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

convenes the

WORKING GROUP MEETING

ADVISORY BOARD ON

RADIATION AND WORKER HEALTH

MOUND

The verbatim transcript of the Working Group Meeting of the Advisory Board on Radiation and Worker Health held in Cincinnati, Ohio, on April 1, 2008.

STEVEN RAY GREEN AND ASSOCIATES
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C O N T E N T S

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-- "*" denotes a spelling based on phonetics, without reference available.

-- (inaudible)/ (unintelligible) signifies speaker failure, usually failure to use a microphone.

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P R O C E E D I N G S

(9:00 a.m.)

WELCOME AND OPENING COMMENTS

DR. CHRISTINE BRANCHE, DFO

DR. BRANCHE: I am Christine Branche from the National Institute for Occupational Safety and Health. I'm the Designated Federal Official as well as the Principal Associate Director for NIOSH. I want to get a couple of things established before I let Ms. Josie Beach begin her meeting. Would the Board members please announce themselves, first those of you who are in the room?

MR. CLAWSON: Brad Clawson, Advisory Board member, not conflicted.

DR. ZIEMER: Paul Ziemer, Advisory Board, not conflicted on this one.

MR. SCHOFIELD: Phil Schofield, Advisory Board member, not conflicted.

MS. BEACH: Josie Beach, non-conflicted.

MR. PRESLEY (by Telephone): Robert Presley, not conflicted.

DR. BRANCHE: Thank you. We do not have a quorum of the Board so we can --

DR. ZIEMER: Did you ask on phone?

DR. BRANCHE: Oh, sorry, thank you very much.

Are there other Board members on the phone?

(no response)

DR. BRANCHE: Thank you, Paul.

We do not have a quorum of the Board, so we can proceed. Would the NIOSH staff please announce themselves, first those of you in the room? Excuse me, please tell us if you are conflicted with Mound.

MR. ELLIOTT: Larry Elliott, I have no conflicts with Mound.

DR. ULSH: Brant Ulsh with NIOSH, no conflicts.

DR. BRANCHE: On the phone? NIOSH staff who are participating by phone and please indicate if you have a conflict with Mound.

(no response)

DR. BRANCHE: ORAU staff who are in the room, please announce your names and whether or not you're conflicted with Mound.

MS. JESSEN: Karin Jessen, no conflicts.

MR. STEWART: Don Stewart, ORAU team, no

conflict with Mound.

MS. BRACKETT: Liz Brackett, I am conflicted.

MS. HOFF: Jennifer Hoff, no conflicts with Mound.

DR. BRANCHE: ORAU staff participating by phone, please?

(no response)

DR. BRANCHE: SC&A staff in the room, please, announce your names and indicate whether or not you're conflicted with Mound.

MR. FITZGERALD: Joe Fitzgerald, SC&A, no conflict.

MR. BISTLINE: Bob Bistline, SC&A, no conflict.

MR. BUCHANAN: Ron Buchanan, SC&A, no conflict.

DR. BRANCHE: SC&A staff by phone, please.

DR. MAURO (by Telephone): John Mauro, SC&A, no conflicts.

MS. DeMERS (by Telephone): Kathy DeMers, SC&A, conflicted.

DR. BRANCHE: Other federal agency staff who are in the room, please.

MS. HOWELL: Emily Howell, HHS.

DR. BRANCHE: Those by phone?

MR. KOTSCH (by Telephone): I'm sorry, Jeff Kotsch, Department of Labor.

MS. HOMOKI-TITUS (by Telephone): Liz Homoki-Titus, HHS.

DR. BRANCHE: Are there any petitioners or their representatives who are participating by phone? Would you please state your names?

MS. CORDY* (by Telephone): This is Maria Cordy. I'm taking notes for Karen Hatts* who was not able to attend today.

DR. BRANCHE: Thank you very much.

Any workers or their representatives participating by phone, please?

(no response)

DR. BRANCHE: Any members of Congress or their representatives, please?

(no response)

DR. BRANCHE: Anyone else who would like to mention their names?

(no response)

DR. BRANCHE: Thank you. Before we get started I would ask that those of you who are participating in the room, if you would please mute your phones. If you're participating by

telephone, if you would please mute the line until you are ready to speak. It will help enhance all the quality for everyone participating being able to hear everything that's spoken. If you do not have a mute button, then please use star six to mute your phone, and then again use star six when you are ready to speak. Thank you very much.

Ms. Beach.

WORKING GROUP CHAIR

MS. BEACH: Good morning. I'd like to go ahead and share some thoughts for the record with regard to work group meeting ground rules before we get started.

First of all, to every extent possible, any white paper or any paper to be discussed should be made available to the work group, NIOSH, SC&A, a few business days in advance of the meeting. If material is provided at the table, discussion may be limited to just clarifying what has been given without actual deliberations.

Second, we will use work group meetings to deliberate on SEC-related questions, adequacy, completeness, integrity,

purely technical or historical factual issues may be better addressed on the one-on-one technical calls or meetings with notes to be taken.

Third, the Board's role includes independent validation of the evaluation reports, assumptions and judgment of historical facts and should not be construed as questioning the rigor behind the evaluation report. The discourse between NIOSH, ORAU and SC&A serves to inform the work board and the Board's future recommendations on Mound.

And fourth, the work group's process is designed to use deliberative process to narrow the scope of the SEC important issues and questions to the point where the worker is in a position to advise the broader Board on any remaining issues that should be discussed prior to a vote on a recommendation regarding the SEC.

And with that I'm going to turn it over to NIOSH to get started with the matrix.

INTRODUCTION BY NIOSH

DR. ULSH: This is Brant Ulsh with NIOSH, for those of you on the phone. Just to let

those of you know who are out there by phone who I am and my role in the process, I'm NIOSH's Technical Lead and so I was NIOSH's review authority pretty much on the evaluation report along with my managers.

I have several folks here from the ORAU team who actually did a lot of the legwork on the evaluation report, were intimately involved in writing it. Karin Jessen is here and Don Stewart is here. We also have Liz Brackett to help on matters dealing with internal dosimetry.

With that introduction then, the matrix was put together by SC&A based on their review of our evaluation report. The evaluation report was delivered to the Board at the Las Vegas meeting, and at that time we recommended, and the Board accepted the recommendation, to add a class at Mound from 1949 to 1959 based on radium, actinium and thorium separations issues. And so a lot of these issues that we're going to talk about today look at the remainder of the time and activities that happened at Mound.

MATRIX ISSUE ONE: EXPOSURE TO RADIUM, ACTINIUM, THORIUM

So just starting through SC&A's matrix then the first issue that was listed is exposure to radium, actinium and thorium starting March 1st, 1959. So this picks up after the recommended class.

Joe, I assume you're going to be speaking for SC&A today. I don't know if you want to go through SC&A's statement of concern or Josie, do you have an opinion on how we should proceed here?

MR. FITZGERALD: This is Joe Fitzgerald. I'm the Lead for SC&A, and we have Bob Bistline and Ron Buchanan here also. This being the first exchange, and it really is the first exchange on any of the issues relative to the evaluation report, I think the key thing that we were looking for is to clarify in some cases the basis for the conclusions in the ER.

And again, this is our first read, and first read of the supporting documents. So we understand that you have spent a great deal of time looking at these materials. And we just want to certainly take the opportunity to clarify more than anything else at this stage.

Did we understand the point being made in the ER accurately? And if so -- and we have some questions regarding the basis of the conclusions.

So really in the context it's clarification more than anything at this point. I think clearly there'll be opportunities to get into these issues in a more in-depth way. So I guess I see a certain exchange back and forth. Did you mean this? Do we understand it correctly? Did we read it correctly? Is there more data than we were able to discern from the supporting documentation? If so, what is that data? I think that's kind of where I would see it.

DR. ULSH: Well, the first issue as I mentioned was radium separations or dealing with the actinium material after the designated class, so after the '49 to '59 period. And I think Josie raised this question at the Advisory Board meeting as well.

And I guess a point that I need to maybe clarify is the reason that we recommended the class from '49 to '59 would

not extend to these other actinium separations is not that those activities didn't happen. We know that they did happen. For example, we have interviewed a former worker who was in charge and intimately involved with the actinium work that happened in 1964.

I think that's the one you asked about, Josie.

He had a very clear recollection of what was done, and in his recollection there were several points that he made that I think are relevant to our discussion today. First, those separation activities happened in a different facility from the one that was used during the '49 to '59 time period. 'Forty-nine to '59 was done in the old cave, known as the old cave at Mound. And by all accounts it was a very, very dirty operation. And we even have air sampling results that indicate that there was spread of contamination outside of the old cave facility.

And that really impacted our decision to recommend an SEC class. In contrast the activities that happened in 1964 were very limited in scope. In fact, the worker that we

interviewed said, I think, yeah, said there were about four people involved in that activity, and it was done in the new cave, not the old cave.

And the new cave had a hot cell inside. And for those of you who are not familiar with a hot cell, the picture that I have in my mind of a hot cell -- and I confirmed this with the individual that we talked to -- several inches of leaded glass, remote manipulators, totally isolated environment. And when I say that what I mean is the activities that are happening inside the hot cell, when the hot cell is operating correctly, are completely isolated from the outside environment.

And so the reason that we didn't include this activity in the recommended SEC was because there was no exposure potential. This was inside the hot cell. And he did mention that what they did was they opened up a couple of capsules of the actinium material inside the hot cell. And the first one that they opened spread a little bit of, spread some contamination inside the hot cell. But

he indicated that nothing escaped and the next capsule didn't have that problem.

And so we didn't see any exposure potential for that material unlike the period in '49 to '59 when there was widespread contamination.

MR. FITZGERALD: Just a clarification if I could. There were later operations, I guess the one that comes to mind is the Cotter concentrate extraction process where actinium showed up as an almost contaminant in some of the production material. So that kind of explains why you tend to, I guess over the history of Mound, that you found some sources of actinium contamination and different D&D processes picked it up and certainly in the final D&D it was picked up.

I guess what we were most interested in was the bioassay capability and the ability to actually monitor for it. And post-'59 I guess our concern was establishing when the actinium bioassay, for example, was available and actually being used for workers that were potentially exposed. And Cotter was one example, but I think in some of the D&D there

were other examples.

In looking at the King report you can sort of establish, yeah, it was a constituent here, there, different places. I wouldn't say it was ubiquitous, but certainly it tended to show up in more places than you would expect. And, of course, the new cave was the most obvious operation, but there's other operations like Cotter.

So I guess my question is trying to track, and I think a lot of the issues kind of follow the same pattern, just trying to understand what the timeline for bioassay availability and capability was versus the source terms in different locations. It's almost if you took the King document and the Meyer document, the Meyer document, of course, being sort of a world map of bioassay, and track that could you establish coverage over time and where were the gaps.

And that's probably the common theme that runs through a lot of this and runs through this as well. Was there, in fact, bioassay being done for in this case actinium across the various activities that where

actinium would show up. And so in other words you were getting monitoring when the source term was identified. And that, again, we're picking up some gaps, but we're not sure whether we're seeing all the data, but it appears to be some gaps of actinium.

DR. ULSH: Let me make a couple of points from that. 'Forty-nine to '59 was when the major campaigns took place as SC&A indicated in the statement there. And in 1959 they D&D'd the old cave. And at that time they did identify, I mean it's reasonable to assume that they did identify other areas where actinium had escaped. And they -- as you know since you were involved, Joe, in a lot of the D&D activities at a number of sites -- it's common to D&D a facility by locating areas of surface contamination, immobilizing those with a seal and a painting over them.

And what happened in the case of the actinium, the issue that we're concerned about in 1990-ish, the early '90s, the R corridor job, they encountered an area that had previously been, I understand, decontaminated or D&D'd in that way. They had a spot of

surface contamination of actinium that had been sealed over. When they went in to tear down the facility, there was scabbling, and that re-exposed that area of contamination.

But I don't think that you can draw a straight line between that incident and '49 to '59 and say that that indicates that there were actinium operations happening the entire time or actinium exposures happening the entire time. Now the one program that you mentioned, the Cotter Concentrate Program, the goal of that program was to isolate protectinium and I believe ionium, Thorium-230. There might have been some small concentrations of actinium and on that I would have to look. I can't really say.

But the goal wasn't to separate the actinium out, it was to get those other two elements. And that also happened in the new cave in the hot cell. We interviewed the individual who was in charge of that program and involved with it. And again, he indicated that there were maybe five people involved. They had 22 drums, well, they had a number of drums stored in a building onsite, but they

processed about 22, maybe 23 drums of that material inside the hot cell. So again, our point is limited exposure, actually no exposure potential for that material.

The Cotter concentrate was stored in Building 21 starting in 1974, I believe, after the Thorium-232 residue had been cleared out. And so I don't know that if you were concerned about exposure to Cotter concentrate that you would actually monitor for actinium. You would probably monitor for some of the thorium isotopes or protectinium. I'm looking at Liz to let her correct me if I'm wrong, but she's looking --

MR. FITZGERALD: Just a comment, I appreciate your comment on the not drawing a straight line because that's certainly, having been directly involved in the issues in the early '90s on the actinium flap, I understand where that came from. But more looking at operational sources, and I'll be the first to admit, again, I'm looking at documentation such as the King report that's, which is the roadmap of sorts in talking with different former rad people at the site trying to

understand whether or not the bioassay tracked with those source terms. And I think what you're saying is except -- and correct me if I'm misinterpreting -- except for trace contaminants in various operations, in this case actinium was handled in a hot cell that would not have been a very likely potential for exposure. Now that's still, I guess in our own mind begs the question, well, if you have workers working in a hot cell actinium, would they have been on a bioassay schedule for actinium or not. And certainly we can't find documentation that suggests that they were, post-'59. Now maybe there is some documentation on that. That would be the question in my mind. Post-'59 until the D&D era in the '90s, was there routine bioassay for actinium for workers that may have been operators or associated with operations where actinium was in excess of a trace quantity for example? And I guess I'm not sure either on the Cotter concentrate whether that necessarily was trace. Of course, that's a subjective call, but nonetheless, that would be my question. Where it wasn't a trace

quantity and where you had a source term where one would look for routine bioassay, was it being done post-'59 because there seems to be a bright line there. And I understand that from the ER, but it sort of raises questions about did that sort of, because it wasn't a main operation, did the bioassay sort of recede and not get taken up again until the D&D or not. And from the documentation it seems suggestive that it wasn't being done in that era. And if it was simply a question of handling in a hot cell because actinium is a bad actor, then that would certainly be one explanation for why you don't see a --

DR. ULSH: Again, we're talking in somewhat vague terms, but in terms of major operations the ones that I'm aware of are '49 to '59 and that one in '64. Now they did, Mound did have a history of working with small sources determining half lives, determining heat generation, determining a bunch of basic physical characteristics.

