour or two doing a particular task -- very specific task. And what I would always notice is that they were usually reported for him a breathing zone sample -- three of them. They were to report three of them. Not that they had only three, but they would report three. They would say here's the lowest one we saw, here's the middle one, and here's the highest in

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terms of the becquerels per cubic meter that he was exposed to during the time that the air sample was collected -- the low, medium, high.

What would happen is they would take the average of those three numbers, and that would represent his exposure for that one-hour time period when he does that job -- that's my understanding for better or worse of the essence of the DWE exposure. And then they process the numbers over and over.

But if you take the average, what you've just done was take what you would consider to be a good central tendency estimate for that particular one-hour job that this guy was doing. And therein lies the essence of our concern because if you have a number of people doing that job, some of them are not going to be in the center. Some of them are going to be toward the high end. And those are the ones that you would not be giving the benefit of the doubt. So it was

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our understanding that that's the way in which it's done.

Are you saying that the Strom article somehow comes to grips with that in a way that --

MR. MORRIS: Excuse me. I'm sorry. I didn't mean to interrupt you, John.

DR. MAURO: Yes.

MR. MORRIS: It's been a half a year or more since I've read it. So be indulgent on my memory here.

But I'm recalling that he included a method or way to assume log-normality in that data set representative of only like three low, medium and high where it might be more data that were actually collected and not reported in the summary level.

DR. MAURO: Absolutely. We're on the same page now because that's how we were looking at it also. Keep going.

MR. MORRIS: And so I think that

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the method incorporates some function like that and in fact addresses it. So that's really all I'm prepared to say because I didn't anticipate this conversation today.

DR. MAURO: This is great. It's important. I'm going to take a look at it. I think the other members of our crew -- because when I do do it by hand -- and I've done these by hand to match your numbers -- it was always the average. But if somehow -- maybe I looked at an example. There was a recent one. I forget which one it was. I said, this is the essence of our concern.

But if in other venues, you're using let's say the Strom approach which does somehow factor in that there is a distribution and tries to grab something closer to the higher end as a way of propagating the number, well, I think that would go a long way to resolving our concerns. But we have to look at this.

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MR. MORRIS: Okay. Now the one last thing I'd say is that they actually developed their method and tested it with AWE-type data, and it represents four or five different sites and shows that it's possible to come up with bounding estimates with this method.

So I don't want to over-represent it, but it's an extensive article that's directly pertinent to the kind of data that we see.

DR. MAURO: Very good. Thank you.

MR. MORRIS: Sure.

MR. FITZGERALD: And just to close out that discussion, you said that's wired into NIOSH's procedures by virtue of the OTIB? Or was that just sort of part of the standard practice now? I just wanted to understand how that's being implemented.

MR. MORRIS: We don't have a procedure that's titled daily weighted average

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or daily weighted exposure. But when we develop the Technical Basis Document to come up with intake rates, you'll see that that is a referenced document in the technical basis.

MR. FITZGERALD: Okay. So it's referenced in --

MR. MORRIS: Yes. And it certainly underpins what we've done. And you can see that it really is one of our central references on this topic.

DR. MAKHIJANI: I don't think it's referenced in the Weldon Spring Evaluation Report.

MR. ROLFES: Well, right now what we have in the Weldon Spring Site Profile is thorium intakes using surrogate data from Fernald. And as a result of the SEC petition evaluation, we indicated that we would use site-specific data for the Weldon Spring Plant. And so as part of the revision right now that's ongoing with the Weldon Spring Site

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Profile, we are looking at the individual air monitoring results and data that we have for Weldon Spring Plant operations and using that in our revision for Weldon Spring.

So we are certainly looking at this issue, and it's something that we're aware of. We're going to take what you've written down into consideration as a part of that revision as well.

One other thing to remember about daily weighted averages is typically those operations didn't last the entire year. And many of the higher air concentrations had documentation indicating that the workers were required to wear respiratory protection.

When we would take that air monitoring data, we had to use it for dose reconstruction. We would not reduce the intake values due to respiratory protection.

Also, we would apply a full year of intake based on that air concentration -- a

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full 2,000 hours per year -- certainly acknowledging that that operation may not have occurred that entire year or may have just been a short production run or a couple of months.

So anyway, those are things that we will certainly update in the Site Profile revision.

DR. MAKHIJANI: Well, Mark, as you're doing that, you might consider the literature that indicates it's pretty hard to establish a relationship that's definitive between air concentration data and bioassay data, when both are available.

I think there may even be some literature from Weldon Spring along those lines, but I'm not sure. I'll have to check on that.

Ron, did I send you something along those lines? We can talk off line. I can't recall right now.

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MEMBER LEMEN: This is Dr. Lemen again.

Is this the Adam Davis and Strom article?

MR. MORRIS: That's right. It is in 2008, if I recall.

MEMBER LEMEN: You said they used for Board compensation but in the article itself it says that there were overestimates as well as underestimates by factors -- of the underestimates by three to ten. So do you really think that --

MR. MORRIS: I think he should spend some more time with the article before we have that conversation.

MEMBER LEMEN: All right. Because it doesn't appear to say what you just said it said.

MR. MORRIS: Well, as I said, it's been half a year or more since I read it. But in my view the bottom line of the report goes

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to a recommendation about how to use the data, demonstrates that it can be used and suggests some bounding approaches that are based on using large geometric standard deviations.

MEMBER PRESLEY: This is Bob Presley.

How much thorium contamination are we really talking about?

MR. ROLFES: Well, the amount of thorium that was processed at the Weldon Spring Plant was less than one percent of the uranium that was there. So -- and it was only during the later part of the operational period from '63 through '66. So I don't recall the exact number of months, but we have, I believe in our Evaluation Report, we had identified the buildings that had processed thorium and the time periods as well.

MEMBER PRESLEY: So it's less than one percent?

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MR. ROLFES: Correct. The material that was produced -- the thorium-232 material that was produced from 1963 through 1966 was less than one percent of the total uranium or special nuclear material throughput at the site.

MEMBER PRESLEY: Well, we're not talking about much contamination.

DR. MAKHIJANI: Well, the percents don't matter as much as the total quantity. At least in your site -- I haven't researched the source term independently, but in your Site Profile, if I recall correctly, it says about one ton per day of thorium. And that's a non-trivial amount.

You might recall at Y-12, we had discussion in the SEC -- and you'll recall this, Mr. Presley -- that initially it was thought that there were a few kilograms here and there. But when Mel Chew and his group discovered that there were hundreds of

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kilograms or tons in total, the tons in total was considered a significant amount. Here we're talking a ton per day. So that's a non-trivial amount of thorium.

And it's also important to note that one percent thorium -- if you're looking at organ doses and dose conversion factors -- one percent of thorium in terms of mass would be approximately equivalent in terms of bone surface dose to -- one unit of thorium would be approximately equivalent in bone surface dose to 100 units of uranium. So you're talking -- for some organs -- for other organs it's comparable to uranium. But for bone surface, the dose conversion factors for thorium are a couple orders of magnitude bigger.

So small quantities of thorium can convert into considerably larger doses than uranium. That's just how the numbers work.

MR. ROLFES: Right. We certainly

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acknowledge that and account for it in dose reconstruction.

DR. MAKHIJANI: Yes, right. I'm not saying you don't.

I'm just saying that you can't say it's one percent and therefore it doesn't matter. There are two ways in which it matters, and I've just tried to point that out.

DR. BUCHANAN: And another way it matters is that if these were campaigns, and so a worker, he wasn't exposed to 99 percent uranium and one percent thorium during that period, he was exposed to 100 percent thorium if he was on that campaign.

DR. MAKHIJANI: Right.

DR. BUCHANAN: And so it wasn't diluted with 99 parts of uranium. And so he was exposed to the thorium during those months, days or years or whatever it was. He was working on it in those buildings. So it

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wasn't a mixture that was flowing through the whole system.

MR. ROLFES: Yes, that certainly would be the bounding situation for an individual being exposed purely to thorium. So what we would do for an individual, say he worked in 1963 with thorium -- and I think we provided a sample dose reconstruction to the Advisory Board on how we would reconstruct a thorium intake. But I'd have to go back and check and make sure.

We would apply an air concentration to that individual, apply an intake for 2,000 hours per year, and assign that thorium-232 exposure. However, if that individual also had a uranium bioassay during that same year, we would apply a uranium intake as well. And typically, when we complete a dose reconstruction, if the individual worked there from 1957 through 1966 and had monitoring for each of those years, we

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would apply a chronic intake for the entire time period for all years of the employment to ensure that we are over-estimating the actual exposure or intake that the individual potentially received.

So basically, our first and foremost piece of information for a dose reconstruction would be the bioassay data that we've had to generate an intake. And then secondly, for an individual perhaps that was exposed to thorium during a short-term operation in the later years, we would take that air concentration data and apply that on top of the uranium intake.

DR. MAKHIJANI: Mark, are these sample dose reconstructions in the Advisory Board document? I don't see that.

MR. ROLFES: Let me check. I may not have put them out there. And I can certainly do that if it hasn't been done.

MR. HINNEFELD: It seems to me

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that we're spending some length agreeing with each other here. We've got to move on to the next issue.

DR. BUCHANAN: Yes, I think that what we want to summarize is that SC&A will need to look at the Health Physics 2008 article, and then come back to the table and see how we evaluate that. Is that in agreement?

Okay. Item D on Issue number 1 was coworker data. Okay.

The comment I have on that number one is, of course, coworker data isn't usable unless the data's been verified. And we talked about that in Issue items A and C. And we have agreed upon the direction forward on that. So coworker data, we have to verify that before it's useful.

Additionally, I guess going from the TBD to the ER, my issue on coworker data is that in the ER, I gathered that NIOSH

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recommends using the operator's data to bound everybody's data so that the environmental data wasn't necessary. Is that a correct assumption?

MR. ROLFES: Well, certainly if you're using the individuals who are directly working with uranium and are monitored. Those are likely the people that are going to have the highest exposures. Those exposures would certainly bound the environmental releases and any intakes from re-suspension of contaminated soil, et cetera.

DR. BUCHANAN: So are we going to use if a person wasn't badged at Weldon Spring -- and that's about 50 -- not monitored -- well, some of them weren't badged; some of them weren't monitored. There were more people badged than there were bioassayed.

So the person wasn't bioassayed, and say he wasn't bioassayed and he was badged, though, would he be given an

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environmental dose or an operator's dose?

MR. ROLFES: If they were issued an external dosimeter but had no internal monitoring data I guess is the question.

DR. BUCHANAN: Right.

MR. ROLFES: You'd have to take a look to see what their job function was, look to see what areas they worked at the plant.

One of the things that we do with everything that we receive is the telephone interview. So we would also have to take a look at the details that we received in a telephone interview if one is available to us.

If we do not know and there's a potential that the individual could have been exposed to elevated levels of uranium in the air, we would certainly apply a uranium intake. We would give the benefit of the doubt to the claimant. So we would apply the higher intake --

MR. MORRIS: Can I jump in on

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this, Mark?

MR. ROLFES: Yes, please, Bob.

MR. MORRIS: In the October 12th document that SC&A -- I may be speaking here -- the response to the SC&A comments on the Weldon Spring Site Profile that was issued earlier this year has got a response I think dated October 12th from the NIOSH team.

MR. ROLFES: Correct.

MR. MORRIS: And in item 1 of that, Ron, you'll see the approach to occupational -- environmental dose methods that are actually being put into a TBD revision that is in review right now.

So let me refer you to that. And if that doesn't answer the question because I'm not sure I got exactly the question you asked, if that doesn't answer it, let's try it again though. But if you could look at that written response, that would be good.

DR. BUCHANAN: Yes. I looked at

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that response. And this is what I'd like to clarify is that in the original TBD, the people that -- the way I understand it -- it's an original TBD, that if the person didn't have bioassay, then the environmental dose would be applied. And this environmental dose would be taken from a hopper-cleaning and a combination of that and perimeter data monitoring.

MR. MORRIS: We developed quite a bit more perimeter monitoring data after the SEC evaluation was completed and we started Technical Basis Document revision. So the perimeter data is more robust than it was before.

DR. BUCHANAN: But it's still perimeter data. It isn't site data. Is that correct?

MR. MORRIS: You're correct on that. But what we did was we looked at the local wetting patterns, got the atmospheric

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dispersion parameters and extrapolated that to the inner ring of the plant building and then established what an air concentration and consequent intake rate would have been in the bounding atmospheric conditions.

DR. BUCHANAN: And this is in a revision -- the TBD 4?

MR. MORRIS: That's right. And it's in review inside the DCAS system right now. It's described here for you in the response to item number 1.

DR. BUCHANAN: Now how did the results compare to the hopper clean-out? Because I noticed in reviewing the TBDs, the hopper clean-out was combined with a perimeter then -- a perimeter data then. The perimeter data only contributed less than one percent to the parameter data.

MR. MORRIS: I'm not ready to answer that. If you want to defer that, I'll look for that and compare it and then answer

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it later today.

DR. BUCHANAN: I think that would be a benchmark because the hopper data was like 100 times greater than the perimeter data originally. And it'd be interesting to see how the perimeter data -- new perimeter data -- extrapolated to the center of the site through the hopper data.

MR. MORRIS: Yes. Well, of course hopper clean-out is a one-time event and we're trying to get annualizing averages for these kinds of numbers. So I would not at all be surprised if the hopper clean-out numbers are still higher.

MR. HINNEFELD: This is Stu Hinnefeld and I wondered if I might make a process suggestion here. And it's just a suggestion; you can do what you want.

But we seem to be spending a lot of time providing verbal technical responses to the written report that we have here. And

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we're ultimately going to have to provide written technical responses to this report anyway. We're not going to resolve any of these findings verbally today.

But we go through these extended technical conversations with these things, and it would seem to me that if we can just have enough conversation to understand the issue and to maybe suggest like, well, we believe we have some information we've put together on our TBD evaluation response that will be appropriate here and we can do some brief stuff there. Because none of this verbal technical discussion is going to resolve anything today.

And so, I think we're better served with our time today -- again, in my suggestion -- to make sure we have an understanding of the finding so that we can provide a written technical response to the written technical finding. This is a

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suggestion.

CHAIRMAN GIBSON: That's fine with me. Everyone okay with that?

DR. MAKHIJANI: Could I supplement that just slightly?

MR. HINNEFELD: Sure. Absolutely.

DR. MAKHIJANI: I agree with you. It might be useful as I did with the issue of air concentration just to point out as NIOSH is preparing its response, some of the things that we're going to be looking at -- I mean, this is an initial --

MR. HINNEFELD: Absolutely. Absolutely -- as much as we can learn, yes.

DR. MAKHIJANI: So I'd like to do that in this case.

A couple of points that would be useful for you to consider in your response looking at your October 12 document here is one we've said before in other contexts. I certainly recall we said it in the context of

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Savannah River Site. And this is from memory, that Gaussian dispersion plume modeling is not a very good idea for on-site environmental dose calculations. You have building wake effects and so you're taking perimeter models -- perimeter measurements -- which are really designed for offsite dose estimation and compliance for offsite people for which this is a reasonably defensible approach in many cases anyway. And then applying it to a situation where in many cases unless you have a broad open field on site where you're placing your worker, it's not applicable technically.

Secondly, because dispersion factors can vary by two orders of magnitude or more when you take building wake effects into account and when you take incidence into account. And the second thing that's come up at Savannah River Site which is under discussion in that SEC certainly, and if I

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recall also at other places -- at least one other place -- is you have activities on the ground. You have fugitive emissions at Savannah River Site. You have burning of solvents. You have ground-level source terms that cannot be handled in that way and workers in the vicinity of ground-level source terms.

And so I think this kind of environmental dose calculation, we've at least pointed out -- and you might expect that if this is the response then we'll have a second round of discussions so you might want to consider some of our prior comments in other cases in preparing your response.

MR. KATZ: That's helpful.

DR. BUCHANAN: Okay. Move on to Issue number 2. That was kind of a drawn out issue with four parts. So it probably is one of the longer ones.

Issue number 2 is interviewing the workers and from the documentation I could

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find, the workers at Weldon Spring did not have the benefit of the egress monitors. In other words, they weren't either surveyed with pancake probes or something when they left, they didn't have a monitor to stick their hands in back in the '50s. And so they essentially combined with the contamination in the work area left unmonitored as far as contamination goes.

There was some area monitoring to keep dust levels down and that sort of thing at Weldon Spring. But as far as I could find, there was not a routine set egress monitoring that either checked them when they left the production area and went into the cafeteria or the offices or whatever, which would of course track contamination around. And also when they got out in the parking lot and left for the car and went home, there was no egress monitoring.

So the workers went home with the

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contamination on them. Sometimes they showered. There were showers there if they wanted to. There was coveralls available that they wore. But there was no checking before they left.

And so, this is a case where I see that there would be a situation where there was no dosimetry of contamination on the skin, especially the folds of the skin around the ears, the nose, the arms and that sort of thing which they could have went home. They would have had the contamination on them and got skin irradiation without any dosimetry to document it.

And so even if they wore a dosimeter at work, as bioassayed at work, what brings up the other issue is covert bioassay for certain periods. They could have had an intake from the re-suspension and the contamination they tracked home with them. And it wouldn't have been detected if they

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weren't happened to be in the queue to have bioassay for that period of time. So that is the concern on lack of egress monitoring.

I cannot find anywhere where it would be documented or be able to compensate for it.

MR. ROLFES: Okay. I know we've taken a look at this previously. And usually the contamination on the skin would be visible. To have something that would impart any external dose, you'd have to have some visible contamination on your hands.

So you can come up with a bounding value of the time that that material resides in the skin folds. First of all, the individual would have to have a cancer diagnosed for our program. They would have to have a cancer diagnosed in that particular location for us to consider something like that.

So for example, an individual has

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a cancer diagnosed on their hand, and they think that contamination could have contributed to that cancer. You can come up with a bounding value of the amount of uranium that would get stuck on your hand, for how long it would get stuck there, and come up with an estimate of the dose received by the skin in that particular little area. And typically, that dose value is trivial compared to the direct radiation from handling large pieces of uranium such as ingots or aged uranium materials.

MR. HINNEFELD: Yes, this is Stu. I've got a little different perspective on this. I mean, this has come up at other places too and how you deal with this possible skin contamination without evidence of such. So I think it's something we haven't really resolved yet. But something that we have and has to be worked on because it's come up elsewhere.

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DR. BUCHANAN: I was thinking more of around the neck and the ears and stuff. That's where you see most cancer --

MR. HINNEFELD: Wherever, wherever. The situation is the same. In a lot of the uranium plants for the DOE quite frankly didn't use egress monitors until my career in some places. And I'm pretty old but I'm not quite that old.

And so, certainly there's question of these uranium plants and the possibility for skin contamination that would not have been detected and how are we going to deal with that issue programmatically because of once you start speculating that there was contamination there, there's no reason to stop until you have a compensation on your skin -- there's just no -- we'll have to see if there's a reason to stop it. I guess we haven't figured one out yet.

MR. ROLFES: The one other thing

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also I guess we should consider is the odds of contaminating a body part without contaminating your badge. If you're exposed truly to a large quantity of uranium in the workplace, it's not going to be localized to one point on your body typically -- possibly just your hands if you're doing direct handling. But if you're rolling around in the mud or whatever, it's going to get distributed throughout your body -- all over your body. And so it'd be difficult to not get any of that on your badge. So in many cases, the badge could record that contamination that was also deposited on other parts of your body.

MR. HINNEFELD: No, we're not going to solve it here today.

DR. MAURO: Stu, this is John. I agree with you completely that -- and this issue has come up -- and I recall the very first time was a review of I believe it was OTIB-17 which is the nonpenetrating radiation.

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And that goes back maybe four years.

This is a difficult problem. Jim and I have discussed it at other work group meetings and other venues. And I do not believe I've seen an occasion where that particular exposure scenario -- the one that was just described by Mark -- you know, where you do -- run bar skin to see what possible dose.

So yes, this has been a longstanding issue. And I think it's an important issue for those people with skin cancer, especially on exposed surfaces. That definitely needs to be addressed. And I think it is a global issue.

DR. BUCHANAN: I'm going to move on here.

Issue 3 on page 4, and this is the lack of worker data for 1967. And one reason I went through the first summary was it just illustrates the thought in 1967, the petition

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was through '67. Well, the petition was through '66 and NIOSH evaluated through '67. And a lot of this applies to '68, but it's not really under the SEC.

And on December 31st of 1966, the plant essentially shut down. And then in '67, apparently the Mallinckrodt safety and health physician was not present. AEC was not present. And there was apparently -- and this is kind of a gray area -- some sort of contractor, subcontractors and third- and fourth-level contractors doing work at the facility to revamp some of the buildings for herbicide production. And this is where one of the major worker concerns are is that during this period, there wasn't a consistency in any radiation protection.

One worker described the job of going into one of the buildings, digging up the brick floor and handling the uranium salts and yellow cake by hand, scooping it out

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without any protective clothing. He wore boots, had him leave the boots there for a while and then he could wear them. And after a while, they let him leave with the boots. Some of the people around him he described as wearing moon suits which I assume is the anti-contamination. That's apparently a different contractor. And so there did not appear to be any oversight of health physics practices there in '67.

Looking through the records, I looked through records to see if I could find any dose records for '67. And I couldn't find any. I might have missed them, but the ones I looked at, I couldn't find any. People that worked there in '66, I looked at some to see if claims that worked there in '66, '65, there was records for them. At '67, there was just a blank wall. There were no records for '67.

And what complicates the issue is that this wasn't like the operations period,

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it wasn't like the later clean-up period in the '80s, and so kind of what SC&A's question is is, what are we going do about 1967 because the situation was different than any of the other periods.

MR. HINNEFELD: Was the site under the Army's control or DOD's control in 1967?

MR. ROLFES: Yes.

MR. HINNEFELD: It transferred to the Army in '67, right, for work? And the Army was doing this work?

MR. ROLFES: Correct. Correct. You have to take a look at the specific workers that you're referring to, but the production period ended December 31, 1966.

There could be potentially some AEC employees that entered this site during 1967. However, it was officially transferred from the DOE to the Department of Defense back to the Army in 1967. So if an individual's doing Army work, essentially it's not covered

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under this program.

MR. FITZGERALD: Was the intent of having '67 included in --

MR. ROLFES: In case --

MR. FITZGERALD: -- case there were AEC workers that came back?

MR. ROLFES: Correct.

DR. BUCHANAN: How do we know? And a petitioner -- and I mean, the workers addressed this directly to me. How do we know what the cut-off line is? Do we have any documents to show that there was no workers employed under the AEC contract there in '67 and '68?

MR. ROLFES: We have documentation. And there's documentation on the DOE website showing that the DOE handed the site over to the Department of the Army in 1967. I don't recall the specific month, but I believe Mel might be able to provide that if he heard my question.

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Mel, do you recall the month that the Department of Energy handed the control of Weldon Spring Plant back over to the Department of the Army?

DR. CHEW: Mark, I do not recall. I think the data is available. I just don't have it in front of me here.

MR. ROLFES: Okay.

MR. FITZGERALD: If there was an AEC worker for whatever reason that came back on site, it would not be a Weldon Spring worker per se. It'd be covered under another site.

MR. ROLFES: That's possible, yes. We'd have to take a look at --

MR. FITZGERALD: That's why you left the door open?

MR. ROLFES: Right.

MR. FITZGERALD: Okay.

MR. ROLFES: There was uncertainty there. So that's why we included it.

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MR. FITZGERALD: Okay. My understanding is the remediation work was done by the Army because they weren't -- so they hired a bunch of contractors to do that mediation work. Because I was at a worker meeting in St. Louis for Weldon Spring workers, and they were describing this very clearly. And it's one of the injustices of the program is, I'm sorry, once it went to the Army, you're not in this program anymore. If your contract is with the Army, you're not covered.

MR. ROLFES: Okay. That helps too. I think the confusion was why the ER didn't go into '67. You're saying, just to make sure, that it covered those that might have. Correct.

DR. BUCHANAN: Would it be possible -- so that I could pass that on to when they question me -- of the document that shows that it was transferred to the Army? Do

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you have it?

MR. ROLFES: Yes. We can get a reference for you.

DR. BUCHANAN: That would be helpful because that's a real problem there.

DR. MAURO: This is John. I have a question.

If I recollect, during the determination and you move into let's say the residual period or the D&D period, there's a distinction between DOE facilities and AWE facilities where I believe in the case of DOE facilities, this post-operations period does not come into play, but it does in AWE period -- AWE sites. Now I believe this is a DOE site.

MR. KATZ: Right. So you're correct about all that, John.

DR. MAURO: And just for my edification, what's the rationale for that distinction?

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MR. KATZ: It's legislative, John.

MR. HINNEFELD: What the law wrote.

DR. MAURO: Okay. So now is this year 1967 considered to be part of the post-operation period for Weldon? And if so, doesn't that take it off the table?

MR. KATZ: When the facility was transferred to the Department of the Army, it's no longer a covered facility. It's no longer covered under the statute.

DR. MAURO: Even if it wasn't -- stay with me for a minute -- and it represents post-operations, does that --

MR. KATZ: No.

DR. MAURO: I just want to understand this.

MR. KATZ: No. So a DOE facility, as long as it's a DOE facility, it's covered regardless of whether they're operating or whether they're in a nonoperating --

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DR. MAURO: I got you. So the distinction between operations and post-operation applies only if the DOE operation terminated. And I guess this idea of residual period not applying to a DOE facility is because DOE is no longer running that facility.

MR. KATZ: Right. So I mean, again I don't want to speak to legislators' intent, but it makes sense to me with the AWEs that they're only covering during the residual period contamination that's clearly part of the work that was done during the operational period. So that's what it's about with AWEs.

DR. MAURO: Okay.

MR. KATZ: In the case of DOE, it doesn't really matter whether they're operating or they're in a nonoperating mode. It's a DOE facility. It's covered.

DR. MAURO: It's covered. So the residual period would count if in fact it was

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still under --

MR. KATZ: Right. As long as it's a DOE facility, it's covered.

DR. MAURO: I got you. I understand. Okay. That's helps out.

So it sounds like the issue here has to do with 1967 and whether or not it's a covered period or not.

MR. KATZ: Exactly.

DR. MAURO: Okay.

MR. KATZ: And then at some point, it clearly, according to everything that's been said here, it was transferred to the Department of the Army.

DR. MAURO: Got it. Okay. Thank you.

MR. FITZGERALD: Essentially you could have just ended it at the end of '66. I mean, I don't quite see the -- I'm struggling with this rationale for including '67 because even if somebody came back, they'd be covered

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under a different facility anyway. I think that's why everyone's --

MR. HINNEFELD: They're not at a covered facility when they're at Weldon Spring. Once it turned over to the Army, regardless of whether they were with AEC or not.