MR. FITZGERALD: Yeah, batch scale lab.

DR. ULSH: Exactly, very small sources of --

DR. ZIEMER: I have a couple of questions

that Brant or Joe or maybe Liz could answer. Tell me the makeup of the Cotter concentrate is what?

DR. ULSH: The Cotter concentrate started, I believe as airport residues from St. Louis. They were then shipped down to --

DR. ZIEMER: So they came from Monsanto.

DR. ULSH: They were shipped then down to the Cotter Corporation in Canyon City, Colorado, where there was some further processing done on them. And then they were shipped to Mound in 1974. And the makeup --

DR. ZIEMER: Roughly, I'm --

DR. ULSH: Yeah, perhaps during the break I can pull up a document that will give you a more specific answer. But it had reasonable quantities of Protectinium-231, Thorium-230. I'm not sure about actinium. I'd have to look, but those were the isotopes that they were interested in. So it was those St. Louis airport residues.

DR. ZIEMER: Now the other question, if you could clarify, any hot cell work you do pull samples in and out from time to time. Were you suggesting all the drumming is also done

in the hot cell before it's removed? Obviously, there's not zero probability of some outside contamination; therefore, external exposures were potential internal stuff.

What was the nature of the things that were transferred in and out of the hot cell? I got the idea from what you said that everything was drummed in there and then removed, and you pretty well had it contained before it ever came out. Is that correct?

DR. ULSH: I believe the latter part of your question is true. They had it pretty well contained before it came out. In terms of the drumming operations I can tell you that the Cotter concentrate was shipped to Mound in drums, and it was stored in Building 21 in drums. Those drums were taken into the hot cell where the processing occurred.

DR. ZIEMER: So it was at least removed from the drums in the hot cell.

DR. ULSH: I believe that's the case, Dr. Ziemer, but I can double check that.

MR. PRESLEY (by Telephone): Hey, Brant, this is Bob Presley.

DR. ULSH: Yes, Bob.

MR. PRESLEY (by Telephone): The drums, did they have any type of pig in them or was this material just stuffed into a 55-gallon drum?

DR. ULSH: I don't know, Bob. I can check on that for you.

MR. PRESLEY (by Telephone): That would be a great help to know exactly how that stuff was packaged.

DR. ULSH: Okay, we can get you some more information on that or at least try to.

MR. CLAWSON: Let me bring up one thing before we go on with Paul. One of the things that I want to bring up was, yes, these were brought in in a drum. The drums and so forth were opened up in there. But once you opened up those inner containers and so forth, is when you get everything going out. Usually in a hot cell you can take them in there but then you have to make manned entries to be able to go in there and retrieve these things back out. So you're basically going back into that environment that you now have a potential for.

Now, it may not have been as bad as the old cell, but you still, to be able to say

there's zero possibilities, I think that I differ a little bit. Because even when they're shipped in like that, they're shipped in an internal pig which you have to open up, break open. And once you break those things open, you've got all the contaminants and everything else that's going to be coming out of there that you've got to go back in and retrieve that drum back out, too.

DR. ULSH: I think it's important to keep a couple of operations separate and distinct in your mind. One is the 1964 work with the actinium, the two capsules. Those were smaller. I mean physically small. And then the Cotter operations that occurred '74 to '79, on a slightly larger scale, and we're talking 22 drums. And there I think our point would be that if you were concerned about exposure to that material, actinium was not what you would sample for. It would be some of the other radiological ^.

MR. FITZGERALD: Yeah, but if I could sort of recap on this one. I think we've kind of, as I said, our intent is to clarify a little bit better. I think it's clearer from what

you've said is that because of the '64 hot cell operation, which was the main actinium extraction, and how the other operations were handled, there was a means limits exposure.

However, I think what's still in question was the bioassay program itself. The availability and use of that tracked the source terms that were, in fact, beyond trace quantities. And I think that's not something that would be difficult to establish, but I don't know if we can do that right now.

DR. ULSH: Well, I can tell you -- I forgot to address this -- actinium bioassay is very difficult to do. It's not common to routinely have that capability. And that was part of the problem in the earlier years. They had to measure it indirectly. There was a lot of interpretation involved.

And that was, I think, also part of the problem in the early '90s because Mound didn't have the capability or the desire to do that routinely onsite. And so they contracted the offsite laboratories to do it, and that's where some of the problems came in. So it is certainly true that actinium bioassay is not

the standard routine type of thing that you would see all over the place. It's very difficult to do.

I think it's also true that for those middle years we don't have in our possession actinium bioassay results. And I understand your question about I'd indicate no exposure. Does that indicate something that was missed.

MR. FITZGERALD: Yeah, again, the only concern looking through the King report and looking at some of the activities is that at this point we're not clear that there weren't beyond trace quantities, the operations, that way that would have elicited some need for bioassay. And again, looking at what we can look at it doesn't appear that there's necessarily a match up with that. So that would be the question we have at this point.

MR. BISTLINE: This is Bob Bistline. And I'd like to get some clarification, too, along those lines, Brant. We know that there was leakage from the old cave taking place for a considerable time after its supposed D&D activity. And so undoubtedly some of this material may have, was it just sprayed on or

were there other isotopes that were getting into the areas. And since there was no bioassay being done, were these people being exposed during that period of time that there was no bioassay taking place. And up until the '90s when the D&D activity found traces of activity present where people might have gotten exposed.

DR. ZIEMER: So there's no bioassay or no bioassay for actinium? There's bioassay for other things?

MR. BISTLINE: For actinium.

DR. ZIEMER: Just actinium. But there was other bioassay which if there were uptakes of, I mean, you have a mix of stuff so if there was, it's hard to envision they would have uptakes of actinium without other things.

MR. FITZGERALD: The third comment to look for an indicator rate^.

DR. ULSH: It is certainly true, Bob, what you mentioned that there was leakage of radon from the old cave. I think there's any indication that there was leakage of actinium.

MR. STEWART: What they were doing was some workplace measurements, you know, smearing for

contamination in that area. We certainly kept track of that. We don't have those data to hand at this moment; however, the old cave was very effectively remediated or at least very thoroughly remediated. There was leakage of radon, no doubt about that because that's going to suffuse through the capping materials that they used.

DR. ULSH: So is it fair to state, I mean, we've talked about the 1964 operation that Josie had asked about.

MR. FITZGERALD: Right.

DR. ULSH: Is it fair to say you'd like to see maybe a summary of what other activities were done with actinium?

MR. FITZGERALD: Yeah, I think really just a map that would clarify because there wasn't bioassay, and I think you hit the issue. We do see some evidence of operations, intermittent as they were, that involved actinium as a constituent. But I think your comment's fair as well. Was this simply trace and were other nuclides predominating as far as exposure issues or not. And if so, then I think the issue tends to diminish.

But because of the difficulty in bioassaying actinium plus the, you know, it's a bad actor radiologically, I think that would be useful. We felt there wasn't, there was some more basis that could be applied there.

And let me add just on this particular item, this being our first cut, we did indicate one other item in here which was the Thorium-229. This could have went somewhere else actually on the matrix chart, but since it was a thorium isotope, we indicated it here.

And this again, based on our first read of the documentation, again we didn't see evidence of bioassay for that isotope as well. And during that timeframe where it was being handled and, again, there's a lot of documentation on this. And I know Liz is probably as close as you have to an expert on internal, but that was, that particular issue also struck us as one where the mapping of the bioassay didn't seem to coincide with the actual operation.

And again, it's a clarifying question because everything we could get our hands on

didn't suggest that there was, but there may in fact be something somewhere.

DR. ULSH: I think that the thorium bioassay that was done was not necessarily specific, isotope specific. And as is typical, I mean, we would assign whichever isotope from among the reasonable possibilities would be the most claimant favorable. We do have a history of thorium bioassay in the history of the site, but in terms of which specific activities involved Thorium-229, I don't have that at my fingertips.

MR. FITZGERALD: It's actually the 233 operation so we're kind of looking at that and saying, okay. And we have a separate question on uranium. So we're coming at it from different angles, but just to understand whether we read correctly that it doesn't appear to be bioassay during that timeframe what the implications are. And if, in fact, it's being captured with a broad thorium bioassay and you're assigning a bounding, you know, sort of a claimant favorable estimation. And that's a reasonable response.

DR. ULSH: Well, also gross alpha. I mean,

they did a lot of gross alpha.

Liz, did you have a question?

MS. BRACKETT: No, I looked at the timeframe that you were talking about --

MR. FITZGERALD: It's just in the matrix. Actually, it is the reference that we have there from '66 to the late '70s on the U-233.

MR. BISTLINE: Fourth line up on that first paragraph.

MS. BRACKETT: 233 monitoring.

MR. FITZGERALD: Yeah, this is the 229, thorium.

DR. ULSH: Right, the extraction of Thorium-229 from U-233, and your matrix says occurred from '66 through the late '70s.

MR. FITZGERALD: Right.

DR. ULSH: And, Liz, are you saying that U-233 would have been what you would have monitored?

MS. BRACKETT: Well, I'm not fully familiar with what went on, but I mean if it was Uranium-233, that could be done. There is some thorium monitoring specifically in 1966 without a particular isotope list, but they did do thorium monitoring at that time.

MR. BISTLINE: If we could get some clarification on that it would be helpful.

MR. FITZGERALD: It's the same question, whether or not coverage existed. If not, what would constitute then the means of monitoring. Obviously, these are all first order questions at this stage.

DR. ZIEMER: If there was, what was the extent of that monitoring in terms of the personnel and so on.

MR. FITZGERALD: And this also gets down to I think you mentioned earlier the number of workers. We haven't gone to that depth to figure out is this two workers, eight workers, 20, 30 workers. And I think for U-229 extraction probably was in small numbers.

DR. ULSH: Yeah, that's the context that we can't really get from King; that's not provided in the count document.

MR. FITZGERALD: So some of this may end up being, you know, it's true that it existed, but maybe it was a very small number.

With that I just think that -- that's only 1-A.

MS. BRACKETT: I was just thinking that.

DR. ULSH: Well, it's actually 1A and 1B, isn't it?

MR. FITZGERALD: Yeah, we actually got into Cotter a fair amount, but really I think on 1A it's sort of the same theme that we'll hit a number of times. It's just the mapping and understanding whether, what the implications of the apparent absence of bioassay would be in terms of those operations.

MS. BEACH: And, Brant, for the record, I would like a copy of the Cotter Concentrate Program you offered to Paul as well just for an understanding of it.

DR. ULSH: Yes, sure.

MS. BEACH: Thank you.

MR. FITZGERALD: So before leaving 1A is that, I guess in terms of mapping, I guess that's maybe one term that'd be popular.

DR. ULSH: So the ones that we're concerned about in particular are Actinium-227.

MR. FITZGERALD: Right.

DR. ULSH: Thorium-229 --

MS. BEACH: And U-233, at least that's what I have.

MR. FITZGERALD: Well, actually 230 because

we got into -- I'm sorry, not 230. That was 229, 229, yeah, 229 and Actinium-227.

DR. ZIEMER: The 1B's about the same issues, isn't it?

MR. FITZGERALD: Actually, no. This is where you get into Thorium-230. It's related because we're talking about Cotter.

DR. ZIEMER: You're still wondering what bioassay's available for that.

MR. FITZGERALD: Yeah, and that's what I'm saying that the theme tends to be a repetitive theme because, again, in this case I think the ER indicated that there was some limited bioassay available, but that could be supplemented by air sampling data for uncovered years. I think that was the phraseology that was in the ER. And again, as far as clarification to understand that sort of combination of the limited bioassay data plus the available air sampling data that would get you there. I think there's agreement that the thorium bioassay data was more limited than you would like in terms of coming up with coworker, I guess, models or what have you. In this case if you

supplemented that with air sampling data that would be available for thorium, would that give you a sufficient basis for estimating dose for that activity.

MR. BISTLINE: Yeah, I think that would -- the representativeness of the air sampling for the use, for supplementing bioassay.

DR. ULSH: Well, we've already talked about it in terms of the Cotter Concentrate Program that was done inside the hot cell. But I understand Brad's point about the whole point about the exposure comes from not necessarily being absolutely zero there, but I would say that it's pretty limited.

I do want to state though that I don't think that we're ready to conclude that there's absence of bioassay data, period. There may not be bioassay data for actinium for that operation or maybe for 230, Thorium-230, although I'd have to look. But we certainly have the capability to do gross alpha at the site. And it's certainly possible that we look like Don said, surrogate radionuclides, and we will check that.

MR. FITZGERALD: This is on B?

DR. ULSH: Yes.

MR. FITZGERALD: Yeah, I think that's the root of our question. What would be the strategy for coming up with dose estimation for that particular period since there isn't any direct bioassay apparent.

DR. ULSH: And again, in B the Cotter Concentrate Program was all of four or five people, but it's important for the four or five people, so we'll check it out.

MR. FITZGERALD: Now, just before we leave that, the four or five people were the ones that were doing the extraction I guess. But would there not be more people that would have been involved with handling, I mean, obviously, a lot of drums and packing, repacking, and some of what Brad was talking about I think.

DR. ULSH: Right, and with the Cotter Concentrate Program keep in mind the source material, the Cotter Concentrate itself would have had on a per week basis much, much lower concentrations of the Thorium-230 and the protectinium. That's why they had to separate it out. So in that case I would say that

there's almost certain to be other radionuclides that you would be sampling for if you were interested in exposure to the concentrate, the B material itself.

MR. STEWART: The major constituents of the Cotter Concentrate were thorium, Thorium-232 rather, 10,000 parts per million; Uranium-238, 60,000 parts per million; Thorium-230 and Protectinium-231 were present at 300 parts per million and 0.5 parts per million, respectively.

DR. ULSH: What document are you reading?

MR. STEWART: This is a reevaluation of the Cotter Concentrate that was performed in ^.

DR. ULSH: This is a document that we'll need to get to Josie and Paul, actually, the whole working group.

MR. FITZGERALD: I'm sorry. What was the document again?

MR. STEWART: It is a white paper that was done by the Mound site, and it's a relatively new capture for us.

DR. ZIEMER: It is already on the O drive or do you know?

MR. STEWART: It is not currently on the O

drive.

DR. ULSH: Does that indicate MDS or SRDB?

MR. STEWART: Well, I do actually. This is an SRDB document.

DR. ULSH: Yeah, it's in the SRDB.

MR. STEWART: Captured by Brant Ulsh.

DR. ULSH: Oh, no wonder it sounded familiar.

MS. BEACH: Does it have a number, Don?

MR. FITZGERALD: What's the SRDB number?

MR. STEWART: It is -- oh no, that's not going to help you. That's the data captured section number.