MR. FITZGERALD: You're effectively talking about the end of `66 as being the ER.

MS. HOWELL: Yes.

DR. BUCHANAN: Okay. Now we want to clarify that the whole facility was transferred, not just that plant.

Was the site, the pits and the quarry transferred?

MR. ROLFES: The quarry was not. And I'll read from the Energy Employees Occupational Illness Compensation Program, DOE page -- the worker advocacy page.

The Weldon Spring Plant -- let's

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get to the part that we're discussing -- in 1967, the AEC transferred most of the acreage including the chemical plant back to the Department of the Army. The AEC did, however, retain possession of the raffinate pits and quarry on approximately 50 acres. The AEC did not have any contractors performing work on this land again until August of 1975 when the AEC contracted with National Lead to perform environmental monitoring on the pits and quarry. And it goes on.

So what we can do is provide some documentation of the data feed exchange back over to the Army. And this is certainly something that we would consider if we have an individual that has employment during 1967. The Department of Labor would take a look to see if that employer is a covered employer in contract to the Department of Energy. And so if that individual was on site and had covered employment, we would receive that from the

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Department of Labor and account for that in our dose reconstruction.

I don't have a feeling. I haven't looked at all of the claims to determine how many cases we might have received with employment during 1967.

MS. HOWELL: Can I ask a clarifying question?

The DOE covered period for the site, according to their website it still says through '67. Has that been modified and the website not updated? Or --

MR. ROLFES: Well, there was a production period up until December 31, 1966. And it wasn't until 1967 that DOE handed the land back over to the Army.

MS. HOWELL: So was it January 1?

MR. ROLFES: Exactly. That's --

MS. HOWELL: Well, I guess I'm trying to understand here -- I mean, ultimately this will wind up being a question

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that the Department of Labor is going to have to resolve. But I'm a little confused about this apparent discrepancy in when DOE had the covered period ending versus what you're saying DOL is saying and what this information is. Because we need to know what the proper bounds of the NIOSH inquiry are and what the bounds for any SEC might be, et cetera.

So I think that this is something that we might want to resolve because there seems to be a discrepancy between DOL and DOE, and ultimately DOL would probably be the party having to resolve that.

DR. CHEW: Mark, this is Mel.

The Weldon Spring Site Profile description says that it was turned over to the Army in August of 1967. David Harrison just emailed me that.

We'll need to confirm that, making sure that that's accurate. But that's what's in the Weldon Spring site description right

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now.

MS. HOWELL: Okay. So we should clarify that, and then we should also clarify what the DOL and DOE the covered period should have been. It went through August of '67? I mean, we need to be clear about this.

DR. BUCHANAN: So that if the issue resurfaces for a person that worked there until August of '67 --

MR. HINNEFELD: Yes, if anybody did.

DR. BUCHANAN: And I find five claims that had '67 as an employment date.

MR. HINNEFELD: Okay.

DR. BUCHANAN: I think it was five.

Okay. So we move on. And so for each in 3, we're going to clarify the exact date and document -- provide a document of that transfer and then look at the claims and see what's going to be done that had

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employment date in '67. Even if they're just getting into the month of January or something, we still have to address it.

MR. KATZ: Sure. And I wonder if you need to clarify -- I mean, the remediation-type work that you were talking about, that's work that would have been done under the Army, then you can assume that it occurred then after August, I guess, because it wouldn't have occurred --

MR. HINNEFELD: We'll have to figure it out.

MR. KATZ: Yeah.

MR. HINNEFELD: We'll have to see what we can find out.

DR. BUCHANAN: Okay, so --

MR. FITZGERALD: Anyone need a break?

MR. KATZ: There's at least one head nodding here, so let's take a --

CHAIRMAN GIBSON: Ten, fifteen?

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MR. KATZ: Fifteen, so at quarter of, by my watch, about --

CHAIRMAN GIBSON: We will restart, and I'm just going to put the phone on mute, but I'm not disconnecting it.

(Whereupon, the above-entitled matter went off the record at 10:30 a.m. and resumed at 10:47 a.m.)

MR. KATZ: Okay. Welcome back. We're reconvening after a short break. This is the Weldon Spring Work Group, the Advisory Board on Radiation and Worker Health.

And carry on.

DR. BUCHANAN: Okay. This is Ron Buchanan. And we're looking at SEC issues, and we've went through 1, 2, 3 and we're ready for number 4 on page 4 of the handout.

And this is concerning radon and thoron determinations.

MR. ROLFES: Ron, I'm sorry. I had one quick question.

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You had mentioned some interviews with workers. Have you provided those interviews to us yet?

DR. BUCHANAN: Yes. They're on our site profile review --

MR. ROLFES: Okay.

DR. BUCHANAN: -- that was issued in February of '09.

MR. ROLFES: Okay. Thank you.

DR. BUCHANAN: They're an appendix on that.

MR. ROLFES: Thanks.

DR. BUCHANAN: Okay. So issue 4 is radon and thoron. Okay.

Now as we said earlier, Weldon Spring did not have pitchblende so they didn't have as much radon radium and therefore radon problems as the Mallinckrodt downtown facility did. However, radon still does emanate from the uranium ore. And according to the way I understand NIOSH -- and there was no

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measurements at Weldon Spring for radon or thoron. Thoron comes from the thorium chain which was processed '63 to '66. It has a short half-life -- thoron does -- about 55 seconds. So it isn't around as long and it doesn't penetrate as greatly as the radon. But it is still an issue. And so in A and B there of issue 4, if A is radon, B is thoron -- similar issues with them.

There were no measurements. There was measurement at the downtown facility, but you can't extrapolate them out here because it was a different facility and different ores. And so what I understand been proposed is that they use the throughput of uranium, and then there's a certain emission from the uranium fraction -- of the radon that escapes.

And the way I understand this modeling here is that it was most prevalent in one of the locations. And so it was assumed that the radon that did come off was captured

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in the hood, and so the workers inside the building were not exposed to that radon. It went out the ventilation, went out I think a ten-meter stack and then dispersed, and used a simple ground model to calculate its concentration in number of curies that was emitted and then its concentration.

And it was assumed it was equal inside and outside and the breathers -- the workers inside would breath that concentration, and using an equilibrium factor of .5 for inside and .3 for outside. And this would be a sign then as the radon intake.

And so I'd like for Arjun to speak to this. I did look at the measurement that was done at the downtown site that showed that the indoor and outdoors weren't equal. It's four times greater inside than inside. Now this couldn't be extrapolated directly to Weldon Spring, but is an indication that equal inside and outside should be investigated

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further.

And so since Arjun had worked on radon equilibrium at other sites, I'd like for him to speak to this.

DR. MAKHIJANI: Yes. I'll address it briefly. Actually, John, if he's still on the line, has addressed it more than me.

But I think that the dispersion modeling would be an issue, especially since it's not validated by any data points. I think the fact -- do we have -- just as a factual thing because I haven't looked at the source data -- do we have kind of concentrate composition information in regard to the radium source term there?

MR. ROLFES: There really wasn't a significant radium source term.

DR. MAKHIJANI: Yes, I'm aware that concentrates don't have most of the radium stripped from them. But they don't have most of the thorium-230 stripped from

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them. That was an issue at Fernald anyway.

And I just wanted to know whether we have some data on the concentrates as regards -- because there is some thorium. If you look at the cold metal oxides in silo 3, I think at Fernald, there's a radium source term there. It's not zero.

MR. ROLFES: Very, very small. Very, very small.

DR. MAKHIJANI: Well, it's not equilibrium with thorium-230. That's for sure. I don't remember the numbers.

But it might be useful to have a radium source term that's specific to the site, I think, especially given the recent history of modeling in regard to radon and a lot of issues have come up. They've come up at Linde. They've come up at Texas -- right, John -- Blockson. I think this looks like a lot less rigorous than the scrutiny that's been given and the rigor with which we've

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tried to approach radon at other sites.

MR. HINNEFELD: Help me understand why radon is an issue at Weldon Spring if they never got ore.

DR. MAKHIJANI: The concentrates do contain some radium. And that's why my first question was if you have some characterization of the kind of concentrates and there isn't really radium in it and we know that because the source term has characterized it, then the issue will go away.

But we know that some of these concentrates contain non-trivial amounts of -- in my opinion, non-trivial amounts of radium, but much less than would be in equilibrium with thorium-230.

MR. HINNEFELD: Well, the examples you all cited about radon being an issue or sites where radium was at least a readable component of material that was handled, they had ore at Linde and radium is a reasonable

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component of the norm in the phosphate --

DR. MAKHIJANI: Right.

MR. HINNEFELD: -- since in all the radioactivity at the phosphate plants like Texas --

DR. MAKHIJANI: And I agree with that.

MR. HINNEFELD: So in all those cases, radium was a significant portion of the radiological source term. And I think my going and belief -- now maybe I'm mistaken here -- is that concentrate, since you remove the radium in the concentrate, then you have to grow the radium back in from the thorium-230.

DR. MAKHIJANI: It won't grow back in.

DR. MAURO: Stu, this is John. I could help out a little bit here.

I've reviewed a couple of AWEs and cases where the concentrates which are

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primarily U308, they've been separated, sometimes carry over with it small amounts of thorium-230 and radium-226. And I agree with you -- and it's variable depending on how good a job is done in creating the concentrates.

Now that being said, I guess the only way I could see any radon being of concern is, okay let's say you could say well, we know that almost all except for some small amount of radium-226 may have been removed and did not show up at Weldon, but there could have been this much. Now given that there could be a little bit of radium, the question is, is it possible that there's any substantive concentration of radon in the air that would be of some concern.

In theory, one could argue okay, let's say that there's as much as a certain amount of trace levels of 226 -- radium-226 associated with the yellow cake. That shows up at the treatment processing at Weldon. And

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you've got a handle on okay, well, this is the amount of radon -- construction rate of radon, that would be entering the air. And again, we're back to the same old problem again. Once you know that, you probably could place a plausible upper bound on what the radon concentration might be indoor -- making appropriate assumptions regarding air turnover rate and emanation coefficients, that sort of thing.

But of course, we're back in the modeling world again, a model that -- that class of model applied to that class of problem, SC&A's very comfortable with as long as you have a pretty good idea of what the upper bound might be on the radium-226 in your yellow cake.

But that's the way you would come at saying well, here's an upper bound on what might have been the radon concentration. And if that turns out to be trivial, well, I think

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the problem's been put to bed.

Whether or not the work group and the Board would agree with the strategy like that because it does in effect employ a model as opposed to direct measurements. But I would be the first to agree that in general, when we're dealing with yellow cake, we don't really think and worry too much about radon except as Arjun did point out, there are occasions when there is a little bit of radium that comes along with your concentrates.

DR. MAKHIJANI: Yes. And I agree with what you said, Stu, in that you're stripping most of the radium. And sometimes you might strip essentially all of it. But concentrates is sort of different than yellow cake in that you haven't stripped all of the cake products from the ore.

And so, all I'm saying is if you can characterize the source term, it will be much simpler to deal with the issue. It might

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just go away, or you might be able to put a bound on it in a better way than what's on the table right now.

MR. FITZGERALD: Yes. Before getting to the modeling, the threshold question sounds like just establishing what the likely source term was --

DR. MAKHIJANI: Right.

MR. FITZGERALD: -- from the concentrate. If it's negligible, then the issue is less. That seems to be the threshold question, before getting into the modeling point. Now thoron, of course, would be a different issues --

DR. MAKHIJANI: Yes.

MR. FITZGERALD: -- particularly since thoron -- so, yes.

DR. MAKHIJANI: Thoron's an issue.

MR. FITZGERALD: Yes. Okay.

MR. ROLFES: If I could point everybody up to a reference in the site

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research database, we've prepared a response in our site profile review matrix on page 2 that addresses this. And we've got a statement in here that says, based on uranium mass throughput and other factors from Meshkoff, et al, 1986, an estimated annual release of radon-222 during the operating period was in the range of 12 to 34 curies.

Now if you take a look at this reference I mention --

DR. MAKHIJANI: Mark, excuse me. Which item in that response are you looking at?

MR. ROLFES: I am looking at response number 1 which is on page 2 of the NIOSH responses to SC&A comments on the Weldon Spring Plant.

DR. MAKHIJANI: I have the document. I just wanted the number.

MR. ROLFES: The Site Research Database reference number for this reference

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is 72152. And it does have information on the source term of radon at the site.

I'll take a look to see if it also has thoron in there. But I don't see it right away.

But this is a starting point for --

DR. BUCHANAN: This is the same in the TBD. The TBD used this model, at least the calculations. The 1986 reference used this same calculation in it.

MR. ROLFES: Okay.

DR. BUCHANAN: The TBD 4 or 5 uses this reference in the calculation of throughput of uranium and a certain emission rate and a certain stack height. And then they calculated 12 to 34 curies released per year. It's the same thing that I sent to you, Arjun, earlier.

DR. MAKHIJANI: Okay. Is it 72192? I was traveling when I responded to

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you. So I don't remember exactly.

MR. FITZGERALD: And this is where he accomplished the concentrate. In other words, all the different --

DR. BUCHANAN: No, it just uses a uranium throughput and assuming a certain emission rate of radon from the throughput. And it's all captured in the hood and goes out a ten-foot stack. And then it would emit 12 to 34 curies a year and that would disperse and then they'd be sucked back into the building and be equal inside and outside and then working levels are calculated from that.

DR. MAKHIJANI: The dispersion model would be a problem the same as what I said.

DR. MAURO: This is John. Let me just step in.