DR. ULSH: On the break we'll give you a copy of this.

MR. FITZGERALD: If I can understand then, you're saying at least from a standpoint of how this material was monitored probably gross alpha possibly, but that in terms of air sampling information with what seems to be some thorium bioassay. But it's not clear how many samples would have been the basis for doing the dose estimation is to work going backwards I guess.

MR. STEWART: Certainly look for the

Thorium-232 which was the haystack rather than the needle.

DR. ULSH: Well, and uranium which was 60,000 --

MR. STEWART: And uranium and/or.

MR. FITZGERALD: Yeah, the one thing that just as sort of a back drop -- and this came as much out of the interviews as -- and this is not specific to Mound but actually a kind of generic issue across the AEC at the time was the natural -quotation marks- source terms like thorium or uranium even radon weren't considered in the same vein as the other materials and were handled that way as well. But they were downplayed, not considered particularly a radiological threat.

So I think again our concern is in looking back did that sort of attitude or take at that time diminish the kind of monitoring that would have been done sort of in the later years, and what are the implications of that. Can we go back and somehow either take later measurements and use them retroactively or take what was done, limited as it may have been, and somehow knit that together and come

up with some basis for doing dose reconstruction.

And so in the early period I think that would be our concern for uranium, for thorium and for some of these so-called natural constituents as to whether they were monitored really from a radiological context in a way that would provide sufficient basis for doing dose reconstruction.

DR. ULSH: I don't know. I can't recall what's coming up in the matrix. So I think the ones that you mentioned here, uranium and Thorium-232, I think we --

MR. STEWART: And radon.

DR. ULSH: -- and radon, do we get to those later in the matrix?

MR. FITZGERALD: Yes. I'm just saying as sort of our concern just to sort of tie this together is that with that kind of understandable attitude, I mean, I'm just saying that back in the '50s and '60s -- and Fernald's another example and some of the other sites -- the low level, low enriched uranium, thorium.

I mean, it was just again considered

pitchblende, sort of considered the natural sources, oftentimes were not monitored as if they were of radiological concern more of heavy metal. And so we're particularly concerned about is there a way to look at that time period from the data that's available and still come to a conclusion on the doses that might have been associated with this operation.

MR. STEWART: Yeah, in fact, Mound had a procedure for 232, Thorium-232, bioassay in 1950 so it's clear that they at least were looking at that as passable.

MR. FITZGERALD: Okay, for this one really being able to understand then the amalgam of what bioassay data for 232 in this case might have been available, 230. And if it's gross alpha from air sampling, how would you go from that then to coming up with some upper bound estimation for these workers. That would help us understand how that would be done.

DR. ULSH: It's also important to recognize that the Cotter concentrate material was stored in the same building that had previously housed the Thorium-232 sludges,

Building 21. That was an unoccupied storage building and was located at a remote part of the site, the south end of the site.

So in terms of 1B here, the Cotter concentrate material, I don't, yeah, sure, there would have been some transfer activities. You take the 22 drums from Building 21 over to the hot cell. I don't know how much exposure potential would be involved there. I don't know. But in terms of material sitting inside Building 21, I'd say it's almost nil. It was just so removed from the rest of the site, and it's not accessed routinely.

MR. FITZGERALD: And for the Cotter versus the monazite material, there wasn't as, the degree of redrumming because it wasn't as corrosive, as I understand it. So I think for the Building 21 storage issues I'd be more concerned about the next issue because you did have, I think, a lot of handling because of the redrumming, constant redrumming. So unlike Cotter -- correct me if I'm wrong -- where you didn't have the corrosivity, you didn't have to do as much direct handling of

that material; and therefore, the exposure of site maintenance workers doing redrumming would not be there as much as the other ones.

MR. STEWART: It had been neutralized.

MR. SCHOFIELD: Are there records of personnel going in there and monitoring the drums, checking for leakage, these type problems on a regular basis?

MR. STEWART: Checking for leakers of the Cotter Concentrate?

MR. SCHOFIELD: Yeah, there's a, make sure that the integrity of the drums are still in place.

MR. STEWART: It is apparent that they detected when drums were failing associated with the other materials. So I would assume that they were making the same sorts of checks. We don't have that at hand right now.

DR. ULSH: Well, now to answer your question, are there records. We don't have those kinds of records in our hand, but here's a couple things to consider. We compared the Cotter concentrate material versus the Thorium-232. The Cotter concentrate materials were neutralized so you didn't have those

kinds of issues. The other important thing to keep in mind is that the Cotter concentrate material was on site for only a very limited period of time. I think five or six years.

Am I right, Bob?

MR. BISTLINE: I think so.

DR. ULSH: So and we don't see any indication, as Joe mentioned, that they had the same kinds of issues that required repacking, constantly redrumming the material with the Cotter concentrate material. That's not the case for the hydroxide sludges. They did have a problem there before it went into Building 21. Does that answer your question?

MR. SCHOFIELD: Kind of. I mean, obviously if they've got a program going to monitor these drums, make sure they're not leaking, make sure there's no problems, and there would have been a group of workers who went in there on some kind of basis, whether it's weekly, monthly, quarterly, I don't know. So there's potential for those people to be going in. I was wondering if they actually kept a logbook or something saying these were leaks on such-and-such a date.

DR. ULSH: If there is such a logbook, we don't have it in our hands. That's not to say it couldn't be looked for.

MR. FITZGERALD: So for 1B then, it sounds like there are perhaps some gross alpha air sampling records or maybe, maybe not. I don't --

DR. ULSH: I don't necessarily want to go that far. I don't know for sure. And I wasn't necessarily, when I said gross alpha, I wasn't necessarily talking about just air monitoring.

MR. FITZGERALD: Right.

DR. ULSH: I'm talking about bioassay as well. I'm saying that it's possible.

MR. FITZGERALD: So it's just the issue of clarifying then how, what bioassay exists for 232 plus this other additional information would clarify then what one could do for that period of time then.

One C?

MS. BEACH: We're on to C. And I'm wondering if there's a way to be more general in, this is SC&A's what they see. This is what you understand. If there's any way, I'd

like to get through this today if possible so that everybody understands. I know these are hard.

MR. STEWART: They get faster.

DR. ZIEMER: Well, one thing we need to keep in mind is that on all of these I think Joe is just raising what their issue is. I don't think we should expect NIOSH to have the answers necessarily today or to get into deep discussions about the options --

MS. BEACH: Just the understanding of what they're asking for is all we're looking for today.

DR. ZIEMER: What and why and so that if you say, well, you're asking the wrong question, that's fine. But otherwise --

MR. FITZGERALD: This is very helpful. I think one thing I wanted to clarify is kind of what we're looking for to clarify or substantiate so that there's no going in the wrong direction or misunderstandings or that kind of thing.

MS. BEACH: No answers, we don't need answers today unless you have something quickly.

Before we move on we did have two additions to the room. We'd like to go ahead and state who they are for the record.

MS. JERISON: I'm Deb Jerison. [identifying information redacted] was a Mound worker.

MS. BEACH: Thank you.

MS. RAMSEY: My name is Ann Ramsey, and I'm a friend of Deb's. And I've been following this issue, and she's been working with it the last few years.

MS. BEACH: Thank you.

MR. FITZGERALD: One C. Well, actually, we sort of got into this to some extent. I think I was just pointing out you'd like to have the bottom line all the way at the bottom, but in this case I think it's sort of two-thirds of the way down. And our concern here is that for these drums it wasn't clear from the ER how the limited samples -- and we agree that samples were intermittent in some cases and somewhat limited, actually, very limited.

How the representatives of the samples taken, we point out the 25 urine samples that's in the ER for the 7279, how that's going to be taken together, how that would be

representative of the span of time that we're talking about -- and this is a much longer time than the Cotter, you know, how that was going to be the basis for coming up with a dose estimation. I can see the data points, but given the length of time, it's a little harder to see how one can use that to cover that time period and be sure that it's representative of the kind of, because of the more extensive handling that was going on.

I mean, to re-drum the entire collection of drums three times over is a relatively large amount of activity for a lot of workers. So I think that's the standpoint that our concern comes from. Is that a sufficient basis by itself to give you that distribution of, or upper bound of the kind of exposures that these workers doing hands-on re-drumming, dirty stuff, whether that would, in fact, be sufficient.

MR. STEWART: In fact, there are a limited number of samples for that activity. However, it's clear from reading Meyer, and I'm sure you're familiar with it, that he will talk about perform the thorium samples for the

summer re-drumming campaign.

It is, once again, I would agree with Brant in that you wouldn't necessarily draw a straight line. We would see a flat graph and then a peak. You wouldn't necessarily expect to see ongoing bioassay, routine bioassay for this. This is an activity that they performed when they could, when they had resources, and when the weather was consistent with the operation.

So I don't know that you would see a routine bioassay program that would go from 1960 to 1974 for re-drumming. And it's obvious that they competed for resources to do this, and they're saying these drums are getting pretty bad. We need to get out there, and we need to re-drum.

DR. ULSH: Just to, in the spirit of your suggestion to keep things brief today, we'll provide more details later. But as Don mentioned, the thorium bioassay that we have for that time period when the drums were stored outside and they were doing the re-drumming, many -- I don't want to say all -- but many of the thorium bioassays that we have

from that period are specifically marked as re-drumming, related to the re-drumming in the logbook that covers that operation.

At a certain period of time in the '60s -- I don't have the exact year at my fingertips -- those drums were emptied into Building 21. And so the re-drumming operations ceased at that point. It sat in Building 21 until it was removed from the site in 1974-ish. And it was removed from the site by a subcontractor that was hired to come in. They did their own health physics monitoring material off site.

DR. ZIEMER: So let me twist the question a little bit. Are there re-drumming operations for which we don't have bioassay?

DR. ULSH: Not to my knowledge.

DR. ZIEMER: I don't know if that was clear or not.

MR. FITZGERALD: Oh, no, I think that is the issue. If --

DR. ZIEMER: Again, if you can correlate the bioassay fully with the re-drummings, I think that's helpful. If there are re-drumming operations for which there is no bioassay, are

they pretty much similar to those, can we use the other bioassay as surrogates for that? It would be that kind of question.

MR. FITZGERALD: Yeah.

DR. ZIEMER: And then after this final deposition that you described, then what do we have beyond that?

MR. FITZGERALD: Yeah, I think that's exactly it. It's sort of two questions embedded in there which is clearly the amount of data, bioassay data, is limited. I think that's acknowledged. But my question would be the same question. Does that data --

DR. ZIEMER: Would it be sufficient?

MR. FITZGERALD: -- it may be sufficient if the data is on the, focused on the re-drumming, and whether there's enough data for the re-drumming to characterize what the facts from exposure to a worker re-drumming might be. It wasn't possible to delineate that from the ER from the site profile. But certainly if that's where the data sits, that would help answer that question. So I'll leave it at that.

MR. CLAWSON: This is Brad, one more thing.

You said that they were in competition for resources. So these bioassays of all the same people aren't going to be in bioassay because they're going to be different. You said they were in competition for resources so a lot of times like that you might end up with different operators performing these because they're not able to. So we want to make sure that kind of have a good representative that people were being monitored.

DR. ZIEMER: Well, the resource issue must have to do with the campaign itself. Bioassay would be a small increment I would think.

MR. CLAWSON: Well, a lot of things with personnel power is you may not have the same people doing the same process through there. You may have another operation going on, another slows down so you bring in a whole new group of people to be able to perform --

DR. ZIEMER: Sure, cannibalizing on something else.

MR. CLAWSON: -- and it's a normally used event to do that.

MR. FITZGERALD: Which is the related question to the question of what data exists.

Can that be tied to the cohort of workers that were, in fact, doing the re-drumming and it sounds like that would be in the data.

DR. ULSH: Yeah, the bioassay samples that exist for Thorium-232 for that period I believe are marked regarding operations. It's related to that.

MS. BRACKETT: And most of those people have multiple samples. It looks like there are at least three samples for each person doing the thorium re-drumming.

MR. FITZGERALD: And there was three cycles so --

MS. BRACKETT: This is for the '59 to '65.

MR. FITZGERALD: Right, okay.

MR. BUCHANAN: I had a question and clarification. This is Ron Buchanan, SC&A. In the SEC for 1949 to 1959, does that include all workers or is that just the people -- the way it's worded here it sounds like in item one there it's just people that worked with these certain isotopes and D&D. Is it all workers, external and other type isotopes, internal, external also?

DR. ULSH: The basis for the class was the

radium, actinium, thorium separations. But we recognized that during that period there was an escape, there was contamination occurred in other areas of the plant other than just the old cave. And so it's plausible that people could have been exposed to that and not monitored. So for '49 to '59 it includes all workers on site based on the radium, actinium, thorium separation activities included for everyone.

MR. BUCHANAN: Okay. They didn't have to be directly involved?

DR. ULSH: No.

MR. BUCHANAN: Okay, thank you.

MR. FITZGERALD: I think that would satisfy us as far as being able to understand that a little bit better.

MATRIX ISSUE TWO: INDOOR RADON AIRBORNE CONCENTRATIONS IN SW AND OTHER BUILDINGS

Okay, radon.

DR. BRANCHE: Issue number two?

MR. FITZGERALD: Issue number two.

DR. BRANCHE: Before you do, for those of you participating by phone, if you would please mute your phone. If you do not have a

mute button, then please use star six to mute your phone. And then when you're ready to speak, then please use the same star six. We appreciate it. Thank you so much.

Go ahead, Joe.

MR. FITZGERALD: Just to tee up this particular issue, we raised this in the site profile. This is sort of reflective of the same issue we had there. Our concern is really pre-venting pre-1980. And a concern there is the, I guess to put it in a general term, lack of characterization of what the radon values, radon daughter values, were. And this is both Radon-222 as well as the actinon and the thoron in the SW workspace.

We have the one sampling exercise that was done there with the perm, and we have talked to Phil Jenkins. And the issue is just simply with the one measurement and using what we can get from his notes, his own calibrated instrument, we're just concerned that it's not clear what the levels would have been over time in these workspaces. And we know for that one week the measurement was between 90 and 160, something like that, maybe 67 and

160.

But Jenkins indicates that the measurement that he took was to rule out radon actually because they were picking up in one of the workers an elevated lung count. So his role wasn't to go characterize what the radon concentrations were in the SW workspace but was simply to rule out radon.

It's kind of interesting. They rule out radon because there was some concern that the individual was exposed to something else, and as it turns out, they didn't rule it out, in fact, established that it was the likely and primary source of that, the high alpha count.

And the concern that I think we have is that's one measurement. It doesn't characterize necessarily what the activity levels would have been in those workspaces pre-1980, pre-venting. And given the fact that you had since the D&D of the old cave roughly 20-some years where you would have had potential venting of radon into that workspace, I think you're talking about a fairly sizeable potential for exposure to

whoever would have occupied that workspace.

Now, we didn't know what the occupancy numbers were for that workspace, but certainly, if nothing else as I think Jenkins indicated, it was a heck of a lot of radon. And he called it an ideal radon production example because you had enclosed space. You had negative pressure. You had a hole. We talked to during the site profile a number of rad techs that, one rad tech said he measured something similar on a crack in the R Building which is sort of, you know, it's a contiguous, next door to SW. And again, I think most would attribute that from the tunnel that was underlying the building.

So I guess in a nutshell our concern is that it was a source, fairly productive source, of radon of various species, not just Radon-222, but thoron and actinon as well. And whoever would have occupied those areas would have been exposed to some level, relatively high level, of radon daughters, but in our view not something that is easily characterized because there's essentially that one measurement.

MR. STEWART: There are data available for this. They weren't discussed in detail in the TBD because at the time the TBD was written we did not get to that level of detail. The goal of the TBD was a little different than it is now. However, we are evaluating these data.

It is clear that Mound understood that they had a short-lived alpha problem in SW, and there were also measurements in R Building. We have not currently completed a database of these data, but we are in the process of analyzing them.

DR. ULSH: And it's true, I mean, SC&A's statement here mentions a couple of different radon sources, the first being the tunnel that you mentioned, Joe. I want to make sure that everyone understands that this tunnel, that people weren't walking through this tunnel. It was maybe two feet tall, but it was the source of the radon that leaked into SW-19. And they did measure the high radon next to a worker's desk, and we know who that worker was. Of course, I'm not going to say his name.

And the second source in your

statement in the matrix mentioned was Building 21 where the thorium material was stored. And I've already mentioned, we've already discussed that, where it was in relation to --

MR. FITZGERALD: That was a fully ventilated building so I think that was just a case of whoever was handling would have been exposed to the radon there as well. But those are the only two sources that we felt were technically enhanced were potential sources of occupational exposure that would have been, you know, because of Mound's high background, natural background, for radon, clearly there was an issue of radon at the site. But these two were above and beyond those natural sources.

DR. ULSH: All right, Don. For those of you on the phone, Don has drawn a pretty picture here that I'm sorry you're not going to be able to see, but let's just keep it brief though, Don.

DR. ZIEMER: Don is now drawing the bushes around the building.

MR. STEWART: Just a little bit of talk about the tunnel itself. What it appears to

be, it is labeled on the construction drawing for the foundation of SW building is a duct. It is, in fact, two foot-three inches tall. So that is the place where they got the 88,000 picocuries per liter measurement. And I know that they went down there to make those radon measurements.

What is not clear to me in that drawing -- and I continue to research this -- it appears that this tunnel went from about here to the corner of R Building where it terminated. So underlying R Building is not really something that we can see at this time. If we have additional data about that, we'd like to see it.

This appears to be a ventilation shaft, and I think what they were doing is venting the stuff up here. Later, in SW-11, this is where they added an additional stack with the radium venting. They got it vented out of the ceiling there. This is SW-19, the infamous old cave area. In fact, what you've got is some office space on top of the cap. You have a small staircase there to get up on top of the cap where they put some gloveboxes

and some other stuff.

Just another quick drawing here, SW-19, old cave, drain trenches, they put some shielding and some other materials from the old cave. They laid it down, then they filled it with gravel, compacted it, and then put another pad on top of that. This is a concrete pad, just have a short staircase. So that's why there's four or five steps in that room there at the time it was demolished.

So I know that they did samples around here to see if they had anything coming through. And this is the area again where the high measurement was made at that gentlemen's desk.

So if anyone has any additional data about the tunnel, I'd like to see that because I was trying to understand from partial data.

DR. ULSH: So to summarize I understand your concern about measuring radon concentrations relative to the source and where it might have impacted in the SW Building and maybe the R Building. And Don says we have some data in ^ that we're currently analyzing. We'll be back in touch with you on that.

MR. FITZGERALD: That's fine and the focus again is location, whether, again, we have to collect the information as well for R. But where this was in fact located, the issue of the contribution of the other radon daughters because the amount of activity involved, just given the spot measurement that was made, even though they're short-lived, at those levels they, it's possible that 219 might have actually been on a par with Radon-222.

That part of it we've gotten some guidance from people that have dealt with radon. So that would be useful to understand just from a dosimetric standpoint even though typically those are discounted because of the short-lived nature. Because of the 100,000 picocuries per liter that was pouring in, they might actually be on par. So that's another issue.

DR. ULSH: You mentioned that you had conducted some interviews with several rad techs during the TBD review.

MR. FITZGERALD: We talked to a rad tech during the TBD review who indicated that he had an alpha counter over an alpha meter over

a crack in R Building. And that was certainly a source of concern. Because again, I think we couldn't find it, and we looked hard to see if there was any information about where that tunnel ended up. And we asked, I guess in this last round of interviews, and got conflicting information again. I think Phil Jenkins thought maybe it was under R Building as well, but it doesn't sound like there's any definitive documentation on it.

DR. ULSH: Could we get copies of your interviews?

MR. FITZGERALD: Yeah, they're --

DR. ULSH: Or do we already have them?

MR. FITZGERALD: -- no, no, no, of course, and what we're trying to do though is cycle those through in our DOE in terms of security review first in the ongoing effort to be conservative about that.

DR. ZIEMER: When was Phil Jenkins' first sample? Was it '89 or --

MR. FITZGERALD: 'Seventy-nine.

DR. ZIEMER: 'Seventy-nine.

DR. ULSH: Just prior to the venting.

DR. ZIEMER: And then there weren't any

prior to that?

MR. STEWART: We're still analyzing that data. We have information ^ supports. It's clear that they knew that there was a short-lived alpha problem in SW Building and in R Building. So once again, we're still compiling the amount of new data that we have.

MR. FITZGERALD: And that's going to be the answer to our concern I think. Because when you have the one data point that gives pause because, for radon in particular, the variabilities involved would make that a number that you couldn't hang your hat on I think because of the variabilities you'd expect at locations and the conditions and everything else. And Phil's the first one who since he did the measurements we're going to admit that it wasn't a characterization measure as much as a swat sample.

MATRIX ITEM THREE: EXPOSURE TO TRANSURANIUM RADIONUCLIDES

Item three, do you want to summarize that for Brant, number three?

MR. BISTLINE: Yeah, I guess the big issue on this number three is the lack of, well,

very limited data for americium and Curium-244 bioassay samples and concern for the lack of data and wondering how you were going to approach this in terms of assessing the doses of these individuals. And one of the issues that comes up is with regard to Americium-241 levels, variability of the amount of americium that may be present in areas.

DR. ULSH: I'm wondering if this is a type-o -- the SC&A statement says exposures occurred while working with Americium-241 sources and while working with highly enriched plutonium. Should that be highly enriched uranium or --

DR. ZIEMER: No, doesn't make sense.

MR. FITZGERALD: Circle that.

DR. BRANCHE: You agree it's not plutonium. You're not sure what it is.

DR. ZIEMER: You wouldn't describe plutonium that way?

DR. ULSH: Right, but americium would be associated with plutonium.

MR. STEWART: They're purifying this americium.

DR. ULSH: Well, anyway, you can get back to us later on that.

MR. STEWART: During some operations they were purifying Americium-241 for, as I understand it, for neutrons.

We looked at, there are a number of rooms identified in King. Of these rooms, plutonium's a dominant element in most of these processes. I talk a little bit about the rooms. I don't need to go into a lot of detail. But it is important to keep in mind that the bioassay procedure used prior to 1981 or through 1981, I don't recall which, is gross alpha. And the method that they used would have brought down all actinites.

DR. ULSH: Including americium.

MR. STEWART: Including americium. Any alpha activity in a sample would assume to be plutonium. I think, and I very much welcome the opportunity to talk to you people in the program there. It seems to me they considered most of their processes to be plutonium essentially.

MR. BISTLINE: I guess the concern is the high end specific activity of americium versus plutonium.

DR. ULSH: Well certainly, we would treat

Mound no differently than any other site where if we had a gross alpha result, and there were several different alpha emitters that were, could have been the cause of the activity that you see in that result, we would assign it to the most claimant favorable one on a case-by-case basis. That would be the same as we do anywhere else.

But I think what Don is trying to say though is that when you don't see americium-specific bioassay, but because they didn't do americium-specific bioassay, instead they used the gross alpha.

MR. FITZGERALD: Which gets us back to what we said before. In this one we're just trying to clarify because it's not as explicit perhaps as we need to have, and I understand the ER was a summary document. So really in this one, given the admitted limited sampling of bioassays, if it's gross alpha, just mechanically how would that be used? And process information is mentioned as a supplement as well. So this is similar to what we said before.

It's understandable with limited

bioassay that you would go to perhaps gross alpha, maybe to process information, and that combination would possibly get you there. And we would just want to clarify how that's going to work so we can understand it better. It's mentioned that way in the ER, but there's no details of how that would actually be done.

MS. BRACKETT: I just wanted to mention here --

DR. BRANCHE: Please speak up.

MS. BRACKETT: -- one item that I just wanted to mention was that this notes that americium ^ plutonium, and that ^ take into account there would be ^ plutonium that the bioassay would assume to be plutonium, and then americium is added as a faction of a particular --

MR. STEWART: To grow in, yeah, yeah.

MS. BRACKETT: -- so it is accounted for in that particular circumstance.

MR. STEWART: In accordance with the TBD. Americium was neglected as part of the E-source plutonium source term.

MS. BRACKETT: Two thirty-eight --

MR. STEWART: Two thirty-eight.

MS. BRACKETT: -- specifically weapons grade plutonium.

MR. BISTLINE: This also begs another question that I've got, and I want to be as general as possible on this because of the sensitivity of ^. The concern is that the ratio of americium to plutonium, or your ratios of the isotopes of plutonium, vary. There was a time period when the U.S. was using some British material, and that I'm very well acquainted with and had a very high, or had a much higher PU-241 content which added to the in-growth and created problems for dosimetry, external exposures to the workers.

And I'm wondering whether any of that kind of material was handled at Mound and whether that's being taken into consideration on the part of you folks because it is, it did really create some problems in some of the other facilities.

MR. STEWART: It does not currently compose a part of the Mound Technical Basis Document.

DR. ULSH: But how about if we talk a little later, and you give me some details, and we can check that out.

MR. BISTLINE: Yeah, I don't want to get in too deep.

DR. ULSH: I know.

MR. BISTLINE: But I think it needs to be clarified.

DR. ULSH: Again with, similar to what we would do with other sites if there are a variety of isotopes present, we would pick the most claimant favorable one.

MR. BISTLINE: And there's a specific time period involved here, too. We can talk offsite.

MR. FITZGERALD: So for the curium, and we also bring up neptunium and less so the americium because I think it sounds like again americium was recognized and equated in the plutonium estimations. But for the curium and for the neptunium just to understand better what the dose estimation approach would be for those given sort of all the above process information, perhaps gross alpha, perhaps some limited bioassays. But we couldn't find anything for neptunium. And again, this is just based on what we examined. That seems a little puzzling but if there is any neptunium

data, that would be helpful as well.

MS. BRACKETT: I'm not aware of any.

DR. ULSH: So before you do, it sounds like what you're asking for is just similar to what we've talked about with the previous ^, some details on what they were doing --

MR. FITZGERALD: Clarification as to how you would actually get this together given the available sources of information. It's a little bit of A plus B plus C. Does that get you where you need to get given the fact that maybe the bioassay data itself is either lacking or limited.

MR. STEWART: Once again, it would have precipitated all of the other actinites, plus alpha, gross alpha.

DR. ULSH: We'll be providing detailed responses, and we'll assume that kind of a discussion.

MR. FITZGERALD: That's fine.

DR. ZIEMER: Isn't the issue partially if you assume it's all plutonium does that still bound it. Are you asking that or are you thinking that it might not bound it? Well, you want them to demonstrate that it does I

guess.

MR. FITZGERALD: I think that's the notion, you know, we don't have any prejudgment on this. It's just that the ER points to a number of sources of information that could be used but nothing that would actually show us how it would be done.

And that's all we are looking for is clarification that if it's a combination of the alpha bioassay, gross alpha, plus perhaps some of these assumptions regarding growth of plutonium plus maybe a couple of bioassay points here and there. That's fine, but right now we don't really understand how that would be done. The data is limited in some cases and lacking in others, so there must be a strategy that you'll be using to come up with those estimations. We don't know at this point.

MR. STEWART: Neptunium work was rare. We typically, and under ER from Mound, we typically don't get that level of detail in the cases. Sometimes we do get some very good detail, and we can go back and we can say, I mean, hypothetically, if a person described in

detail the process that he performed with Neptunium-237, we would look, keep that in mind when we looked at his bioassay records. And we would assess, okay, well, if I assume this gross alpha measurement is Neptunium-237, is it a higher dose or is it lower to the particular organ.

MR. FITZGERALD: And that's all you can do at this point is you're looking at the King document that identified neptunium as one of the lot trace elements, something that would be significant source term for a particular facility in a certain time period, and there's no bioassay. So we get to the next question and say, okay, were people monitored for this, and, if so, where's the data. If not, what would be the work around in terms of using other sources there. That's pretty much the --

MR. STEWART: What change to the TBD would be necessary to --

MR. FITZGERALD: Right, right. And this may end up being a site profile issue, but I think it does affect the question of how dose reconstruction will be done for those

operations that might have neptunium as a, I won't call it a major constituent, but certainly one that you wouldn't want to ignore. So you might want to tweak the algorithm perhaps to take that into consideration or do an upper bound. I don't know how that would be done, but that would be just the question on that.

MR. STEWART: Once again, we're talking about a process that affects a small number of individuals. Mound is one of the many sites that had diverse research programs and very small operational programs.

MR. FITZGERALD: And that would be an important qualifying statement that wasn't clear in a lot of these cases. The King report doesn't get into numbers so again, this is the first order.

MS. BEACH: Are you ready for a break?

DR. ULSH: They're rumbling about a break down here, Josie.

DR. BRANCHE: We're going to put the phone on mute for these ten minutes, and we'll unmute when we return.

(Whereupon, the working group took a break.)

DR. BRANCHE: For those of you participating by phone, if you could please mute your phone. If you don't have the mute button, then if you would please use star six to mute your phone, then when you're ready to speak, you can use that same star six to begin speaking. And we appreciate your cooperation with this whole mute business.

Ms. Beach.

MS. BEACH: Josie Beach here. We are going to go ahead and switch gears and move to number 14 on the matrix. We're going to work through 14, 15 and 16, all the way through 19, and then go back to where we left off after those items have been covered.

If you're ready, did you want to start, Ron?