So are you saying that at Weldon the concentrates were not piled up indoors but they were sitting in hoods? Did I

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misunderstand? In other words -- this is an important point.

If the reality is that any radon -- any radium, even if it's in trace levels, contained in the concentrates is -- there's a confinement system around it whereby as it's emanated in small quantities, it's captured and vented. Well, then it wouldn't enter the workplace the way I just described. What I'm hearing is it would be exhausted. Now certainly it could come back in again from outdoors. But that changes the whole picture and makes it even a more remote issue.

MR. ROLFES: The hood I believe that you're referring to would have been the air ventilation system above the acid digestion tank. And that was where the radon was assumed to be liberated from and vented up a stack.

DR. MAURO: Okay. So you're saying that the radon comes -- see, I guess I

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had a little bit different conceptual model.

You've got concentrate. The concentrate if it has any radium in it, will be exhaling radon all the time whether it's been digested or not. Certainly if it's digested, then you're breaking up the matrix in a way that even more radon could be released.

But even if it's just sitting -- I'm visualizing a pile or 55-gallon drums of concentrate. And they're broken open. But if they're all sitting in some kind of confined area with ventilation exhaust control, then the radon, even if it's small quantities -- don't get me wrong, we're talking about concentrates so we're not expecting very much radium in there but there might be a little bit. Any radon whether it's digested or not will escape to a certain degree. And if it's a direct access to the general working environment, there will be some airborne radon

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in the general working environment.

If it doesn't -- if it's being captured by some kind of ventilation system that is a hood over it, well, then that radon as it sort of escapes will be captured and really not enter the breathing zone of the working environment. And that does change the picture a bit. And of course, if you folks could show that there really wasn't any radium there in the first place because the concentrates were of a quality, well, then the problem also greatly diminishes.

So the only reason I jumped in here is when I heard stack releases, I just assumed that was general exhaust from the working area. But you're saying that no, that was exhaust from hoods. And then I thought maybe think about this differently in concept.

MR. FITZGERALD: Well, going back again, I think this still comes down to a source term -- a Weldon source term estimate.

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And I think what Mark's pointing out is we actually do have some estimation that confirms there was radium. The only question I think in my mind is whether that calculation would encompass the concentrates or not. It sounds like they just took a kind of a simple feed in of uranium and just came up with a calculation over time.

And the question is is that source term, 12 to 34 curies, would that in fact encompass the probably small contribution from these things like concentrates or not. So this is actually a reasonably good number.

Then the other question is the one I think that's raised in the matrix which is we only have the emissions number from the stack. Does that necessarily reflect what's in the workplace itself?

DR. MAURO: Yes.

MR. FITZGERALD: And I think that's a pretty good question. I would think

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that if this is the off-gas and the potential concentrations -- and this is kind of the things that could keep coming up in this modeling with the Board is can you show us or demonstrate how you would know that that is bounding or not. And I think it'd be pretty difficult to show that the emissions from the stack would be bounding the actual workplace.

So I think that's the question. If there's a unique source term for Weldon, does this range encompass that source term if in fact the source term is for the workplace not for the environment? And I think someone said earlier can we get a source term for Weldon that we can feel comfortable with. And I think at this point, there's some questions around that.

DR. MAKHIJANI: We'll definitely look at the document. I mean, that should be part of what to do, I guess.

DR. BUCHANAN: I sent that to you.

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I went through the whole calculations. And its assumptions. It's a model that so much is emitted from a certain uranium throughput. I understand that it's vats where the digesting the concentrate in acid. And then they have a few open. It's not inside a glove box or something like that. It's in a big room with vats and they have these hoods over them. They exhaust to the stack.

MR. FITZGERALD: And this is pretty large-range. I would think that if you took the upper part of that range, the only question would be, well, how can you translate that to the workplace, know that you have a bounding number for the actual workers themselves around those vats, not necessarily in the stack, right.

DR. BUCHANAN: Yes. Because the 1986 reference, now what it calculates is the 12-34 curies being emitted.

MR. FITZGERALD: Being emitted.

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DR. BUCHANAN: And it doesn't say anything. It doesn't go any further as far as the intake.

Then there's assumptions made on how that then circulates back to the workers inside the building and outside the building.

MR. FITZGERALD: Because I remember these other sites that we've had these lengthy debates before the Board. It was all predicated on how can you come up with this search model within the building itself. And those were lively exchanges. I can't imagine that if this were a stack emission how we could backtrack that into the workplace and argue that it's bounding. So I think that's probably the biggest issue.

MR. HINNEFELD: Well, I think we have the essence of the finding --

MR. FITZGERALD: Yes.

MR. HINNEFELD: -- is the essence of the finding.

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MR. MORRIS: Would you say why you think it couldn't be bounding. This is Robert Morris.

MR. FITZGERALD: No, I think you would start to get into a question of whether or not the ventilation, the collection hoods and what have you were 100 percent efficient which of course, I don't think that would necessarily be the case. You'd have workers around acid. I think you would have to argue that yes, in those days if you had an efficiency of 60, 70 percent, that's pretty damn good. But you would still have perhaps concentrations of radon. And it's not clear to me that that necessarily would be bounding. You'd have to at least come up with some estimate of what the collection efficiency was of the --

MR. MORRIS: So would you disagree that if we took that first term and just pushed it inside the facility in a box model

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that we couldn't be bounding with that?

MR. FITZGERALD: I don't know.

MR. HINNEFELD: Robert, we need to have this conversation ourselves.

MR. MORRIS: Okay.

MR. FITZGERALD: But I think that gets to the root of the issue that needs to be answered I think. That's what we're saying.

DR. BUCHANAN: Yes. Two reasons is the source term and then the inhalation concentration. And that goes with radon part A and thoron part B.

DR. MAKHIJANI: I think that source term is much more important.

The thoron -- you're processing thorium there. You've got thorium decay products there. So -- yes.

DR. MAURO: I've got a question on thorium-232. Was that ore unlike the concentrates of the uranium where it's primarily uranium oxide of some form? The

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thorium-232 issue that we're talking about in thoron, did they process ore? Therefore of course you'd have thoron. Or was it also separated thorium?

MR. ROLFES: No, this wasn't ore. It wasn't like a monazite sand for example. It was I believe received as thorium nitrate tetraydrate -- TNT.

DR. MAURO: Okay. And so the only thoron you would get is the radium-228 had the five-year half-life. So if it was somewhat aged, you might grow in a little radium-228 and therefore have thoron. So I was wondering if you got a feel for why is there thoron there. And is the thoron there because it was ore? Or is the thoron there because the thorium-232 was somewhat aged? And it doesn't take that long. I mean, it doesn't take thousands of years before they're -- unlike the radium-226. The radium-228 has a relatively short half-life of five years.

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So in principle, you could grow some radium-228 in. And between the time the thorium was separated and shipped and maybe have a thoron coming in. Do you know offhand which of those we're dealing with here?

MR. HINNEFELD: It's the second, I think, that you described, John. When you have a thorium product, if it has much age on it since it was chemically purified, you're going to have some thoron generation that's going to -- it becomes an issue a lot quicker than radon-220.

DR. MAURO: I got it. Okay. Good. That's helpful. Thank you.

MR. HINNEFELD: I believe that's the situation we're talking about.

DR. BUCHANAN: Yes. Thorium-228 has a half-life of 1.9 years. So it can go fairly --

MR. HINNEFELD: Yes, it doesn't take a lot. And it doesn't have to go to

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equilibrium. You've just to get a --

DR. MAURO: Yes. Growing in.

MR. HINNEFELD: You can get some growing in and you're starting to generate thoron.

DR. MAURO: You know what? Ron just made a very important point. That's right. When you separate thorium, you get the thorium-232 and one of the daughters. But the radon comes off the radium-228, doesn't it?

DR. BUCHANAN: Right.

DR. MAURO: And that has a five-year half-life.

DR. MAKHIJANI: No. Radon will come off of the thorium-228.

MR. HINNEFELD: You see, when you separate the thorium, you get the thorium-228 with the -- you can't separate the two isotopes. So you've go 228 -- thorium-228 there. The radium-228 Ron says has like a one-point-something year half-life.

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DR. BUCHANAN: The thorium-228 has a 1.9-year half-life.

MR. HINNEFELD: What's the radium?

DR. BUCHANAN: The radium has a 3-day -- 3.6-day half-life.

MR. HINNEFELD: Radium-228?

DR. BUCHANAN: 224.

MR. HINNEFELD: Okay. Right. It goes to 224. It goes from thorium-238 to radium-224, which has a very short half-life.

DR. BUCHANAN: A couple days.

MR. HINNEFELD: So it's the one-year half-life of thorium-230 or 228 --

DR. BUCHANAN: Right.

DR. MAURO: Okay. That's the driver. Okay?

DR. MAKHIJANI: It will take a couple of months of sitting --

DR. MAURO: Is that all?

DR. MAKHIJANI: Because thorium-228 are 1.9-year half-life. So after a couple

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of months, you're --

MR. HINNEFELD: Start to see it --

DR. MAKHIJANI: -- you'll see it.

DR. BUCHANAN: Any further discussion on that?

MR. KATZ: No, you can move on.

DR. BUCHANAN: Okay. Another issue which -- it's 5 -- which is recycled uranium. And the ore concentrate that came in in '57 through '60 supposedly did not have recycled uranium. Recycled uranium of course comes from uranium that's been recycled, taken from a reactor and tried to re-use the uranium -- unfortunately this has some byproducts with it -- that came to light and in year 1999, DOE went and did a study to try to find where this came from and where it flowed to.

And in 1961 -- and this is a two-part issue; one I'm sure is resolvable -- it is the year that Weldon Spring started receiving recycled uranium. From what I can

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see from '57 through '60, there was no indication of recycled uranium being resided at Weldon Spring. I don't have any smoking gun saying it was. But now in '61, documents start referring to it.

However, in the TBD and in the ER, there's a mixture of terms -- after 1961, after 1962 -- and those sort of terms which are an inconsistency in the date that we're supposed to start using recycled uranium at Weldon Spring. And I'm sure that that's resolvable. Just need to look at that and get those consistent.

And also, I would like to see a reference that says that Weldon Spring didn't start receiving recycled uranium until 1961. I'm sure that's probably available. I couldn't find it. It was really stated in the Fernald document or in DOE 2000. However, I didn't read all of DOE 2000, because it's 1200 pages long, looking for it. But I do think we

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need to set a documented date on when recycled uranium was received at Weldon Spring.

I did go through the recommendations in TBD 5 and the ER looking for how they planned on finding the recycled uranium -- the first issue or the start date. The second issue is the use of the bounding number. If you decipher through Fernald's TBD 5 and look at their conversion factors, it drops out for plutonium -- of course, the key issues that we have is the recycled uranium contained trace amounts of plutonium, technetium and neptunium or the most significant amounts of some U-236.

So I looked at Fernald's TBD 5. And they recommend 100 parts per billion plutonium per uranium. And so, the ER though states on page 27, Table IV-6, an average of 2.9 parts per billion plutonium and 6.3 to be bounding.

Okay. I have two issues. Number

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one, would you clarify why the TBD says one thing and the ER says another thing? And also, I looked at some of the claims that had dose reconstruction done on them. One of them had 100 parts per billion plutonium added in correctly as the TBD instructed them. Two others did not, even though it was less than 50 percent. And so I think probably there's a lack of clarification there to the DR.

And so I guess the first issue is why is there a difference between the 100 parts per billion in the TBD and 2.9 and 6.3 in the ER?

MR. ROLFES: Okay. The TBD for Weldon Spring Plant was written back in 2005. And so at that time, we had adopted surrogate data from the Fernald site.

The reason for that 100 parts per billion default at the Fernald site was because of the elevated transuranic concentrations of the Paducah flame and tower

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ash which was shipped to Fernald in the late '70s. And it was that that formed the basis for that 100 parts per billion default even though the majority of all the other shipments except for a handful were much less than 10 parts per billion plutonium on the uranium mass basis.

The TBD that was written in 2005 for the Weldon Spring Plant defaulted to the Fernald data of 100 parts per billion. The actual data in reviewing the Weldon Spring site-specific data as part of this Special Exposure Cohort Evaluation Report indicated that the average concentrations were 2.9 parts per billion plutonium on a uranium mass basis and gave a 95th percentile value of 6.3 parts per billion. So the actual site data that we looked at for the Weldon Spring site indicates much lower levels of transuranic evidence.

DR. MAKHIJANI: There are site measurements of contaminant data for Weldon

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Spring --

MR. ROLFES: These are based upon the --

DR. MAKHIJANI: -- from the time?

MR. ROLFES: -- DOE 2000 report from Weldon Spring.

DR. MAKHIJANI: So part of this issue is how reliable is this DOE 2000 report. And by the accounts of people who were there when it was prepared, it was prepared in a big hurry. It was prepared in response to a scandal essentially on the front pages of newspapers about Paducah. And it was rapidly prepared as a mass balance. And then in 2003, the DOE issued another report that said, oops, the 2000 report was rapidly prepared.

So we've expressed a fair amount of discomfort with the use of the report in the Fernald case. And that issue is still on the table. So I think the question of whether you can use that mass balance data. So far as

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I remember, the measurements are not from the time. The inferences are from measurements that were made in the '70s and '80s. Now at Fernald at least you can say they were still processing uranium there.

What was happening at Weldon Spring was in a completely different time period. And if there was recycled uranium involved at Weldon Spring, it would have not probably come from Paducah and tower ash. And so I would suspect, or at least you have to establish that it's connected to that source term.