MATRIX ISSUE FOURTEEN: EXTERNAL ISSUE, NEUTRON DOSE RECONSTRUCTION

MR. FITZGERALD: Yes, Ron Buchanan, who actually addressed a lot of the external issues, provided the details but these issues are actually kind of familiar issues because they're generic to a lot of DOE sites. This question of NTA film use and sort of the how

does one address the energy dependence issue, and application of n/p ratios, all these sort of play a role in the proposed approach in the evaluation report. So we have several specific issues that we've identified which Ron will summarize.

MR. BUCHANAN: Ron Buchanan, SC&A. We're looking at the neutron -- one of the external dose issues was the neutron dose reconstruction. And at Mound they used the NTA film up until about '77 I believe. And the main issues that we had, they did have pretty good records in the NTA results. If you look at the database system, they did monitor some of the workers and that data is there.

Our concern as far as being able to do the correct dose reconstruction is with the NTA film. Like at any of the sites, they recognized after they had used it awhile that it was missing some of the lower energy neutrons. And going through the Mound data, as far as SC&A could find, is that they did do a fairly good job of calibrating the NTA film in the lab and counting the number of tracks

depending on the type of source they had, and realized in about '63 that the lower energy PU sources were not, or any plutonium source was of lower energy and was giving a lower amount of counts on the tracks as opposed to the old polonium sources. And so they did recommend a change at that time on some of the calibration.

And our problem that we would like to see clarified or additional data or issue addressed is the fact that when they did the calibrations, they did it in the lab. But I could not find anywhere in the documents where they went out in the actual work environment. I would think that to be able to use that NTA film to make corrections to the results, we'd have to have some documentation of where they took the NTA film out into the work environment, compared to an absolute neutron dose measurement to determine how many tracks were being missed so to speak.

Now, we have two issues with this period between -- now that the SEC covers 1959, we'd be covering 1960 through '77 when they switched over to -- whenever the official

date was they switched over to TLDs -- was if there was any documented evidence showing that they actually took the NTA film into the work environment, compared it with an actual neutron dose equivalent measurement and used those calibration factors as opposed to doing it in the laboratory, we didn't have the moderated neutrons.

You have two factors here. You have that the NTA film was lacking in response to below a certain energy of neutron, plus, it would fade faster if it was exposed to the lower energy neutrons. And this was addressed kind of haphazardly. I wouldn't say it was address haphazardly, but the documents that I found address -- in Meyer especially -- address the issues, but you can't really tie it all together like Joe was saying earlier, a thread to link them all together.

And I could not find where they actually went in the work environment. I would think that it had been necessary to go in the work environment, expose the NTA film to some absolute neutron and some absolute neutron measurement device to get a

calibration factor for different locations as moderations and sources changed over the years. Now, I did find evidence that they do the calibration in the lab.

There was a few neutron energy spectrum measurements done in the work environment, but there was no comparison of we need to adjust the NTA film for these particular locations in these particular years. Now, these calibration sources were about 1.3 MeV, and the average neutron energy out in the field during this period from say '60 to '77 from what I can find averaged around 0.8 MeV. There was 0.7, a few 0.5s, some 0.9s, but it's around something under 1 MeV.

And this might be considered not much difference than the calibration source of an unmoderated 1.3. But it is important because it drops off very rapidly, the NTA response does to energy. And so my concern here whether you're talking about the polonium sources or the plutonium sources, my concern is out in the actual work environment where they were located, and the NTA film hung on

the workers' chest, that that NTA film was being exposed to a lower energy neutron source than what was being used to calibrate them in the lab and assign doses.

Even though fading was compensated for some in later years, I don't see a real correlation between the work environment and the calibration facilities that were used to assign doses.

DR. ULSH: Well, as you know, this is an ongoing, living-type process, and we anticipated that this might be an issue because it has been at other sites as well. And in anticipation of that we worked with the Department of Energy Legacy Management folks to locate -- would I be overstating if I said a vast treasure trove -- a large body of paired neutron and gamma measurements from SM Building, from PP Building, from R --

MR. STEWART: Actually, I kind of broke it into five different exposure regimes, and that is: T Plant for polonium processing; SM building early, no shielding; SM Building late with the addition of shielding; PP Building; and a Californium-252 facility. We have

paired neutron gamma results for each of those regimes.

DR. ULSH: And there are spectral measurements, neutron spectral measurements. We're currently in the process of capturing this data, uploading it, and we'll certainly make it available to you as soon as we have it.

MR. FITZGERALD: Are the spectral measurements also from the same treasure trove?

MR. STEWART: They are part of the data that exists.

DR. ZIEMER: What was the time frame on the spectral measurements? Did they use monitored?

DR. ULSH: Yes, they used long counters, didn't they?

MR. STEWART: They had several different instruments that they used. Our principal internal dosimetrist, Jack Fix, is familiar with each of these. This is our principle internal dosimetrist.

MR. FITZGERALD: I guess you were asking about time frame though?

DR. ZIEMER: Yeah, time frame will tell you a little bit about what might have been available, whether it's long counters or --

MR. FITZGERALD: Because that's one issue.

DR. ZIEMER: -- monospheres or -- I know these early spectrum measurements are a little crude, but they can at least separate, tell you what's below the threshold and that's helpful. I think in most cases the high energy stuff was still a bigger contributor to dose when you make the conversions usually. In terms of numbers of neutrons per unit area per second, it takes a lot of thermals to give you the same dose.

DR. ULSH: Well, and I do want to make it clear here --

DR. ZIEMER: Talking about, well, okay.

MR. FITZGERALD: Yes, some of these are a little --

MR. BUCHANAN: Yeah, 1 MeV is where you start dropping off so quick, and so you still get 25, 45 percent, so, you know, it depends on the moderation.

DR. ULSH: Well, and we did recognize that. I mean, your statement says that SC&A

questions the assumption that only high energy neutrons existed at Mound around polonium material. We never made that assumption. In fact, in Section 5.4.3 of the ER we state that neutrons in the workplace would be expected to include a continuous spectrum of energies below the maximum emission energies, and it goes on.

So we never made that assumption. We recognize what you're saying that there would be some moderation occurring in the workplace. And like I said, we're in the process of getting this data into a, you know, we're uploading it now. And we know that you guys are keenly interested in that, too, so we'll make that available to you.

MR. BUCHANAN: Can I, are you heading towards the direction of using just NP values for neutron assignment or are you going to use NTA results modified?

DR. ULSH: We'll use NTA results where we have them with appropriate adjustment to account for exactly what you're talking about, the fraction of the neutrons that are below, for instance, the threshold detection limit of

the NTA film and also for the track fading issue. Now, keep in mind, I would have to go back and look in detail about how they calibrated these things, but if you handle the calibration films the same way that you handled the films that people were wearing, then the track fading issue comes out in the wash.

MR. BUCHANAN: Right, track fading was addressed later on.

MR. STEWART: Nineteen sixty-eight.

MR. BUCHANAN: Right, but they weren't, well, they was kind of corrected sometimes, but they didn't go back before that. When they recognized that, they said, okay, we're going to do the correction, but they did not go back to 1960 on track fading. Is that correct?

DR. ULSH: I think that's because the fading issue was dominant in the PP Building with the plutonium. They didn't go back into the earlier years into the SM Building where they were primarily worked on the polonium because it was, I think it was anticipated that the fading issue would be less of an issue because

you had higher energy neutrons.

MR. STEWART: That's correct, and the memo that discusses that says that the factor of two is likely not applicable or not applicable to doses prior to the time that he stated, and I forget the exact date. And it's clear that in their own mind at least, that they did not need to correct any additional data. We may come to a different conclusion when we evaluate this.

MR. FITZGERALD: One thing I picked up in some of the supporting documentation -- I think it was Meyer -- but there was some also problem with interference from, was it gamma or something. It was some interference that was making it difficult to read.

MR. STEWART: Correct, and at that time what happens is NTA film is sensitive to photons as it is to proton recoil. So you're counting the tracks, and if you have a lot of gamma background, it will darken the film so that it's more difficult to see the tracks. And we often see this comment -- well, not often -- we have occasionally seen the comment that the film was too black to read.

MR. ELLIOTT: I'm sorry, do they call it fogging? Is that fogging?

DR. ULSH: Gamma fogging.

MR. STEWART: And, in fact, it makes it more difficult. And the Mound site operated their microscopy equipment so that they could more easily distinguish the proton tracks.

MR. FITZGERALD: So really, to sum it up, given those limitations, the neutron-photon pairs are going to be the backstop to some of the issues where you can't rely on the NTA. Is that --

MR. STEWART: I don't know that we're going to state that we can't rely on NTA. NTA, you know, we have a high average energy for the Mound operations for the most part. Mound claims a threshold of between 0.5 and 0.7 MeV for neutron detection. So I don't know that we're going to totally throw out the NTA results for any particular era.

DR. ULSH: It would just be in situations, if there are any, where you have someone who might have been exposed to neutrons but wasn't monitored for it. Now, I'm, let me be quick to state I'm not saying that there are

situations like that. But that's typically where you would use the n/p ratio methodology.

MR. FITZGERALD: And also, I guess, where you might, if you do, in fact, have some work-site-specific spectral measurements that were reflective of certain time periods, if you showed a component in the middle range, you know, 7, 600 KeV or whatever, you would have the basis for making an adjustment. I guess our issue is just that might work if you had enough spectral or some measurements that were site specific rather than sort of broad. I think -- am I right in terms of neutron degrading we've gone through this at other sites. Depending on the circumstances it's going to be almost building to building or site to site. So in a way you almost need some understanding of how that bears on.

DR. ULSH: Well, if you think back to our discussion with, our discussion on this issue at Rocky Flats, the way that they calibrated the neutron films there was they looked at both an unmoderated source and then a fully moderated with, I can't remember of how many centimeters of polyethylene. I'm not sure

about Mound, but I would have to check to see if they did something similar. But what they did at Rocky is a fairly good --

MR. FITZGERALD: I think this is a case of throwing in some of that information as to whether or not there's a basis for making adjustments I guess.

MR. BUCHANAN: Yeah, Mound, if I recall right, didn't do moderation until later on the calibration. I don't know that they did a lot of moderation to begin with. But from what I could find I don't see that that's connected in the TBD. The TBD gives one, on two subjects an n-over-p ratio they suggest a factor of two, I believe, that's all that's really addressed in the TBD.

MR. STEWART: I'll just point out real quickly that we cannot use that for dose reconstruction.

MR. BUCHANAN: Okay. Because, you know, I felt that was too general, and I didn't really see a good basis for that. And so you're proposing that perhaps you're going to generate a more specific n-over-p for people that did not have neutron monitoring or you

can't read them.

DR. ULSH: If there are people like that, yes.

MR. BUCHANAN: And also, the TBD did not give an adjustment really for the missing, the lower energy neutrons for workers that had NTA results. They gave an adjustment of 14 percent for the lower limits of detectability in the looking at missed dose, but the way I read the TBD, they really don't give an adjustment for lower energy neutrons. For people that were monitored, they got 100 millirem or 200 millirem. I could not go back and doing a dose reconstruction see where that was applied.

DR. ULSH: Yeah, we recognize that limitation, and that's going to be, that's one of the topics that we're addressing with the data that we --

MS. BEACH: Brant, how soon do you think you'll have that data uploaded and out to us?

MR. STEWART: Well, we had 28-41 special dosimetry files done as of Friday. I believe that that probably will be done pretty quickly, and that's in a spreadsheet. The

other data I can't really say right now when we would have that available. A lot of those are already in the SRDB, but I'll need to go back and index those in order to make it obvious what we're looking at.

DR. ULSH: We'll put that down as an action item, too. Anything that we've already got in the SRDB we'll point it out to you.

MS. BEACH: Okay.

MR. FITZGERALD: The essential new information that we haven't probably seen though is the paired neutron information and the additional spectral measurements. Those are two key pieces.

DR. ULSH: Yes, we just got that recently, in a recent data capture.

MR. BUCHANAN: And how that's going to actually be used in dose reconstruction.

MR. STEWART: Right.

MR. BUCHANAN: How that's going to be applied. And if we do have neutron energy spectrum measurements, I mean, that's good, but I'd like to see how that's going to be used to make the corrections. Because in the documentation it says in '63 they got an

average energy of 0.7, but I didn't see that really applied anywhere. And so I would like to see how we're going to use any neutron spectrum information that was done, how that's going to be applied to correct any dose assignment.

DR. ULSH: Right, that's one of the standard things we do when we get information like this is talk about if you've got a particular neutron dose measurement and applied correction factor whatever. And we don't anticipate doing anything different here.

MR. BUCHANAN: Assumption as a function of building and time, and I don't know how much detail you have, but from what I get I couldn't gather too much, but --

MR. FITZGERALD: I think Brant's been there, done that, so we know the fire drill.

Anyway, I think that Josie would be taking care of 14. I guess that is 14 and 15.

MR. BUCHANAN: I separated those out because I wanted to indicate that we did that on SEC --

MATRIX ISSUE SIXTEEN: BETA LOW ENERGY PHOTON

MR. FITZGERALD: So we're up to 16. This is

actually moving from neutrons to beta low energy photon.

MR. BUCHANAN: On beta and low energy, originally from the documents I could read beta was a problem initially when they'd get slugs from Hanford and stuff, but most of that was covered under the SEC period.

And then we had plutonium come to the site in the late '50s, at least according to Meyer, and then that took over from the old operation they had. And what you had is some lower energy photons. So we went on to look at shallow dose, really beta low energy photons. And from the records I could see was we really didn't have this calibrated up until say '79 or even into the '80s before they actually got to where they passed some accreditation for shallow dose.

And so to me I see a blank period now between '60 and say '80 being able to assign beta dose on a calibrated basis other than just subtracting the difference between the windows but as far as having a documented calibration and procedure for low energy and being able to separate out that from the rest

of the dose.

Where do we stand on providing any dose reconstruction for shallow dose?

DR. ULSH: First of all we stand corrected. You did catch us in a typo here. We're not going to use n-to-p ratios to do that. So that's a typo in the ER.

Don, do you want to --

MR. STEWART: Sure. We've been looking at Meyer's history to go back and see where we actually do have data results. We know when they show up in the records and the information is conflicting, you know, the TBD I believe says that we don't have any prior to '79. I've seen a number of documents where there were documented beta measurements.

So we're in the process of going back and seeing whether those are actually are taken, whether they are building-specific or whether they're general. They are aware, I mean, as most of us at the table know, if you have a shallow dose, you will see it as a film processor because that area of the film will be darker than the gamma portion of the film.

And I know that Meyer talks about

this. In particular, I believe, one of the supervisors there said we have noticed some darkening of the open-window portion of the dosimeter. To that point Mound felt they didn't have a beta or a low energy dose fraction, but they started to evaluate it. These bits of data, I need to go back and look at them in detail and make sure that the TBD adequately addresses them.

MR. BUCHANAN: Have you found anything that you could, if they did notice or they recorded the difference in the open and shielded and such, have you found any calibration information that we could say how much dose that is? How can we equate that dose if we don't have a calibration for it?

MR. STEWART: We would expect the low energy photons to be overestimated to a very significant degree. There is calibration information in there. I can't locate the time frame right now. So that's why I wanted to go back, put together a roadmap and say what I've got and when.

MR. FITZGERALD: It sounds like you're part-way into that.

MATRIX ITEM 17: BADGING IN RADIOLOGICAL AREAS

Number 17's another familiar issue. This is more of a clarification question though again in terms of the most exposed worker question and badging. And again, this has been raised with just about every SEC I suspect.

In this case what we're trying to establish is the policy or documentation that sort of establishes that all workers in the radiological areas were badged. Now, talking to various former workers and HPs at this site, it suggested that it was a very tight system. So in a way from that recollection and from some of the documentation, workers that worked in radiological areas were badged. Maintenance people that entered radiological zones or buildings picked up a badge. There's a little bit of a question on security staff, whether or not they were badged going in and out of areas escorting.

But I think that comes down to just establishing behind this conclusion what the documentation of the policy or the record indicates so that we can rule out the

potential for any cohort badging in the early years, that kind of thing. And again, this is an issue that we'd like to dispel at the beginning before we get into data integrity and the other issues.

DR. ULSH: I think we can go a long ways towards dispelling that. In Meyer's history, this is a direct quote from Meyer's history, "In general, all personnel who enter a radiation area are monitored for possible exposures to external penetrating radiations." He goes on with some details about how often those are evaluated. He does say that even occasional visitors to the risk areas are monitored by the use of film badges which are evaluated the day following usage. So certainly Meyer is indicating what you summarized, Joe, that people, when they went into radiation areas, they were monitored.

MR. BUCHANAN: What page is that? Do you have a page number?

MR. STEWART: I have the page number as "Meyer's History", Volume One, page number 1-6-6.

DR. ULSH: Now as you mentioned, this is an

issue that we discussed at many other sites as well, but the cohort badging issue seems to keep coming up. We don't have any -- well, first of all, we don't have any indication that cohort badging occurred at Mound. We see nothing that suggests that.

But secondly, as at other sites -- I mean, our response is going to be the same here -- if cohort badging did occur, that's not necessarily the kiss of death in terms of being able to use that data. If it was focused on the people at highest exposure, it should be okay. If it's focused randomly, it should be okay. It's only if it was focused on people who had the lowest exposure potential that we would have problems using it.

But again, I think it's a moot issue here because we don't have any indication that they did cohort badgings.

MR. FITZGERALD: Well, I think that clarification helped because I think the statement's made in the ER, but it wasn't clear where that statement was derived, and I think what you're saying is that, and in what

we also have tracked, is it's from contemporary histories of this site, in this case Meyer's, and the fact that in your dose reconstructions that have been done and other means you have not seen any evidence that there was unbadged personnel that were clearly in radiological areas. I mean, I'm just trying to get a --

DR. ULSH: That's an accurate summary of --

MR. FITZGERALD: -- okay, there's been comments made, but it wasn't clear from what we've seen.

Now in looking at the usual distribution data and MESH and everything else, we'll probably, in looking at data integrity and what have you, validate that from another source as well. But I think this particular issue we just wanted to clarify what the basis for the statement was.

MR. BUCHANAN: Yeah, I did have an additional question. Is there any company policy, I mean, do they have a health physics manual that outlines badging requirements and that sort of thing?

MR. STEWART: This policy's restated at

various points in health physics documents, and this, in fact, is something, is from a document called "The Mound Laboratory Radiation Exposure Records System". We didn't cite that because there's no date on that particular document in Meyer's history. However, when we respond we will have a number of citations from Meyer that will show us where that is, that policy is restated.

MR. BUCHANAN: Is this outside of Meyer? I mean, do we have something from the company, management or --

MR. STEWART: Meyer, as you know, incorporates a number of, a disparate number of documents within his history, and those are Mound documents. Currently, we haven't gone outside to verify those documents as yet.

MR. FITZGERALD: To the best of your knowledge though there wasn't any groups of workers that weren't either (A) rad operators in radiological zones, or (B) site-wide workers that were badged or monitored when they went into a radiological zone. The reason I'm raising this is that looking at the various cohort of workers that might have been

onsite.

The only one that to me is a little ambiguous, and I haven't seen anything that ices it, but for example, security guards would be a group that wouldn't be considered radiological workers, would not be doing routine maintenance site wide, but nonetheless would be able to have access site wide. So just looking at the different worker population, just establishing that it was a rather rigid and universally applied thing that, yeah, you were monitored if you went to a rad zone or if you worked in a rad zone of course you were monitored.

DR. ULSH: Yeah, I don't think it was based specifically on -- I'm trying to think of a clear way to say this. I don't think there was a judgment made about you, Joe Fitzgerald. You're a security guard, and so you get a badge. It was more access specific. To get into these areas you needed to have a badge.

So if you were a security guard and you made rounds in the cafeteria and the administration building, you may not be wearing a badge. But when you went into FM

Building, you picked up your badge before you went in.

MR. FITZGERALD: And that's sort of our perspective as well so far in terms of looking and talking to people and looking at the documentation. So we have nothing that would dispute that. And it sounds like the, your dose reconstruction information as well as the Meyer's history supports it. So I think that's where we stand. We'll probably --

DR. ZIEMER: Are you looking for additional policy statements by the company as to outside of the Meyer's thing or does Meyers cite those policies?

MR. STEWART: We have not to date looked outside.

DR. ULSH: Well, Meyer does cite a number of external documents. I mean, it's not just stuff that Meyers --

MR. FITZGERALD: We'd like to go beyond the history to get specific --

DR. ZIEMER: Yeah, here's a document that the company says this is the requirement.

MR. FITZGERALD: That plus sort of looking at it as NIOSH has done with dose

reconstructions and as we would look at it in terms of data integrity. Just see if there's any instances that would pop up that would suggest lack of monitoring for someone that should have been monitored if it's true.

We don't pick up any instances and there's the Meyer's history as well as hopefully some company documentation. I think that puts the whole thing to bed. We're not coming into this prejudging that there's an issue for badging at all. And I agree that doesn't mean necessarily there's a problem with that per se. But I think just to put that behind before we get into other issues would be useful. So anyway, that's how we would leave it.

MS. BEACH: Before we get started with the next issue, we have two new people that joined us.

If you would speak to the microphone and state what your name is.

MS. RUSSELL: (inaudible)

MS. BEACH: Thank you. If you can speak loud enough that would be great.

MS. RUSSELL: My name is Mary Russell.

MR. RUSSELL: And I'm Larry Russell, her husband.

MS. BEACH: Thank you.

MATRIX ISSUE 18: INTEGRITY OF RECORDS

MR. FITZGERALD: We're on 18, and here's a series of issues that deal with the integrity and completeness of records. And I'm not sure we need to spend time talking about that. This is something I think as a matter of course that the work group would expect an hour to go through, in this case, the MESH database and PORECON, PURECON, and what else to look at that from the standpoint of completeness and accuracy.

But we certainly wanted to make sure that we framed the issue as an issue anyway. And if there's anything that we can get from you all as far as whether the framing may raise questions of accuracy or if we're missing something, certainly we're interpreting this. I don't think we're going to do anything different than, for example, we did at Rocky Flats.

I think we're going to look at the records from the standpoint of do we find any

discrepancies as far as missing records. Do they agree electronic to paper, that kind of thing. So these would be part and parcel to that.

Ron, do you want to add anything to that?

MR. BUCHANAN: Yeah, I have two additional questions on that. The way I read the TBD you really don't, there is not a coworker database for gamma at this time. Is that correct?

MR. STEWART: That's correct.

MR. BUCHANAN: You gave some ranges in there, but there's no numbers that a DR can really use to assign to a monitored dose.

And, let me see, that was my first question.

MR. FITZGERALD: The range is the second I think.

MR. BUCHANAN: Yeah, he said that, too, just gave ranges. I forgot the second question. I'll talk about that later.

DR. ULSH: Well, I think there's some things that --

MR. BUCHANAN: Was there any quality check of the, have you uncovered, we have not been

able to uncover, and Meyers did not state any, a quality check of transferring the database from one database to another. Have you came across any of that? Did they do any, other than the PURECON and PORECON?

DR. ULSH: Well, to clarify, PORECON and PURECON are for bioassay data. And MJW did extensive validation on that dataset. I don't have documentation at my fingertips that would suggest that a similar level of detail has been done on the external data.

I mean, it's standard across the complex, and we've seen this numerous times at other sites, that when you're migrating from one system to another there's QA/QC involved. But in terms of a real in-depth description of it like we have from MJW's dose reconstruction project, I don't know that I've got that specifically. But we haven't looked necessarily specifically for it.

And if it's an issue that the working group decides they want to pursue, then we can go look. I think, however, that this would be an issue for the working group to discuss and perhaps give us some guidance on what you'd

like to see before we leap into a project of the scale of what we did at Rocky Flats for data integrity, data completeness.

Because this is almost a repeat of what I said before we did it at Rocky. That is an enormously resource-intensive effort, enormously. And at the end of the process at Rocky Flats, what we found was not the smoking guns that indicated that there were vast numbers of missing records. In fact, we found almost complete data completeness records. We found it verified the integrity of those records.

Now, there were some statements in passing and listed in the evaluation report that voiced some concerns about the rad data system. I'm assuming that that means the records systems at Mound. But it was a central tenet of the Rocky Flats ER that the dosimetry records were unreliable. So that's why I think the working group felt obligated to go into a great level of detail examining that issue. It's worth discussing among you guys what your priorities are here, I mean the work group members, before we engage in a

project on that scale.

MR. FITZGERALD: Just a clarification, you're saying at least for the external -- I agree on the internal. MJW did quite a bit on the QA side for those databases. But for the external you're not aware of any reliability check --

DR. ULSH: I really don't want to say that none have been done. I'm just saying that it's not, it wasn't a source of documentation that we went after specifically. I'm making the assumption that, you know, they were the typical types of QA/QC. But if the working group and you guys want verification of that, that's something that we're going to have to go look for in particular to find out exactly what measures they took.

MR. FITZGERALD: Well, I guess the first thing that we were actually raising was how reliable the external database happens to be and whether either the site or NIOSH or ORAU had done any look in that regard. And then the secondary question is there any evidence that would suggest otherwise. And I don't disagree. I haven't seen anything that would

suggest problems with, in this case, the external database.

DR. ULSH: And, you know, you can always slice and dice this up pretty thinly, but we took some comfort from the fact that MJW found a high level of data integrity in the internal dose records. Now, of course, you could say, well, that's not external. But if we look at external, you could say, well, that's not beta or that's not gamma or that's not neutron or a particular time periods, particular buildings. It just depends on how in depth the working group decides that they want to go on this issue.

MR. FITZGERALD: Well, to give you some examples, addressing the neutron issue that would be, I think, instructive as to whether the fact that database were reliable before one got to the point of deciding if the dose assessment strategy was sufficient. You have a ^ issue for that perhaps. I wouldn't say that you would have to do everything. I'm just saying that for certain instances you might want to at least validate that you're dealing with a reliable database.

I don't know on external if I've seen anything that suggests that the site historically has done that kind of a QA check on at least external. I think the internal I feel, you know, I think MJW did a quite extensive look at QA for what was there in '96, so that's a slightly different story. But external, I don't think that was done, and again, our point of raising this was to verify that that was your understanding, too, that there wasn't really that kind of retrospective look at the reliability of all those years of data.

DR. ULSH: No, well, I'm not aware of anything on the scale of what MJW did with the internal data. I'm not aware of something on that scale with the external data. That's not to say that there was not QA when they migrated from one system to another.

MR. STEWART: That is documented in Meyer's history.

MR. FITZGERALD: Yeah, and it seems to me that maybe the interim step. And I don't disagree that one should launch into something that's broad without some kind of indication

we'd need to look at. But information may exist in terms of this QA in terms of evolution, one system to another and over time. Since you have such a long history on this site, see if there is anyway one could at least qualitatively say it looks like, looking at what they did do, there doesn't seem to be any evidence that there were discrepancies or gaps or problems with the database as it stands.

The other thing, and we've talked about this in the past, is to be able to look at the MESH database in terms of being able to not just simply draw from the information that's there, but also to do some comparisons that would indicate that the information in there is complete. I think there's certainly a charter, if I'm reading the SEC procedures, to be able to provide a basis for judging reliability of the database to the Board so that question can be answered.

I think I'd be open to how one could do that through the working group in a cost-efficient, readily ready way. So that might be something to explore as far as,

particularly on the external side. Is there any way one could establish for the working group's sake what the reliability of, in this case, the external database is?

DR. ULSH: All I can say is we're not aware of any disuse with the external data at this point in time. We can certainly, without an inordinate amount of resources being expended, go through Meyer and pull out qualitative descriptions of what kind of QA/QC was done. To go beyond that I'd really like to hear a discussion and consensus opinion from the working group because that has the potential at least to be a really big project.

MR. ELLIOTT: I would like for us to talk a little bit about how, the question at hand here is the databases and how they were developed and how they were transferred or transported into other databases over time. Is that right?

DR. ULSH: Uh-huh.

MR. ELLIOTT: And how do, I think it's worthwhile to spend some time here talking about how we use those databases if we use them in dose reconstruction. Because it's my

understanding that we take the dose of record that comes from the DOE point of contact at Mound for each claim and reconstruct a dose and whenever we have gaps or deficiencies in that data, we would bridge those gaps using a coworker database distribution which we don't have here. We have not developed that. So to question the reliability of databases I think we have to look first at how often do we use the databases.

DR. ULSH: Well, in a collective way we really don't here at Mound with the exception, we do have a coworker model for polonium and plutonium. We don't have the external coworker model because it's our position that we don't need it. Everyone was monitored. There are no unmonitored people for whom you have to apply coworker data which, like I say, in a collective way that's what we typically use the database for is to generate coworker models.

MR. BUCHANAN: But you go back, when you do a DR, you go back to the MESH database. I mean, that is where they're getting, the DOE's getting their information. I mean, that's

what is actually printed out. When you do a DR, the DR uses a MESH database summary to assign dose to that worker.

MR. ELLIOTT: That's correct.

MR. BUCHANAN: And so if the end result is the MESH database, now that might have been the fact --

MR. ELLIOTT: The source of the information.