I would suspect that the recycled uranium dominant source term in the DOE complex which isn't very well treated in the literature originated in the U Plant at Hanford -- and I've raised this issue before -- is when you're dealing with a U Plant at Hanford, a set of ratios that is key to plutonium doesn't work. It's sort of like the

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raffinates at Mallinckrodt. Once you've stripped the uranium, then a set of ratios of thorium and radium and protactinium to uranium does work when you strip the uranium.

It's the same problem. You've stripped the plutonium at the reprocessing plant during the Manhattan Project. You've put uranium, neptunium and fission products in the tanks. And then you've taken that back out -- the uranium, fission products and neptunium -- and you strip the uranium and then you have entrained fission products in neptunium. But you may not have any significant entrained plutonium.

So you've got all these other contaminants whose relationship to plutonium I haven't seen established by measurement data. And Hanford did have guidelines. But we don't know whether they had out-of-specification material. We don't have measurements. And we don't know what went to

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Weldon Spring.

So I think these back-extrapolations of measurements of recycled uranium are much more problematic, at least as things stand, at Weldon Spring than they would be --

MR. ROLFES: I think we need to be careful about saying we don't know what went to Weldon Spring because there is an evaluation of the data that was done at Weldon Spring. And it's reference ID 11818. And it's Health Physics Concerns for Recycled Materials. And it's an interim report on the data through November 1, 1964. It has alpha and gamma versus nuclide content.

It's a report which is 12 pages long. It is an evaluation --

DR. MAKHIJANI: What did you say -- 11?

MR. ROLFES: 11818. It's an evaluation of the alpha and gamma activities

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for the materials that were sent back and considered to be recycled uranium.

DR. MAKHIJANI: From the time?

MR. ROLFES: 1964. So, yes.

DR. MAKHIJANI: Excellent. I'll take a look at it.

MR. ROLFES: It's an evaluation of recycled feeds for additional health problems. And I don't know, I don't think we need to discuss it --

DR. MAKHIJANI: Well, so far what's on the table is surrogate data. And so if there's something else on the table, then we'll look at that.

MR. ROLFES: It has a discussion of the findings with health activity and it mentions neptunium-237 versus 234 and 235 as well an analysis of actinium-227 and 231s.

DR. MAKHIJANI: Great. If there's substantive data from the time, this simplifies things considerably. And then you

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have the question of reprocessing of recycled uranium and how you're treating the raffinates. And then it becomes a more --

MR. FITZGERALD: I guess I'm a little confused.

This document comes after -- after the ER? I'm just trying -- why did you go to the Fernald surrogate data?

MR. ROLFES: This document was from the 11,800 range in the site research database.

MR. FITZGERALD: No, I'm just saying you didn't choose to use that as a part of the recycled uranium assessment.

MR. ROLFES: Correct. I guess at the time just with the pressure to get claims done, we didn't want to go back and -- just because of the length of the reports -- we've got a 1,000-page report -- we felt that it would be claimant-favorable to default to the 100 parts per billion --

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MR. FITZGERALD: Right.

MR. ROLFES: -- for the Fernald site.

MR. HINNEFELD: I think originally the surrogate data from Fernald was used for expedience --

MR. ROLFES: Yes.

MR. HINNEFELD: -- in the Weldon Spring PR program.

MR. ROLFES: Right.

MR. HINNEFELD: And it definitely bounds what you had in that report.

MR. ROLFES: Correct, correct.

DR. BUCHANAN: And you're saying that's reference 11818?

MR. ROLFES: Yes. It's 11818, Health Physics Concerns for Recycled Materials.

DR. BUCHANAN: And is this where the 2.9 and 6.3 figures come from?

MR. ROLFES: No, that is not.

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That data is from the DOE report from 2000, I believe, for Weldon Spring Plant.

MR. HINNEFELD: So that question about the quality of the 2000 report still remains then?

DR. MAKHIJANI: Right. So what my suggestion would be since you're re-looking at this stuff is that you go to the site data that you have and then we can assess the quality of the site data because we've raised all these issues in another context, and they're still on the table and they're still being discussed and they're unresolved at Fernald. And then so you're kind of thinking what's going to happen in that other arena that will bring you back into this arena. If you've got site data, it's much better. Then we can look at that.

DR. BUCHANAN: Okay. Want to move on to issue number 6, neutron exposure dosimetry records.

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There were processes at Weldon Springs that would create -- that's on page 8, issue number 6 -- that would create potential neutron exposure. According to some documents, there was NTA film issued to some workers that were involved in these operations in a slight risk of uranium of one to two percent that was received during different campaigns. But there are no results documented. They're either in a claimant's file or they're otherwise -- see if they could locate.

And so, the question comes up if there's a potential exposure without any records -- dose records -- to reconstruct the dose, what do we do about that? And so recently in the TBD -- and this is an area that we would like to clarify. Recently in the TBD, the use in Fernald measurements -- one-time measurements of beta gamma -- I mean, neutron gamma and do a .1 I think in the

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method. And SC&A did not agree with that in their site review report.

I see in the ER that it is mentioned that the OTIB-24 would be invoked if necessary on a case-by-case basis for neutron dose assignment. And there was a mention of missed dose assignment. And so at this point, I'd just like some clarification on how neutron dose would be assigned. It's still TBD-6, or are you going to use OTIB-24? Or misquotes come in when you don't have any comeback data.

MR. ROLFES: Well, I'll have to delay a response to that. I'm not certain. But I know for the Fernald site what we've done in the past for workers that were handling enriched uranium, we've applied a neutron-to-photon ratio. From the top of my head, that was around .3 to 1 for the 95th percentile.

And Fernald handled higher

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enrichments. It had larger quantities of material there. So that would have probably been a bounding neutron-to-photon ratio for the Weldon Spring Plant.

We'll prepare a response on that and make sure that it's addressed for the revision.

DR. BUCHANAN: Okay. Thank you, Mark.

I did have one question. Do we know -- I mean, just as a general question -- do we know that Weldon Spring only received RU and enriched uranium from Fernald?

MR. ROLFES: I will have to delay my response to that once again. I --

DR. BUCHANAN: Because that's important. If we're going to use any of Fernald's data, whether it's DOE 2000 or the enriched uranium 1 to 2 percent and that sort of thing, we need some documentation that they only received that material from Fernald.

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MR. HINNEFELD: If we only use what now?

DR. BUCHANAN: If we only use Fernald data for enriched and recycled uranium --

MR. HINNEFELD: Oh, okay.

DR. BUCHANAN: -- then we need some documentation. They didn't receive some from Hanford, they didn't receive some from other places that is available through the years.

MR. ROLFES: Does anyone on the phone perhaps -- Mel or Bob or Monica -- know if there were uranium shipments to Weldon Spring from sites other than Fernald?

MR. MORRIS: Mark, not that we are aware of. Again, not that we're aware of.

MR. ROLFES: Okay. So based on what we currently know, everything that Weldon Spring received would have come from Fernald then?

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MR. MORRIS: Yes, sir.

MR. ROLFES: Okay. We'll double check on that for you.

DR. BUCHANAN: Okay. I mean, it would be good to have some documentation showing that they didn't receive anything from anyplace else.

Okay. So that was issue number 6 on neutron dosimetry.

Issue number 7 was the quarry and raffinate pits exposures. This is kind of a problem area in that the operators -- we might be able to use their data to bound, say, the secretaries or the lawn workers or the non-production workers so to speak at the site that were roaming around the site and stuff in between admin and the plant and such. However, the quarry and the pits are different sources -- different source terms. And apparently there was not too much attention paid to it back in the active days from '57 to

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'66 and '67. The quarry was kind of looked at as a dump. And in fact, downtown brought a lot of junk out there from their plant -- contaminated junk -- and dumped it in the pit. In other words, there was a dump truck apparently.

And so, there wasn't much done about characterizing it until 1970s, 1980s. And so, I guess I have an issue with using 1970 and '80s data for the active period of the quarry and they were dumping stuff in it.

And also, the pits that were characterized later on and now the justification in the TBD and/or the ER was you grow in equilibrium of these decay products or any measurements done later would be limiting to what was there during the production era. And I agree from a scientific basis that the ingrowth would increase. But I don't know if that necessarily extrapolates to exposure potential because after you do a measurement

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and a situation -- a physical and chemical component in the '80s -- wouldn't necessarily reflect say the dust and the contamination stuff which was present there in dumping into the quarry in the earlier years and the condition of the pits in the earlier years.

And I did note that Mason did do some pit characterization in the Site Research Database. I think there's a '58 article in there.

And so, that's an issue I'd like to bring up is how can we extrapolate from later days back to earlier days when the pits and the quarry was active as opposed to a stagnant period after they had set 20 or 30 years.

MR. FITZGERALD: So this is kind of a source term question as well -- the question of whether the source term --

MR. HINNEFELD: Yes, theoretically they're okay. So there were measurements

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probably during remediation of the pits and the quarry.

DR. BUCHANAN: Yes.

MR. HINNEFELD: But the problem being that during the operation of the site when they were putting things in the pits and ostensibly in the quarry, then those exposures -- those materials since they were essentially bereft of uranium would constitute an exposure that you don't have uranium markers for, whereas the operators, uranium is pretty much the marker for the internal exposure. Is that kind of where we're at on this?

DR. BUCHANAN: Yes.

MR. HINNEFELD: Okay. Not bereft. They were devoid. They lacked uranium.

MR. FITZGERALD: And I guess just to wrap that up, the ingrowth of the decay products was in the time frame substantial enough that -- I guess it's a hypothesis -- would hold. But I mean, but it is --

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MR. HINNEFELD: Well, you're talking uranium decay change, I don't see a whole lot of change in those nine years.

MR. FITZGERALD: But I'm just saying that that's just sort of the premise here -- right -- that that would make it bounding. But on the other hand --

MR. HINNEFELD: Well, your point though is that the work activities and the exposures during -- because the activities were different, you can't necessarily assume that the remediation activities mimic the actual operational activities as they were loading that. That's the issue here. Is that true?

DR. BUCHANAN: That's correct.

MR. HINNEFELD: Okay. Well, unless you've got something to speak to that, we'll just take it back and work on it.

MR. ROLFES: I was just going to say just to point out, the .65 picocuries per

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liter is about what you measure normally in backgrounds.

MR. HINNEFELD: Of what?

MR. ROLFES: Radon.

MR. HINNEFELD: And that was measured when?

MR. ROLFES: Let's see. This was in the 1970s and '80s. The weakest was for radon.

MR. HINNEFELD: Okay. So that's when --

MR. ROLFES: Yes, yes.

MR. HINNEFELD: -- Ames started doing some environmental monitoring around --

MR. ROLFES: Yes. Let me --

MR. HINNEFELD: Okay.

MR. ROLFES: -- read that there.

MR. HINNEFELD: I think the issue here is going to be though that in '75 to '80, these pits were sitting there and stagnant and no one was working around it and putting

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things in -- and putting materials in the contained quarry. Is that the issue?

DR. BUCHANAN: Yes.

MR. HINNEFELD: Okay. So the fact that we have environmental monitoring from a quiet situation, the issue raised here is how can we convince people that environmental monitoring from a quiet situation is sufficient to bound or measure the exposures from two workers who are actually filling those materials now. I don't know what the filling processes were and whether there was potential or not.

I mean, some waste pits were slurries of radioactive material that no one got close to, and it was a liquid or a slurry anyway. So you don't have a lot of exposure potential as long as you keep it under water. But I don't know anything about that, and I don't necessarily think we need to go any further to know what we need to address.

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DR. BUCHANAN: Okay. I'll move on to issue 8. This is probably equal with -- is incidents and off-normal situations.

When I interviewed the workers and talked to them since -- has stopped, this is probably the biggest issue that sticks in their mind is that back in the '50s and early '60s, uranium was mainly viewed as a chemical hazard, and there was debate going on. But it was mainly a chemical hazard with some minor nuisance of radiation and beta activity to it. But it was not necessarily recognized as a health hazard until later on.

And so, we're not so much concerned with the identified high activity bioassay result and stuff which obviously sent up a red flag under AEC was investigated I think. What their concern is, is that there were incidents that weren't recognized as being radiologically hazardous. And so, they tended to the situation whether it was a

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medical situation or whether it was a physical or a plant situation or what. And there wasn't any follow-up, there wasn't any indication in the records.

And so, I went back and looked at a few of these -- of the claims. And I looked at their DOE files. And the couple I looked at were fat in that they were involved in what we consider today a serious accident with contamination and possible intake. But their records didn't show any attention to it other than just what they would normally -- if they happened to be one of the members being bioassayed. See, they had cohort monitoring. And so they would take a certain operational group and they'd do bioassays -- one or two guys would do bioassays for that group. And then the next month, they'd have another representative from that group.

And so if there was an incident, it wouldn't necessarily be caught if they had

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an intake unless there was a special bioassay. And this did not seem to occur anyway in the records that I looked at.

And so, I don't have a suggestion or a solution to this problem. And again, it's kind of a global problem with the site is how do you address incidents back in the earlier days when they weren't really recognizing radiological incidents, and so therefore weren't necessarily entered in the record as radiological incidents. If they were entered in, it was more of an occurrence -- a plant occurrence or from a medical standpoint of view -- injuries, cuts and that sort of thing as opposed to a radiological incident, especially at a production plant. How do you address these?

And so, like I say, we don't have an answer for it. But it is something that is large in the claimant's mind, and it's an area that I can't answer them. I can't say well,

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we include this in all the bioassay data because nobody was continually bioassayed. And so that's the way we brought up issue number 8.