MR. BUCHANAN: Right, it might have been back in 1962 that it was originally entered, handwritten or entered on punch cards or whatever. And that went from that database through several databases up until it got to MESH. And our question is, is the original handwritten information or whatever it was, punch card or whatever that said the guy got 120 millirem for that quarter, does that appear in the MESH database. I mean, do we know that that got transferred over and wasn't any of it dropped through the cracks or it got transferred correctly. That's, and we have not --

MR. ELLIOTT: That's the root of the question, the root of your question.

MR. BUCHANAN: Yes, the root of the

question. And Meyer's, I have looked through his notes, and he doesn't give any details. It's more like this was transferred or at this time these were transferred or such. And there is no detail on how it was transferred like the internal dose was very well documented. Whether you agreed with it or not is a different point, but it was very well documented.

Well, the external, the guy that actually does the dose reconstruction in 207, he uses those printed forms from DOE, but how accurate are they? And I'm not saying they're not. I just don't know, my question was have you done anything? Because I didn't want to re-plow the same grounds. If you've done anything, I'd like to know about it. If you haven't, do we want to do anything about it?

DR. ULSH: Well, I think that's a good summary. No, we haven't gone back and done the scale of the review that was done at Rocky Flats where we took original logbooks and went through to look at -- gee, I've forgotten already. Whatever the name of the database was out there. HIS-20, that's right. How can

I forget that?

MR. STEWART: I don't know but it shows up at Fernald, too.

DR. ULSH: And again, we don't have any indications. I guess fundamentally it gets down to the assumptions that you carry into this process. Do you look at the data and say, well, we've done similar exercises at other sites, and we've not found indications of endemic problems here, maybe some specific situations, but nothing system wide. And so I come into this saying that we don't have any obvious indications. There's not big gaping holes that there are missing data. So in the absence of indications otherwise, I'm using the data.

MR. ELLIOTT: Or corrupted data. I mean, we do look for that. We look for CEP data. We look at CEP, a corrupted entity at a point in time, so if they provided data we throw it out.

DR. ULSH: Right, and we have done I don't know how many dose reconstructions, 500 or so?

MR. STEWART: Several hundred.

DR. ULSH: At Mound, and in the experience

of doing those dose reconstructions, no problems have jumped out at us. But in terms of going back and comparing original logbook entries to the current database, I mean, is that something that we're going to be doing at every site, de facto? Are we going to go in and assume that it's bad unless we --

MR. FITZGERALD: No, I don't think, certainly from our standpoint I wouldn't suggest that strategy which ended up being the case at Rocky would be appropriate here at all. I think that was a case where you didn't have much else to turn to, and there was an indication, as I recall, at Rocky from the union that the logbooks would be the source of whatever you could do to verify.

In this particular case I think what we're suggesting here is consistent with the SEC procedures that the Board has adopted which is to look at the reliability of the database, the records that are being used as part of the dose reconstruction process in support of the SEC. And certainly, we don't want to duplicate any validation that's been done whether it be by MJW for some of the

internal or for whatever the site might have done historically.

But where there's no evidence that anybody has validated the reliability of the database, it seems like you have to start with that. Because if the database itself can't be validated in some sense, I'm not saying there's any set way of doing it, I don't know if you could have the confidence, the only confidence you would have is we haven't thought had any problems to date. But I have to go back to Rocky when I think we identified the '69-'70 issue, for example. I don't think anybody was aware that there were a couple years of missing information.

DR. ULSH: No, no, no, it wasn't missing.

MS. BEACH: Let's not re-do Rocky.

MR. FITZGERALD: Right, I'm just saying that certainly the rationale for looking at or sampling for the purposes of supporting this procedure or this intent I think is one we're looking at. Now how you do that I think is completely open and something that the work group I think would be in the best position to decide. But it is an understanding in the

procedures that we would at least start with reliability and integrity as a starting point before getting into the later issues of dose reconstructability and some of the other questions.

DR. ULSH: Would it be a reasonable first step to put this on the table for everyone to consider for us to summarize what has been done by this site? You know, we'll go look for that kind of information. We'll specifically make data requests to find out that information and to present that to SC&A and the working group as a first step. From there maybe you can decide --

MS. BEACH: I think that's reasonable.

DR. ZIEMER: If we can establish that they had a process in place to do that I would be quite satisfied with that. If they had a QA/QC process. You're sort of asking did they even have that. Do we know that they had that. I think you are.

MR. FITZGERALD: Well, certainly one question is on a continuing basis was there a QA/QC process which I think most sites do have something of that order.

DR. ZIEMER: Yeah, but I mean specifically on transferring from one database to another. Isn't that the question you're asking? Are the numbers that the person got in the original record the ones that show up years later on the big spreadsheet?

MR. FITZGERALD: Right.

DR. ZIEMER: Because if there's a QA/QC process that looked at that during the transfer times, then that's at least a first step. In the absence of that then you say, well, how do we know that they did transfer it correctly.

MS. BEACH: Well, I think I read there was a ^ percent error rate or -- correct me if I'm wrong, but it seemed like their 21 percent error rate in the data transfer.

DR. ULSH: I don't know.

MS. BEACH: I've read it. No, I don't recall.

MR. STEWART: We read in documents here something like 21 percent error ratio in the database or something.

DR. ZIEMER: That seems awfully high.

MS. BEACH: I would be satisfied with the

summary as a first step to start with.

DR. BRANCHE: Just to give you a heads up, first of all you're going to get a quality control --

MR. STEWART: Quality Assurance, Quality Control presentation.

DR. BRANCHE: Thank you

-- next week at the Board meeting as well as SC&A, John Mauro will provide some information about how, given the number of SEC petitions that you are going to see for the remainder of this year, how findings from previous sites might be helpful in the current sites, how there might be some ability for you as a Board to entertain some information from sites that have some similarities. And so I would just caution that you're going to hear about that at next week's meeting.

And I've discussed this with Dr. Ziemer, we anticipate quite a few SEC petitions to come before you the rest of this year.

MS. BEACH: How specific will that be from site to site? I'm curious.

DR. BRANCHE: A great question for you to be

able to think about asking next week.

MR. ELLIOTT: You mean on the QA/QC presentation or on John Mauro's --

DR. BRANCHE: No, on the --

MR. ELLIOTT: Mine is not site specific. My presentation is on the Quality Assurance/Quality Control steps that we employ throughout the program. But it doesn't go to individual site.

MR. CLAWSON: It's on your process is what you're saying.

MR. ELLIOTT: Yes.

MR. STEWART: You know, I think you want us to prove a negative here. I mean, you want us to prove that these databases were examined, evaluated as they were built, and that presumes that they weren't. I don't know that to be the case. And 21 percent sounds really high to me. That would be unacceptable in my parlance of QA/QC. We'd send people back and say, well, if you can't get it any better than that, you're fired, and we're going to put a double blind entry in here. That's what would happen.

And I don't know the answer here. I

don't know if there were regimented guidelines established when each site said, hey, we're going to establish an Oracle database here and include everything that we have assembled in our dose information in the database. I know that was done at several sites. Oracle was, you know, came into being and then it went out within about two or three years, and they had to do all of that over again.

I don't know. Have we ever looked for those kinds of documents that say you're going to create a database using these documents or these items, and this is what we expect as far as the quality. I don't know if we've ever seen that. Have we ever looked for that? Maybe that's something you want us to look for. Maybe it's something SC&A might want to look for or say that it doesn't exist. You can take it from there. I don't know. It's a hard thing to prove, Joe, as you know.

MR. FITZGERALD: No, I agree. I think it's instructive, and I have gone through everything MJW did for the internal side. And I think that's both an appropriate and an important thing to do before getting into

trying to assimilate bioassay information. I'm just looking for any indication, whether it be process related QA/QC, substantiation from Meyers of the world, or any ability just to demonstrate that there are no issues associated with the error rates, whatever. At this point on the external side I think we're drawing a bit of a blank as to how that comes out, that's all.

DR. ULSH: So I think I hear the concern is focused more on the external data?

MR. FITZGERALD: No, we haven't got the internal, but external would be my focus area right now because I think other than what MJW didn't do isn't very big. I mean, I think that covered a lot of ground in the '96 review. So I think the concern about validation is much less.

The external, I'd feel better if we found some contemporary evidence that the QA/QC was examined. Someone went back and looked at reliability. That's not really clear, and it's sort of an open question of if you have confidence, is there anything beyond not having seen a problem crop up that would

give us some of that substantiation. And I think that's pretty much it.

We're not coming in saying that we have allegations, concerns or anything. It's just that we couldn't find that substantiation. We're asking you if you have it as well. The last thing I want to do, having lived it in real time, is go through what we went through before.

On the other hand, there's a responsibility I think to be able to account for the reliability, both internal and external, to the work group, and that's kind of what I'm looking for if we can somehow do that.

DR. ULSH: So we'll focus on the years this data was collected. We'll get back to you on that.

MR. ELLIOTT: Some related QA/QC of the transport or development of the database.

MR. FITZGERALD: Right.

MR. CLAWSON: And I understand I guess basically back to what I'm kind of used to, we've gone through several evolutions of it is whenever we change over to a different program

or whatever, they have somebody basically over-check it again. That's just what it's getting down to. And I've seen an awful lot, and that's one of the big reasons why we don't like to change databases because of this issue of the millions and millions of things that are in it.

DR. ULSH: It only gets bigger over time.

MR. CLAWSON: One other question I have. Who is MJW? I've heard this --

DR. BRANCHE: Thank you.

MR. ELLIOTT: The ORAU team is composed of teaming partners. And if I may, MJW is one of those partners. It's a consulting agency, a corporation out of Buffalo. The other one is Dave Moeller, Incorporated, out of Richland and then the ORAU is the mother ship, if you will, that completes the partnership. MJW had done dose reconstruction work separate from this program and separate from their association with ORAU and Dave Moeller on Mound.

MR. CLAWSON: Well, the reason why this ^ personal information because I've seen MJW appear in interviews and so forth like that,

and Mutty, yeah, I think he works for that. And I was just getting the impression also, too, that MJW had worked at Mound previously before it closed. They did some work for Mound. I guess --

MR. ELLIOTT: They did some dose reconstruction for Mound.

MS. BRACKETT: They did a large dose reconstruction project, just internal dose, of people who had the potential to have greater than 20 rem committed effective doses. That was in the late '90s. And then we also, after that we did do some technical basis documentation work for them. We went in and helped them write a technical basis document and procedures that was probably around 2000 that we did that. And Mutty, actually he's only been employed with us during this project. A lot of the people that you saw listed, they currently work for MJW, but they were actually employed by Mound.

MR. CLAWSON: Yeah, I was just trying to draw a clear line because it's kind of interesting. I kind of go back and forth.

MS. BRACKETT: Right, there are a number of

people who did actually come from Mound. I never worked for this site myself. I just worked on the dose reconstruction project.

MR. CLAWSON: Was that dose reconstruction a part of the legal issue that was there?

MS. BRACKETT: Yes.

MR. CLAWSON: I'm just trying to draw myself a picture of how everything fell in.

MS. BRACKETT: I believe it came about as a result of the legal work. Part of the settlement I believe was to do that dose reconstruction. And so we came in and worked on that. And I think that's where the greater than 20 rem came in. That was what they decided --

MR. CLAWSON: I read that, and I was just trying to make a clarification of where this was all coming from.

MS. BRACKETT: That's why you keep hearing our name. We did that. And that's why we're so familiar with, or why I'm so familiar with the data because we did a lot of digging into the old records to find data.

MR. CLAWSON: I appreciate that clarification. Thanks.

MR. BUCHANAN: I had a question. You said you was a dose reconstructor for Mound, right?

MR. STEWART: Yes.

MR. BUCHANAN: When the DR does a dose reconstruction, does he take this information from the MESH database, say for external. Or does he look to compare that to any of the old DOE files? I mean, maybe this is a way we'd see if there was any problems with that and completeness integrity.

MR. STEWART: Those records are present only in a small number of cases. And I believe -- this is my own opinion here -- I believe that those are those cases who had termination dates prior to 1959 or 1960 when they migrated to the first computer database called Excess. They used a Form 1015-X to record personal meters, film meters as they called them, and neutron dose rates or neutron doses, Q and neutron doses.

All those pieces of information would have been on these cards. We find those quite useful because we can estimate the missed dose more accurately when we have those data. When it goes to the MESH database, then we no

longer have cycle information so we have to overestimate the missed doses. But we see that those are consistent with the data entry for MESH.

MR. BUCHANAN: MESH is consistent with the old original cards.

MR. STEWART: Right.

MR. BUCHANAN: And you haven't found a problem.

MR. STEWART: We have not found a problem.

MR. BUCHANAN: Did you check that?

MR. ELLIOTT: That's what I was going to ask. Is that standard practice? You get the DOE submitted data for the client, and then you look at that. Do you go to the MESH database and match that up and say, oh, they're all here or, hey, we've got one or two missing. I don't see this guy.

MR. STEWART: No, that's not a standard practice for dose reconstruction. Because I'm the lead dose reconstructor I would tend to look at that in a little more detail, make sure that things are happening the way they're supposed to happen.

MR. BUCHANAN: But they would use the MESH

printout as the primary dose reconstruction document?

MR. STEWART: That is correct. That is what is used for, actually, check that. They will enter cycle data when those data are present in the file. So if I got a data entry file from our data entry people, I would have cycle information through '59 when those data are available, and then they would go to the MESH data.

MR. BUCHANAN: And if there's a discrepancy they would use the highest between the MESH and the original?

MR. STEWART: I don't know that that's the case. I would have to check that piece of information.

MR. BUCHANAN: But they do, they do look at the other database.

MR. STEWART: Yeah, they do go back and they pull the actual doses from the cards when those cards are available. As I said, some of those people who terminated early, and my opinion, just a theory, is that those data cards went to their files, were entered into Excess and then put in a separate file

somewhere so they were no longer in the employees' personal records. And that's why we don't see the personal records any more.

MR. FITZGERALD: What part and partial to the request that we sent through Brant for a POC? We want a contact on some of these questions I guess it sounds like.

Next question?

MR. BUCHANAN: Yes, I'd sent a couple case reviews, and I could not find, I found the neutron data in the double neutron on the MESH, but I couldn't find the gamma data on the MESH that was used in the dose reconstruction. Apparently, there's a file in there I can't identify that has a lot of the --

MR. FITZGERALD: We can follow up. This was something we hadn't cycled through you, and we're asking if there's somebody that might know that.

MR. BUCHANAN: I need to get in contact with somebody to point me in the right direction.

MR. FITZGERALD: We can do this offline.

Anyway, just to recap then, certainly we support looking at this as an interim

question that would be picked up at the next meeting. Now, I've been working with Jack Gibson in terms of trying to solve the various IT issue respecting MESH to make it searchable from our standpoint. Is that something that's being held in abeyance on this issue of being able to at least look at the MESH, or search the MESH database. We're trying to get a search capability.