DR. MAKHIJANI: Could I supplement that?

This has come up recently at another site, and I'm struggling in my head to remember which one I brought it up at. I can't remember. But it's the issue of blowouts.

There were pretty frequent blowouts at Fernald. And there were also pretty frequent blowouts where the process was developed at Ames.

Now at Fernald, blowouts went on into the '70s. That's documented. At Ames, of course, they were quite frequent when the process was developed. And indications are that blowouts continue to be a problem and maybe to a different extent at different

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sites, but continue to be a problem.

Now at Weldon Spring in the TBD, you said there's no record of accidents. But I can't imagine the record of uranium tetrafluoride reduction to metal using the magnesium reduction process is at the sites where there are records of accidents is that blowouts were an issue.

And so, I think a default assumption has to be that there were blowouts. But I didn't see that in the literature. I'm just supplementing what --

MR. ROLFES: Yes. We suspect that there was. But I guess the concern would be whether the people that were involved in those incidents were bioassayed.

DR. MAKHIJANI: That's right. So we recognize that the bioassay record does reflect whatever happened whether there was an incident or not.

MR. FITZGERALD: I think it sort

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of get into the threshold of what a bioassay -- would it be done. Portables were such that it was a very high threshold. It was more chemical-based than radiological-based because low enriched uranium, certainly you're missing a lot of the bioassays. And how do you portion that?

And I'm not sure it's an easily solvable issue because they just didn't recognize low enriched uranium as a radiological issue in all cases. It's a dilemma.

It sort of reminds me of the contamination issue. How do you do something with that if you know that was the practice and the perception, but your instances were based on something other than radiological?

MR. HINNEFELD: So we know for a fact that bioassay was a cohort monitoring scheme at Mallinckrodt?

MR. FITZGERALD: I don't think so.

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I'm just saying that --

DR. BUCHANAN: Yes, it was. Yes, bioassay was cohort.

MR. FITZGERALD: Yes. There were more people that were monitored. And I believe -- it is discussed in our evaluation report. And I'm trying to recall if they had monitored members of each individual work group like three times per week. I don't recall.

Maybe Bob, on the telephone, if you could explain. Do you recall the method for the little cohort bioassay sampling?

MR. MORRIS: No, I don't remember, that, Mark.

MR. ROLFES: Okay. I know that we had discussed it. And I guess basically our concern is whether a person that was involved in an incident would have had a bioassay is the bottom line. And I guess what we'll do is take a look and see if we can find some

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indications of workers that were involved in incidents, et cetera, and take a look at their bioassays.

MR. FITZGERALD: Can you pull, I guess, a small sample of just trying to --

DR. BUCHANAN: Yes. Of the actual people I talked to and see it was in the record.

MR. FITZGERALD: See if it was in the record. I think --

MR. HINNEFELD: As I see your write-up, one person's bioassay who was in furnace fire was not -- there was no bioassay in his record. But something said bioassay available in investigation report or something? Is that what your write-up says?

DR. BUCHANAN: No, I think it didn't really indicate -- it didn't really indicate that he was involved in a fire. It says personnel monitoring summary reports -- there was another --

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MR. ROLFES: Okay. So there's --

DR. BUCHANAN: It's written up in a MCW report. And there's information in that that the dose reconstructor could use. But it didn't say anything in his report that he had the bioassay.

And the other one just had something about medical aspect of the worker's complaint. It didn't have anything on bioassay.

MR. ROLFES: So this was, like, you're referring to his file as, like, the DOE response file didn't contain it?

DR. BUCHANAN: Right.

MR. ROLFES: Okay. Yes, that's one thing that we have had in the past. Some of the records don't always make it into the DOE response file when they're related to an incident and such.

And so one of the things that we've done to resolve these types of issues

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from our data captures from various sites -- all the documents that are put into the Site Research Database -- what we can do is actually search each of these documents and find any kind of bioassay data or exposure data and link those back into our NIOSH OCAS claims tracking system.

So, yes, that certainly is something important. So we want to make sure that any bioassay data from an individual's incident is included in the DOE response file. And if it isn't, we want to make sure that it's available to the dose reconstructors during the dose reconstruction process.

MR. HINNEFELD: Well, I think the issue here is pretty clear though is that in this one instance where the person had -- there was a notation or a personal file and there was an investigation report, and we could go find that bioassay and do dose reconstruction. That's one instance where

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we'll find it.

But the idea, though, is if it's done in that fashion, how do you know you don't miss something? How do you know you always have that notation about data included in an accident file?

And another important question here is how was the cohort sampling done.

DR. BUCHANAN: And that changed. Cohort sampling changed over time. First it was just Fridays and then it was Monday -- Friday, Monday, Friday. And then it went -- they changed it two or three times during the ten-year period if I recall right.

MR. HINNEFELD: Okay.

DR. BUCHANAN: Okay. So that brings us up to issue number 9. And that is one of the concerns of the petitioners that qualified the ER was the geometry factor not being included.

And so, this was important in that

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if a person generally practiced to wear the badge on the chest, and if the exposure source term was some distance away, it would duplicate the calibration of the badge so that a reading was correct for dosimetry purposes. However, if the source term was close or further away from the badge than part of the bodies, then there's a problem. Or if there was a shielding in between. That's a spatial issue -- a spatial and space-type issue.

And if a lot of this uranium have high theta doses -- and in fact some of them quote 20 r per hour on some of the lathe material. And so shielding as it interfered between the badge and the source but didn't interfere between the source and the person's head or hands or feet or whatever the situation might be, then you'd rest your dose lower than what the person or organ received.

And so a lot of places that recognize this, especially using glove boxes

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and stuff, have a geometry factor for people that worked certain jobs. And of course the compound disc at Weldon Spring just for extremity monitoring was implemented and basically wasn't there. And so there's no extremity monitoring to show any extremity doses that they were approximately equal to whole-body doses. If they were, then you can say well, there's probably not too much in geometry factor, but that it doesn't exist.

And so the geometry factor is an issue here even though we haven't had claims for extremities or that sort of thing. It shows that from readings -- the literature on their operating fields and operations that the geometry factor could be important in some organ doses. And so, we would like to bring up the issue that geometry factors need to be implemented at Weldon Spring.

MR. ROLFES: Yes, I would agree with you if we had a dose reconstruction that

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needed it. But I just did a quick review of the claims that we have in NOCTS and I didn't see any cases where the individual had a cancer on their hands, for example, on an extremity. But yes, I do agree that if a situation where an individual was handling uranium materials and had recorded doses, et cetera, we would certainly want to develop some geometrical correction factors to make sure that we're accounting for the dose to the extremity properly.

The other question I had was the reference you had mentioned -- the 1958 office memo. It mentioned dose rates from 10,000 to 35,000 millirem per hour. That doesn't sound like uranium to me. I mean, that didn't really sound like it was something that was coming from Weldon Spring Plant. Do you recall if it was another site?

DR. BUCHANAN: No, no. This was -- let's see. I can give you the reference

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number for that document. That's a Weldon Spring document. I can give you the reference number for that.

It was on a lathe, I think.

MR. ROLFES: All right. So it wasn't uranium. It's likely protactinium-234 and such.

MR. HINNEFELD: Yes. If it was on a lathe, it was probably a machine that could surface off the --

DR. MAKHIJANI: Mark, where did the protactinium-231 and actinium-227 come from at Weldon Spring?

MR. HINNEFELD: That's U-235 decay chain. I mean, you're mainly protecting 234.

DR. MAKHIJANI: Yes. But if it's being processed already, you expect that stuff to have gone away, right?

MR. HINNEFELD: I don't remember the ingrowth of those.

DR. MAKHIJANI: They're slow.

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They're very slow.

MR. HINNEFELD: Yes. It may not be 231.

MR. ROLFES: Are you referring to --

DR. MAKHIJANI: I just saw it in the document you referenced.

MR. ROLFES: In the health physics concerns for the safety materials?

DR. MAKHIJANI: Yes.

MR. ROLFES: Okay. Yes, that would have been a small amount from U-235 decay.

DR. MAKHIJANI: All right.

DR. BUCHANAN: I'll get you that document.

MR. ROLFES: You don't have to provide it right now. But if you could after the meeting.

MR. FITZGERALD: But it doesn't sound like we have a -- here either. It's

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there for your -- it's a tool that you're going to use if you need to use the tool.

DR. BUCHANAN: Well, and it's more though than just the extremities. It's brain cancers and anything above the neck up and your feeling bad doesn't necessarily reflect it if it's coming from a lathe or something.

MR. FITZGERALD: So they're still geometry questions.

DR. BUCHANAN: Yes. Even though I have a shield here and you're not -- the brain, it could be receiving a different dose than the benches.

DR. MAKHIJANI: At Mallinckrodt, there was an also an issue of geometry where the source was below which applied to the vats.

MR. HINNEFELD: Yes, there are serious --

DR. MAKHIJANI: And there's a --

MR. HINNEFELD: -- there's not

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that -- is there? There are certain parts in the orientations which may interest us if needed. I'd have to go back and check on that.

MR. FITZGERALD: So you're talking about with maybe an analog for Weldon that may be drawn from this.

DR. MAKHIJANI: Right. But I think that issue was resolved.

MR. FITZGERALD: A lathe was one of the set-ups in the Mallinckrodt document. A lathe was one of the set-ups.

DR. MAKHIJANI: There's quite a lot of very good work done --

MR. FITZGERALD: Well, maybe a lot of the leg work was done on them checking out the factories --

DR. BUCHANAN: Okay. That's the nine issues that I had on the SEC.

CHAIRMAN GIBSON: Is everyone clear about consulting these to further look

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into and respond back to?

MR. HINNEFELD: I took some notes. I guess Mark probably took notes. I think we'll -- if we have some questions -- about what -- but I think we've got it straightened out. And we are within written responses for these matrix issues. Now this is clear that this must be a summary out of a report that is going to PA clearance or something --

DR. BUCHANAN: Well --

MR. HINNEFELD: -- security clearances?

DR. BUCHANAN: It's just a draft. It's not --

MR. FITZGERALD: We want to slow them up.

The report is in draft, ready to go --

MR. HINNEFELD: That's okay. Before you go to DoD for their security or applications first.

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MR. KATZ: So it should come out in -

MR. HINNEFELD: Well, I'm just saying that normally the written reports are very instructive about the basis behind this number 5. That's when I'm --

DR. BUCHANAN: Yes, they'll be more -- more details.

MR. HINNEFELD: Because I hate to compliment the contractor -- the Board's contractor here -- but there's a lot of well written stuff in the actual review reports. And the ideas usually come across pretty clearly that the basis for the finding in some has been more so than just what he did in the matrix.

MR. FITZGERALD: So that would take a couple of weeks that we'll be done with this.

MR. KATZ: Well, it sounds like the TBD revision is also correct or at least

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for a couple months.

MR. ROLFES: Correct.

MR. FITZGERALD: There's been a couple of portions that have been in the works, I guess. I believe the site description has been updated. But I believe the other significant TBDs - the internal and the external as well as the environmental dose portions of the site profile are still in internal review at ORAU. And I believe we're hoping to get those out by the end of the year.

MR. ROLFES: And when you say out of ORAU or do you mean through DCAS review too?

MR. KATZ: I would expect that they'd be through DCAS review too by the end of December -- early January.

MR. ROLFES: And will that have to go to DOE too then?

MR. KATZ: Yes, it will.

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MR. HINNEFELD: That's usually two weeks.

MR. KATZ: Yes. Okay. So it sounds like that'll be out by January -- sometime in January?

MR. HINNEFELD: We'll do what we can.

MR. KATZ: I mean, obviously it's something --

MR. HINNEFELD: Everything we do is a juggling act about which fire are we planning today or this week.

DR. BUCHANAN: And I know that the matrix usually comes out after the report. In this case, we signed that in the spring and we didn't want to clog up the clearance pipeline with a report --

MR. HINNEFELD: I didn't mean to complain at all. I'm just saying that usually the report includes really clear descriptions --

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MR. FITZGERALD: We sort of push the matrix out faster given schedules.

MR. HINNEFELD: I'm not complaining. I understand.

DR. BUCHANAN: And that reference number on the beta dose is 14938.

MR. ROLFES: Thank you, Ron.

DR. BUCHANAN: That's a 1959 Mallinckrodt lathe operation, shielded and unshielded.

MR. KATZ: That was an item that you wanted a chance for someone from the ORAU staff to come back.

MS. HOWELL: Monica.

MR. KATZ: Monica. Early on. Is that still open? Do we want to see if she's back with us from her call?

MR. ROLFES: Well, I don't know. Did we want to discuss that? That probably falls back into the technical discussion of --

MR. HINNEFELD: If it's a

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technical discussion of the timing then I don't think we need to do it.

MR. KATZ: It was about the pedigree of the data.

DR. BUCHANAN: Using the ER.

MR. KATZ: So is that useful to decide anymore?

MR. HINNEFELD: No, I don't think so because we got to the point where the key question was what's the origin of the exposure history in the individual file. And if we have a dose reconstructor here, do you really need that?

I've had a couple email exchanges with ORAU, and I'm not entirely sure I understand them. So I don't know that it's worth talking about.

But apparently, the individual exposure records apparently are hard copies, records from the site. Some are handwritten. Some are printouts from Weldon Spring

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monitoring program. And those are obtained from Oak Ridge Operations who is the holder of those records. So that's what shows up in the person's file is a report that was generated from Weldon Spring. That's what the dose reconstructor gets.

And it should be a little look in on Weldon Spring's claims if not and see exactly what's in there. It would be under the DOE response in the claim docs. It's part of the documents -- claim documents.

CHAIRMAN GIBSON: Okay. Is this a good time to break for lunch before we come back and cover the Site Profile preliminary responses for --

MR. HINNEFELD: I mean, it's convenient now to break again.

CHAIRMAN GIBSON: Come back after 12:00 then?

MR. KATZ: Yes, It's noon. So after 1:00?

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CHAIRMAN GIBSON: Yes.

MR. ROLFES: Well, I think we sort of discussed both of -- I think the Site Profile issue's really been discussed in the SEC evaluation portion. But I don't know how much detail you want. We can certainly discuss them if you --

MR. HINNEFELD: I mean, we might as well run through them. It'll take what it'll take.

MR. ROLFES: Sure.

DR. MAURO: This is John. Real quick before you break, I just wanted to check with you this paper by Adams and Strom in Health Physics on DWEs. I'd like to ask do we get the green light to go ahead and look into that and perhaps write up a white paper on it?

MR. KATZ: Yes. It may not require a white paper out of this. But certainly take a look at it and see --

DR. MAURO: Okay. We'll take a

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look at it and be prepared just to report back. And certainly the work group could then decide whether it'd like a white paper or not depending on the complexity.

DR. MAKHIJANI: John, let me suggest that what we might do is compare what's in that paper with what we did before and write a short memo on that. It might be as simple as that. Or it might need a white paper. I don't know.

DR. MAURO: Right. Well, I'd like to also look at what's in that paper and what actually done for example on a number of places where DWEs were used in the past and whether or not that -- let's say we find that protocol reasonable in Adams, and then we'll see whether or not that protocol was in fact employed in many of the cases that we've reviewed in the past.

MR. KATZ: Yes. And John, the only thing I'm feeling a little uncertain

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about is DCAS has part of this equation too to explain how that paper or its methodology sort of relates. And until you have that, you may not be able to respond fully on this issue.

DR. MAURO: Yes. I think I'd just like to do a little homework to see what was done.

MR. KATZ: Absolutely.

DR. MAURO: And you know why? Because it's going to come up again on Fernald real soon. And the more we know about it, the more intelligently we can speak about it.

MR. KATZ: Sure. But absolutely you can dig into it.

DR. MAURO: Okay. But we'll keep it light just enough so we get familiar with it.

CHAIRMAN GIBSON: Well, I guess I have no idea how much their work -- Mark, what's your sense as to how much is there to go through with TBD review that hasn't been

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covered?

MR. KATZ: Well, we've sort of hinted on some of these things. If you look at issue number 1, we've discussed atmospheric monitoring data for the operational period. And basically, many of these responses were basically saying that we're updating the Site Profile, and that should be coming out at the end of this year.

We might be able to run through these in 15 minutes possibly.

MR. HINNEFELD: It's okay with me.

CHAIRMAN GIBSON: We'll take a quick break, make sure we've got everyone still on the phone and then just --

MR. KATZ: Yes. You want to take a ten-minute break and then come back and we'll try to knock this off about half past the hour or so?

It may be useful, Mark, because it may help you in your final review of the TBD

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to hear whatever -- okay. So in ten minutes, yes?

MEMBER LEMEN: Does that mean you're not going to take a lunch break and you're just going to try and finish the whole agenda and then --

MR. KATZ: I think so. We're going to try to do that. So if we find that it takes longer, we'll break at 12:30 for lunch.

MEMBER LEMEN: If we can finish the agenda, then we'd be done.

MR. KATZ: Then we would be done for the day. Yes.

The only other thing we have to talk about is possibly scheduling the next one.

MEMBER LEMEN: Okay. I just wanted to -- never mind. I'll just wait until I get back.

MR. KATZ: Okay. Thanks.

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(Whereupon, the above-entitled matter went off the record at 12:02 p.m. and resumed at 12:14 p.m.)

MR. KATZ: Okay. We are reconvening after a short break. We're going to try to wrap things up. I think we can do it pretty quickly because Mark during the break looked at the TBD review responses and found that a lot of this has been discussed.

MR. ROLFES: Yes, I think we've been discussing these issues really as part of the SEC discussion that we had earlier.

Just to go through some of these, the first issue on the NIOSH responses to SC&A's review of the Weldon Spring Site Profile, we had discussed the lack -- well, SC&A found that there was a lack of environmental monitoring data for the operational period. We now have more robust perimeter data. And we've listed reports from which we got the environmental monitoring

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data. I don't know if we need to discuss that any further.

MR. HINNEFELD: Well, not in terms of that. There's still the main issue of back-extrapolation using the plume model on the site. That's still something that needs to be talked about.

MR. ROLFES: Okay. All right. Let's see. Number 2, I think we have -- special data for unmonitored workers internal environmental dose. That's essentially addressed in number 1 as well.

And number 3, lack of validation for maximum environmental dose, we've once again pointed back to our response to item 1 and have mentioned the additional environmental monitoring data from Weldon Spring Plant environmental monitoring reports.

Let's see. Now if we take a look at number 4, basically SC&A has identified that there's an incomplete assessment of

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uranium decay products. And taking a look at what's presented here -- let's see -- I think if you look at the last paragraph of our response here, it says, NIOSH intends to revise the TBD to include contributions of thorium-230, -232 and decay products which are more important to internal dose. So this is something that we have agreed with you and have decided to update our Site Profile. And so that should be incorporated in the December revisions of Weldon Spring Site Profile.

DR. BUCHANAN: Question. I have a question on number 4, the last sentence there. It says, change will only be appropriate with intakes before initial processing.

MR. ROLFES: Yes. Okay. The initial processing of materials would separate the thorium from the uranium. So that's --

DR. BUCHANAN: At what point would that be? How are you going to determine that in dose reconstruction? If a person was

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exposed to the whole chain or the purified chain?

MR. ROLFES: Well, usually if you actually take a look at the dose reconstruction methods that we use, if you are interpreting an individual's bioassay data for uranium, you convert that mass quantity into a specific -- into an activity that is excreted in a 24-hour time period. If you assume that all of that activity resulted from U-234 rather than all of the different isotopes that make up natural uranium, the dose is always going to be higher for the majority of the organs. I think there might be one or two organs where considering another issue, the internal dose could be slightly elevated.

But the bottom line is when you assume that all of the internal dose from uranium results from U-234 rather than a distribution of U-234, U-235, U-238, the U-234

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internal dose is always going to be greater and more claimant-favorable. And that's the method that we use in dose reconstruction.

So I think that your concern about thorium-234, if we would evaluate thorium-234 intakes, if we would look at the individual components -- the isotopic make-up of what the individual was exposed to -- the actual internal dose that we would calculate would likely be lower than what we would do in our dose reconstructions now.

DR. BUCHANAN: Well, my question though is what do you mean by that last sentence. These changes will only be half of the intakes before initial processing. Can you explain what that sentence means?

MR. ROLFES: Well, I think I mentioned it would be the -- let me see, let me read through this entire -- so the ratios of thorium-230 versus the U-234, we would really only be concerned about the thorium-

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230.

MR. HINNEFELD: Well, I mean what that sentence says is that after you would find it, then that stuff's gone. And that's what that sentence says. And your question is beginning new dose reconstruction, how do you know if this guy was exposed before or if it was afterwards.

So we'll have to take a look at what exactly is intended on that response. I'm having a little trouble following it myself.

DR. BUCHANAN: Okay.

DR. MAURO: This is John. I have a question.

Now we're dealing with concentrates where the material predominantly is the naturally occurring isotopes slightly enriched slightly enriched -- the two percent -- which would include the thorium-234 protactinium, and of course uranium-234. But

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you wouldn't have very much thorium-230 or radium-226, right?

DR. MAKHIJANI: No.

DR. MAURO: So I guess the question I have for Ron, are you concerned how they're going to deal with the internal doses to thorium-230 and radium-226? Or did the question go toward more the short-lived progeny of the 238?

DR. BUCHANAN: I'd have to go back and re-read the whole thing again. But I remember that the inhaled thorium-234 was not included from the decay of the material in the person's body itself.

DR. MAURO: Okay. Yes. When you do the internal dose from 238 -- this goes to IMBA, I guess -- I believe the thorium-234 ingrowth and the protactinium, that's all part of it.

Well, I'm drawing a little bit of a blank now, but --

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MR. HINNEFELD: Yes. Well, the response here is that what we wrote is that the protactinium-234 and the thorium-234 intakes are small contributors to the dose. And as a routine practice, what we do at uranium intake, we assume all the uranium activity is thorium-234. Uranium-234. And so -- which gives you more dose per amount inhaled than uranium-238. And by doing that, you've covered essentially not only U-238 but also those intervenings short- and half-life daughters.

DR. MAURO: Yes. I would agree with you completely that --

MR. HINNEFELD: That's the first part of the response then.

DR. MAURO: Yes.

MR. HINNEFELD: The second part of the response gets into thorium-230 and 232 --

DR. MAURO: Okay.

MR. HINNEFELD: -- and their

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presence in the concentrates.

And what we say in our response is that we're going to revise it to take those into account that those will only be applicable to intakes before initial processing. While that's technically true, as a practical matter, it's not clear that we'll know when we do a dose reconstruction whether somebody's exposure was to pre-refined or post-refined uranium. And so why even make the distinction? I mean, to me, it's not going to be a lot.

DR. MAKHIJANI: It's a small thing.

MR. HINNEFELD: Yes. So I think we understand the whole thing. It's just we've got to clarify exactly where we're going with the response here.

I don't know that this response which has to do with the technical feasibility of doing dose reconstruction and the way that

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you would theoretically do a dose reconstruction translates real well into how actually dose reconstruction is going to be done. So that's the thing we need to think about on our part of this response.

MR. ROLFES: All right. Looking on at issue 5, we discussed the radon exposure. I don't know if we need to discuss this any further. But we did discuss the method that we are coming up with. We discussed our radon source term and our assumptions for employee exposure. I think we've agreed that we would take a look at that again as well.

Let's see. If we move on to 6, the issue here was the different solubility classes listed for the same element. This is really a dose reconstruction issue.

And what NIOSH does when we complete a dose reconstruction, we would use the chemical solubility for the given nuclide

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which resulted in the highest internal dose to the target organ in the dose reconstruction. So it's a matter of assumption that is claimant-favorable.

Should we move on?

Okay. Number 7, missed dose and co-worker data not adequately addressed. Our response here is that the TBD did not have a formal co-worker study in it. However, the urine data summarized in Tables V-8 through V-17 may be used by dose reconstructors to estimate the doses if an employee's records are not available for a given time period.

And the data included part of the median and 95th percentiles.

DR. BUCHANAN: Yes. That kind of goes back to our original verification of data and stuff.

Now I did have a question on the MDA. It wasn't really clear on page 18 of TBD 5 exactly how it was decided upon to use that

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MDA value. Maybe that was page 18.

There were some discussions made on the bottom of page 17. And then it was said that the .008 milligrams per liter was derived from Rocky Flats and supported for use at Weldon Spring. And so, to me, that's not quite a lot of support for it. If we're going to use .008 milligrams per liter at Weldon Spring, is there any other way we could substantiate that rather than say well, we used it at Rocky Flats? That was the way I understood it. If there's a different work for that, if I could hear it --

MR. ROLFES: All right. Yes, we can certainly look at the MDA.

Let's see. Yes, we didn't address that I don't believe in our responses. But that's something we'll look at -- the limit of detection for the uranium bioassay. And we can take a look back and see if they reported any less than values for example.

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But the fluorometric method that was used; it was pretty common and we can probably come up with a good estimate based on other sites that were doing the same operations in the same time period.

DR. BUCHANAN: I would think as thorough as Mason was -- and he was there at that time -- that he would have said something somewhere about that detected limit because he was pretty thorough.

DR. MAKHIJANI: And this also brings up the Mason comment in the mid-70s. And I think you have that document. Ron, did you send that document to Mark? I think NIOSH has that document --

MR. KATZ: Yes.

DR. MAKHIJANI: -- where there was this objection that bioassay data was never meant to be used for dose reconstruction.

And this has come up before. And I think -- and I actually addressed this by

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saying using new models and reinterpreting old data.

But the thing that was different that struck me about this memo -- just to call your attention to it -- was that it was written in the mid-70s when the methods were already more developed and as a retrospective on what happened at Mallinckrodt by Mason. And I think it's worth another re-look and a response -- well, since a petitioner has raised it.

MR. ROLFES: Okay. What was the issue? I'm sorry.

DR. MAKHIJANI: The issue was that bioassay data was never collected for dose reconstruction.

MR. ROLFES: Okay. Yes, I mean, just explain that I don't have the document in front of me at this moment. But I did look at it a couple weeks back. And I suspect that this issue is related to the unavailability of

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the biokinetic models to --

DR. MAKHIJANI: Right.

MR. ROLFES: -- interpret bioassay data.

DR. MAKHIJANI: I agree. And I know that NIOSH has addressed this before. But since it came up explicitly from the petitioner -- and I guess I should have remembered to bring it up in our prior discussion -- but since we're discussing uranium right now, I remembered it and forgotten all morning. It might be worth just if you feel the same response is valid since this came up explicitly.

MR. ROLFES: Okay. Sure.

Shall we move on to 8? This is related to shallow and extremity doses. And let's see. I'm looking at the review of the -- I don't know if you want to introduce this, Ron, or not. But I think we've already touched on the geometrical correction factors

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you had previously mentioned.

DR. BUCHANAN: Yes.

MR. ROLFES: We have no extremity monitoring data for the time period that Weldon Spring was operating. But then again we don't have any cases right now for individuals that were handling uranium that had a skin cancer, for example, on an extremity like for example their hand was the specific search that I had done, or their forearm. But we do agree that if a case comes up where we need a geometrical correction factor or an extremity, then we would certainly look at that issue.

As far as the other organs, you had mentioned the head or lower torso, for example. You'd have to take a look at the dosimeter position. And I think Stu had said that this was more of a generic issue that spanned multiple sites rather than one specific site.

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MR. HINNEFELD: Yes. What we should do is take a look at the Mallinckrodt because I'm quite -- about the use of geometry models. We should take a look at that and see how we feel about that or something similar to that.

DR. MAKHIJANI: You might consider generalizing it.

MR. HINNEFELD: Yes. Exactly. Right.

DR. MAKHIJANI: Well, beyond the geometry question, the skin piece of that is less a geometry question. And the geometry question is that deep dose where the badge was, the organ.

The skin dose question is a little more difficult. I was telling Stu off line that it might be worth -- I mean, this has come up a number of times also. And it might be worth looking at the Bethlehem Steel discussions where this came up first in our

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review process. There's quite a lot that was done. I mean, there's an item in the exposure matrix I just checked. I don't remember all of the discussion that led up to that item being in the exposure matrix. But I think with uranium -- and we've got to assume that uranium was handled at Weldon Spring because all of this was metal, right? And so people were handling it.

And so, even though you don't have wrist-to-ring dosimeters, you have to calculate it --

MR. ROLFES: Sure. I can work with -- but I'm not sure what the issue that you're --

MR. HINNEFELD: What he's saying right now is --

DR. MAKHIJANI: The literature available to you that you can refer to.

MR. HINNEFELD: The issue of what we were talking about working with uranium and

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not having egress monitoring and what do you do in a situation like that has been addressed and apparently resolved in Bethlehem Steel is what he's saying.

MR. ROLFES: Oh, okay.

MR. HINNEFELD: So we can look at Bethlehem Steel for ideas on how to deal with it.

DR. MAKHIJANI: Just trying to be helpful.

MR. ROLFES: It's really the contamination --

MR. HINNEFELD: You were acting so out of character, we didn't recognize you.

(Laughter.)

DR. MAKHIJANI: It's totally in character. You just don't know my character.

MR. ROLFES: Just to make sure we're on the same page, you're relating your concern about skin contamination rather than the shallow dose from a direct radiation

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source.

MR. HINNEFELD: Yes. We should just go into Bethlehem Steel and see what it says. I think it would be helpful for the discussion.

DR. MAKHIJANI: It would. I was part of that discussion.

MR. ROLFES: Okay. Issue 9, we have the badging policy was not consistent. And let's see. I don't know if you want to introduce this, Ron. Yes, we have quite a large response.

DR. BUCHANAN: Yes, our main emphasis there is that yes, the operators were badged, and we know that. But there are people probably would have been badged today that weren't badged back in those days.

And so, my concern is that how is the dose reconstructor going to know whether to assign them environmental external dose or some form of operator dose. And this is

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problematic in that if you look at the workers' records, they don't really say where they worked very explicitly as a function of time. They may be assigned to a certain department or a division or even a building. But that doesn't necessarily mean that the guy mowed the lawn or he stayed in that area. He could have been around any of this.

So as far as badging, not so much that the workers were badged as opposed to the other workers that weren't badged. How do we know they shouldn't have been badged in certain times and certain instances? And so how are we going to sort out the difference between people that should just receive environmental dose and those that should receive say 50 percent of the operator's dose or something?

MR. ROLFES: Again, that's certainly something that's important if an individual is monitored but appears to have

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had a potential for exposure. We certainly would assign an unmonitored dose to that employee. However, if we had indication that that individual had never entered into a production area or an area where they were storing radioactive materials, I would think that the ambient exposures would certainly be the more appropriate.

Let's see.

DR. MAKHIJANI: Can I ask an information question? What fraction of the workers were routinely badged at Weldon Spring? Just order of magnitude.

DR. BUCHANAN: About half.

MR. ROLFES: I was going to pull up our evaluation report and give you an idea of the external monitoring data here. I know it's answered in there.

DR. MAKHIJANI: That's a lot less than at other sites --

DR. BUCHANAN: Yes.

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DR. MAKHIJANI: -- typically for the period.

DR. BUCHANAN: Right. The probable correct answer is about half.

MR. ROLFES: I'm hunting through the document at this --

DR. MAKHIJANI: Well, I'll find out. It's fine. I have the answer I need.

DR. BUCHANAN: It wasn't the kind of -- where everybody walked through the cave that day.

DR. MAKHIJANI: Right.

MR. ROLFES: Right. I'm not seeing it. Did you want me to continue to look for it?

DR. MAKHIJANI: No, no. I can find it. I have the answer.

MR. ROLFES: Okay. Did we discuss that, or is there anything else that you needed clarification and/or a response on?

MR. HINNEFELD: For this one,

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since it's such a long response, I would like SC&A to let us know if there are still questions after they've gone through the response.

MR. ROLFES: Sure.

MR. HINNEFELD: Okay?

DR. BUCHANAN: Yes. We haven't had time. I got this Friday.

MR. HINNEFELD: This one came out a little bit ago.

MR. ROLFES: Okay. And the final issue that we had in here is lack of sufficient co-worker data development for external dosage. It essentially is part of the previous question that was had.

DR. MAKHIJANI: That was the reason for my question. We established that.

MR. ROLFES: Okay. What we've identified in our evaluation report was that there were 8,000 external monitoring records in the CER database representing 1,850

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employees during the period from 1957 through 1967.

DR. MAKHIJANI: So the whole question of the CER database that we talked about in the morning becomes a lot more important.

MR. ROLFES: Okay. I think that covers the Site Profile Review matrix.

Is there anything else that we need to discuss?

DR. BUCHANAN: There were 28 findings in Site Profile.

MR. ROLFES: Okay. I know that we didn't receive a matrix from SC&A. So for this meeting in advance of it, we prepared what we felt were the issues of concern. And so we tried to lump some of them into --

MR. HINNEFELD: Into those ten.

MR. ROLFES: Right.

(Laughter.)

MR. ROLFES: I know one of the

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issues that wasn't included in this matrix was the recycled uranium issue. However, we did previously discuss that as part of the SEC evaluation.

So I don't know if there's other things that we did not address. If there's other issues that you've identified that we haven't really discussed or at least understood better, then we'd certainly --

DR. BUCHANAN: I haven't had time, of course. Like I say, I got this Friday at noon. I haven't had time to go back and look at this and see if it covers any update -- lumped them all in for --

MR. FITZGERALD: Maybe that's an action that we should take just to come back and look at later. You've listed the primary ones. Whether there's any others that you haven't set as primary.

MR. KATZ: Right. If there are, you can just add them to this document.

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DR. MAKHIJANI: Could I make a process suggestion that worked quite well at Hanford?

Since we have two matrices going on the same site that the issues that we think are SEC issues be at the top and the issues that are residual be in the same matrix. Then if we resolve SEC issues and agree that they're separate issues, then you can just note that and work from one matrix.

MR. FITZGERALD: Sort of avoid the duplication?

DR. MAKHIJANI: Yes. And then we can go back to our Site Profile and kind of bend those 22 and make a reference to those findings in this new consolidated matrix. It might make it easier.

MR. KATZ: So does SC&A want to merge these matrices and make a spreadsheet?

DR. MAKHIJANI: It might be useful.

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MR. FITZGERALD: Yes, we'll draft them and bring them back a lot earlier before the next meeting. That way you can read it and see if you agree with it or not.

MR. HINNEFELD: Do you want to use the one that we assembled as a starting point? Or do you want to start with the 28 that you wrote and sort of match up what these may address or we should address?

Well, there are two reasons I ask that. You can use this one. Fine. But we should probably get you a Word version of it as opposed to a PDF version of it based on my experience.

Can we do that for him -- get a Word version of it?

MR. ROLFES: Yes. Certainly.

MR. FITZGERALD: If you want to just take a look and decide -- I'm not familiar enough with the 28.

MR. HINNEFELD: It's something to

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think about going forward.

MR. FITZGERALD: -- which way you want to start.

DR. BUCHANAN: Well, if you'll send me a Word version of this, and what I'll do is I'll go in and I'll take our 28 issues and somehow put this in with that. These are the ones that we didn't answer.

MR. HINNEFELD: If for nothing else, send us the 28, and we'll cross out which ones we think are addressed in number 1 response or something because we're the ones who did that. Or there may be some that are not responded to.

MR. KATZ: Well, going back to Arjun's suggestion too, I mean, I think obviously a lot of these will go into the SEC portion of it. So just that meld will go into the new matrix.

DR. BUCHANAN: I can redo the Site Profile issue with the SEC's up front --

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listed first, and then list the other 28 -- remaining 28.

MR. HINNEFELD: If they remain 28.

DR. BUCHANAN: Yes. They'll be --

MR. HINNEFELD: Some of the findings for review may be considered SEC.

MR. ROLFES: Well, it made sense to merge them but that's what they've done and that makes the conversation simpler if they're merged.

But we're coming out with one matrix, not two.

DR. BUCHANAN: Okay. And once I do that, do you want me to send it to you and you say okay, I answered these in here? Or do you want me to take this and put it into my matrix and say this is for the answers --

MR. HINNEFELD: Well, I'd kind of leave it to your discretion probably. And probably whatever works for you. You're assembling this matrix. Whatever works for

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you whether you want to use the 28 original or the 10 that we feel like we kind of summarized the 28 into -- whichever works for you. If you use the 28, we'll take a look and we'll see which one we think -- the three --

MR. FITZGERALD: Yes, with the admonition I think if we can simplify it by consolidation, then it would make more sense to have fewer than that.

DR. BUCHANAN: If you'll send me and --

MR. HINNEFELD: I don't have a Word file of it.

MR. FITZGERALD: Yes, I have the Word file.

MR. HINNEFELD: Okay.

DR. MAKHIJANI: Maybe since you know which of the 28 were merged if you could indicate that to Ron, it would make the job a lot easier.

MR. HINNEFELD: Yes. Can you do

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that at this point, do you think?

MR. ROLFES: I'd certainly ask ORAU to do that since they're the ones that prepared this from the SC&A's review.

DR. BUCHANAN: If they merge some of them --

MR. HINNEFELD: Talk to -- make sure they don't an additional some sort of tasking --

MR. ROLFES: Right. There may have been something for example like the recycled uranium issue we discussed as an SEC issue that --

MR. HINNEFELD: Okay.

CHAIRMAN GIBSON: Okay. Do we want to hunt for a date now or do we want to at least get a time frame and how long is this going to take?

DR. MAKHIJANI: Seems like late January is --

MR. HINNEFELD: Yes. It sounds

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like at least the evaluation report revision will be available in late January.

I hate to make schedule predictions very precisely in these meetings because there are a lot of things that go into what happens on a schedule between now and January.

CHAIRMAN GIBSON: Well, couldn't you just plan on late January? If you guys just keep me in the loop be it email then maybe after the first of the year we can start tossing around some dates or something. Does that sound right?

MR. HINNEFELD: Yes. I think for my purposes if I'm to be here, late January would be the preference rather than getting into February. I'm going to be on vacation for most of February until the Board meeting.

MR. KATZ: So why don't we just go ahead and grab a date for now? We can change it.

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MR. HINNEFELD: Sure. Can we make it tentative or something?

MR. KATZ: But why don't we pick a date while we can?

Like in the last week of January which in my look is clear.

MR. HINNEFELD: Yes, I'm good that whole week.

MR. KATZ: Dick, are you still with us?

MEMBER LEMEN: Yes, I am.

MR. KATZ: So how's, for example, the middle of the week -- the 26th of January -- on your calendar?

MEMBER LEMEN: Twenty-sixth? I would prefer the 25th. The 26th is kind of heavy. But I can probably switch things around.

MR. KATZ: The 25th? That makes no difference.

MR. HINNEFELD: It makes no

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difference to me.

Mark, you got a --

MR. ROLFES: The 25th? I don't believe I have any -- let me make sure. I'll be silent and let you know if I have a problem as soon as I can get back into my calendar here.

The 25th is Tuesday? That works for me.

MR. KATZ: Okay. Let's just set that as a tentative. Right now, we'll have that as a date. If we need to change it, we'll change it down the road.

MEMBER LEMEN: The 25th, right?

MR. KATZ: The 25th of January. And that would be another meeting here face to face.

DR. MAKHIJANI: I'll have to participate by phone probably. But that'll be just fine. I don't have a problem. That's fine.

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CHAIRMAN GIBSON: Okay. And just one more thing before we close out.

If there's anyone on the line -- any claimants or petitioners that have any comments or questions about today's meeting or anything that we could potentially address in the future, we'd like to open the floor and hear from you now.

Any claimants or petitioners who would like to make a comment?

(No response.)

Okay.

MR. KATZ: Okay. Thank you, Mike.

MR. ROLFES: The one other thing, are we going to exchange emails about what we've agreed to do sometime in --

MR. HINNEFELD: Yes. You should put together your patch-on list. You send it to Ted and the work group members and then the --

MR. KATZ: Right. SC&A will do

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the same.

MR. HINNEFELD: And copy Emily.

MR. ROLFES: Okay. Great.

MR. KATZ: And we're adjourned?

CHAIRMAN GIBSON: Yes.

MR. KATZ: We're adjourned. Thanks.

(Whereupon, the above entitled-matter went off the record at 12:47 p.m.)