We have access to the MESH database in terms of downloading tables and what have you, but in terms of being able to do any searching because it's a Sequel database, Jack was the person that you put me to. He was working on the front end to make that searchable online, and that would give us at least the capability of being able to get our way through it.

DR. ULSH: So that hasn't been resolved yet. You guys still don't have --

MR. FITZGERALD: No, but that wouldn't be subject to this issue, in other words being able to look at that database. We're still going to be able to look at the database quite apart from the question of looking at the completeness question which is what we're

talking about here.

DR. ULSH: I guess I'm not following you. If you're asking if there's --

MR. FITZGERALD: We made a request to be able to get into the MESH database. You put the MESH database up, and we were able to certainly download useful, relevant tables. But because of the way the software's set up, we couldn't actually sort anything.

DR. ULSH: And that's still the case now?

MR. FITZGERALD: And that's still the case, but that's sort of a typical, classic IT issue which I can't, I'm sure that's a difficult situation. But that seems to be a separate question than this one here which is a more systematic review of data integrity-slash-completeness. I just want to make sure, you know, we're going to be looking at the database, but we're not going to make any decision on how systematically to sample that until we've had this dialogue next time.

DR. ULSH: Right, I will check the status of ^.

MR. FITZGERALD: Yeah, he was very encouraging for the first week or so, but got

progressively discouraging and sort of like after a couple of weeks you realize, okay, I guess it wasn't that easy.

DR. ULSH: Okay, I'll check on that.

MR. FITZGERALD: Thank you.

MS. BEACH: So does NIOSH go in and search? Do you have the capability to go into the MESH data and search out certain items that you're looking for at this point or do you --

MS. BRACKETT: I think we have the same problem. There's been discussions of trying to contact who's the expert from Mound. I don't remember her name.

DR. ULSH: Let's just say we're trying to contact the expert.

MS. BRACKETT: Okay, because we have the same problem.

MR. FITZGERALD: Okay, well, that's comforting.

MR. STEWART: As far as DRs, we take the printout that's supplied by Mound from the database.

MR. FITZGERALD: Ron, do you have any --

MR. BUCHANAN: No.

MR. FITZGERALD: -- you're the short

traveler here so I want to make sure that you have your opportunity. Ron has a four o'clock flight so he should be leaving here shortly.

MS. BEACH: That takes us through 19 or...

MR. FITZGERALD: Well, I think we've been discussing 18, and I think what we're saying in terms of adequacy and completeness, that combination, I certainly prefer to see what NIOSH can come up with in terms of just sort of this historic QA/QC and any other substantiation on the reliability on the external side that would shed some light on this that would inform any discussion we have next time on this data reliability issue, sort of a decision forward.

MR. BUCHANAN: And the adequacy, we haven't really formed an opinion.

MR. FITZGERALD: No.

MR. BUCHANAN: We haven't determined whether there's adequate data for dose reconstruction one way or the other at this point. I have not found a thing that says there isn't or checked enough to say that there is, but that's the Board's decision.

MS. BEACH: How do we feel about lunch

break? Is everybody ready for that?

DR. BRANCHE: All right, we're going to actually turn this phone off, and I'll just redial at 12:45 p.m., Eastern time. Thank you.

(Whereupon, a lunch break was taken.)

DR. BRANCHE: We're going to start the Mound meeting again. Again, if those of you who are here in the room, if you could please mute your phones. And if those of you on the phone, if you're participating by phone, if you would please mute the phones while you're listening. If you do not have a mute button, then please use star six to mute your phones. And then when you're ready to speak, you can use star six again to unmute your phones. It's very important that we mute the phones for participants on the phone so that our court reporter can hear everything and that we have an unobscured line. So thank you so much.

Ms. Beach.

MATRIX ISSUE FOUR: URANIUM ISOTOPES

MS. BEACH: We are on number four of the matrix.

And, NIOSH, if you're ready to proceed.

DR. ULSH: Number four, this issue deals, well, it's similar to our discussions earlier this morning about some of these other type radionuclides. This one in particular deals with the particular isotopes of uranium. And, Joe, do you want to go through --

MR. FITZGERALD: Yeah, I think you're right. I think this is similar to what we raised earlier on some of the internal emitters as far as mapping the availability of bioassay for uranium is different forms during the history of Mound. And just basically in our reading of the usual sources, King, Meyer, so forth, there does seem to be some gaps that would suggest some issues that would have to be addressed in any dose estimation strategy.

And we just are raising some questions as to whether given what seems to be a relatively small amount of bioassay data for certain periods of time, whether that can't be bridged or not with the information that's available. I think it is very similar to what we've raised for some of the other source

terms.

DR. ULSH: Yeah, and our response would probably be somewhat similar in that if you're looking for uranium isotope specific bioassay, you may not find that. But you would expect to see more total uranium bioassay and to some extent gross alpha. And just like with the other sites, when we don't have a specific bioassay, in other words, isotope specific, we'll pick from among the possibilities and assign the most claimant favorable.

But I did want to ask a question here about the SC&A statement in the matrix. You talk about you have some concerns whether we can bound exposures to uranium based, particularly given the inherent limitations of fluoroscopic analysis techniques used during the '50s to '85. And I was just wondering what you were thinking of when you said that. What are your concerns on that?

MR. FITZGERALD: Actually, that was a concern that was raised, I think raised the question of whether fluoroscopic, the techniques in the early days were very accurate at all in order to establish doses.

And I think the only question there was given the techniques available, what kind of confidence in the actual measurements would you have from the early days?

DR. ZIEMER: What would be an issue on the detection limits are not as good, but then you have a way of handling that for any whatever the lower limit of detection --

DR. ULSH: Right, it could very well --

DR. ZIEMER: I guess that's the question, isn't it?

MR. FITZGERALD: Yeah, going back to the early techniques what kind of confidence do you have in terms of the actual measurements themselves. This gets into radiochemistry, radio analysis.

MS. BRACKETT: Yeah, It's beyond radiochemistry. It's not my area of expertise. I know that fluoroscopy is used to current day. I don't know that the technique has really varied over the years. And since it's still in use, I --

DR. ZIEMER: I wonder if John Mauro may know. I think the procedure is reliable for identifying uranium.

MS. BRACKETT: Right.

DR. ZIEMER: That's isotopes, but uranium per se --

DR. MAURO (by Telephone): Paul, this is John. We were just engaged to look at this very issue on Blockson where the analyses ^ and gross alpha analyses for uranium samples in urine. And we were asked to look into the protocols. And this was the 1950s, I believe, that were used. And we did some tracking, and we tracked it back to the Health and Safety Laboratory in New York City which was an AEC lab at the time.

And those are very formal protocols. They're well established, and one of our radiochemists ^ and guess we walked away saying that at least that far back the standard protocol for doing fluorometric analysis and gross alpha analysis for urine samples were very scientifically sound and defensible. I don't know if that answers your question.

MR. FITZGERALD: Well, that would be certainly another QA check on the question of how reliable fluoroscopic would be in the

'50s.

DR. MAURO (by Telephone): The reason we said it was mainly because it was the Health and Safety Lab, and that had a lot of good pedigree.

DR. ULSH: I seem to recall seeing in one of the documents kind of a timeline where it talked about the major programs at Mound and the corresponding bioassay techniques as given in particular MRM reports. We'll go look there to see if there's something like that for either gross alpha or uranium, whatever the case is here. So we can do I think similar to what John described. Kind of look at what technique they used --

MR. FITZGERALD: The technology pedigree as to what was used and --

DR. ULSH: And we'll do that. From where we're sitting right now though, I'll readily grant as Dr. Ziemer mentioned, that some of the MDAs in the earlier days were higher than they are now. You had progressive lowering of the MDAs, but that doesn't pose an SEC issue to us, and we'd just assign a high missed dose. So we'll check out what exactly the

technique that they used.

MR. FITZGERALD: So maybe the more pertinent question going back to this sort of common issue is given the number of apparent bioassay samples for some of these isotopes, what would be the basis then for coming up with the actual dose reconstruction value. What strategy would be used. It wasn't explicit in the site profile I don't believe or the ER, but that's not to say there isn't a way you can do that. So I think this is similar, very similar to some of the other questions that we've raised.

MS. BRACKETT: I don't think that Mound used fluoroscopy, did they? All the results are in units of activity ^ mass for fluoroscopy, I don't --

DR. ZIEMER: Unless they converted.

MR. STEWART: I don't recall.

MS. BRACKETT: I don't think that was a technique that they used.

MR. STEWART: It is described in the TBD as being applicable through '98.

MS. BRACKETT: I have not -- and I've seen the calculational sheets that they did their

uranium samples on, and they're all activity.

MR. STEWART: I agree.

MS. BRACKETT: That's not fluoroscopy.

MR. STEWART: The results I have seen have been in activity.

MR. FITZGERALD: Have been in activity.

MR. STEWART: Yes.

DR. ULSH: Well, we'll check. We'll find out what they used.

MR. FITZGERALD: Well, I think that's where the reference and the time period came from the TBD.

MS. BEACH: Brant, I missed what you were going to provide for that.

DR. ULSH: We're going to go back and see if we can get details on the techniques that Mound used for uranium bioassay particularly in the earlier years.

MS. BEACH: Thank you.

MR. FITZGERALD: Would there be any perspective though on how you would actually apply that information in terms of a dose reconstruction strategy? I think that was the question we're trying to get to is you say maximum or best estimate doses can be

determined.

DR. ULSH: I think it would be similar to what we do everywhere else and that is if someone could have been exposed to -- just to make up an example -- Uranium-238 or -235 or several different isotopes of uranium, and all we have is a total uranium bioassay result, we'll assign it to the one that is the most claimant favorable among those that are possible.

I mean, obviously, if a particular isotope's not even at Mound, we wouldn't consider that among the possibilities. But I thing generally it goes to 234, right, just because that's the most claimant favorable.

MR. STEWART: Yeah, almost without exception.

MATRIX ISSUE FIVE: OTHER ISOTOPES POSSIBLY DISCOUNTED

MR. FITZGERALD: Number five, you know, there's a statement that the other isotopes of 239 weren't dosimetrically significant and can be discounted, in particular 241. I think we understand 240, 242 are much less so. But for 241 there's a numbers of tables and treatments that are in the Mound documentation that, one,

they were aware that they had to account for 241 and factor that in.

So I guess on one hand I think it can be enveloped as far as a dose estimation. But I guess our concern was this question of whether it could be discounted. I don't think it appears that even the site was discounting 241.

And then there's this other question which I'll defer to Bob on which is sort of uncertainties about what the isotopic concentrations were of 241 that might have come onsite in different ways. And I think certainly in the Mound documentation there were higher isotopic values than the 0.3 percent. There was just variations in terms of the 241.

I think what Bob raised earlier about the possibility of higher concentrations is something that was raised in a planning document that we read, and I think we highlight in here where the oxide feed might have been higher. And I think Bob was mentioning the possibility of a foreign feed as well.

So just a question of how, one, sure are we of the isotopic concentration of 241 and is it, in fact, discountable or negligible as a dose reconstruction issue. And we're not sure about that given what I think we read in some of the literature.

DR. ULSH: Well, let's be clear what we're talking about when we're talking about discounting. We're not throwing away dose. What we're doing is, as with our earlier discussions, among the possible isotopes we're going to assign the one which is most claimant favorable which is almost always...

MR. STEWART: For the weapons grade mix we would use a mixed radionuclides.

MS. BRACKETT: (inaudible)

DR. BRANCHE: Please speak up.

MR. STEWART: Weapons grade mix we are, and the plutonium is considered to a hundred percent Pu-238.

MR. FITZGERALD: We're talking I think more 239.

MS. BRACKETT: And that would be added on top of the Plutonium-239 in a ratio to the Plutonium-239, right?

DR. ZIEMER: Are you talking about ^ source or --

MS. BRACKETT: No.

MR. FITZGERALD: No, the 239, weapons grade.

MR. BISTLINE: It's understandable. The 239, 240 alpha emitter which is, you can't separate anyway with alpha spectroscopy with the 241 is a beta emitter, but it leads to the production of Americium-241 which is an alpha emitter.

MS. BRACKETT: Right, but both of those are added to. You calculate the intake of Plutonium-239 and then you have a table that says, okay, if you have 20 percent of that would be Plutonium-241 and a certain percent of that in addition to --

MR. FITZGERALD: Yeah, and I tend to agree. I mean, we had a sort of a two-part issue, and after having several additional weeks of reading, I agree that actually I did find tables where the site was able to, by virtue of the age of the plutonium, factor in what the 241 ratio was.

I was kind of, I don't know, maybe misunderstanding this discounted part because,

again, I don't think it was discounted. It was actually factored in and was something that was considered as a dosimetrically significant albeit something that could be estimated and factored in.

MR. STEWART: Claimant favorably overestimated.

MR. FITZGERALD: Right. But the second part again is whether the input concentrations were well enough known and there's a couple of examples where it seemed like the concentrations could be double what's in the Meyer or King document. And those we haven't been able to pin down. One is the proposal that, in fact, higher feed material were used from Savannah River.

Another is, I guess, the UK material. I don't think this is like one of these, compared with some of these other issues, is a fundamental roadblock. This issue of whether or not you can -- again, the word discount kind of threw me I guess -- discount this as part of dose reconstruction. I don't think that's the case, but I don't think that's what you meant. Is that what you're saying?

DR. ULSH: Yes.

MR. FITZGERALD: Okay.

DR. ULSH: And in terms of the two specific examples that you mentioned, we're going to look into the UK. The other one that you mentioned and the report that you cited here in your statement, the Mound report, I've got it here. And this report clearly talks about a sample that they were looking at to see if they could make microspheres from some unusual material that they got from Savannah River. They were just evaluating it for whether or not they could even do it. They didn't use this on a routine basis.

MR. FITZGERALD: I guess the only question was whether or not that proceeded to application. So that's the only question we have on that one.

DR. ULSH: It didn't. Because I contacted the author by e-mail and asked them. There's two authors, and he contacted the other one. And both of them had no recollection of ever using this material beyond this --

MR. FITZGERALD: Beyond the one sample.

DR. ULSH: And furthermore, they wouldn't

use it because as you know the purpose of the heat source program was for space applications. So you're looking for the highest energy output per unit weight you can get. And so to lower the Plutonium-238 from the feed stock wouldn't make sense for that application. And so that was their recollection that they had never used it beyond this particular sample.

MR. FITZGERALD: So I guess the recap on that one is basically to understand whether the input parameters, the UK stuff --

MR. BISTLINE: And just to raise a flag, there may be something here that we need to look into that isn't evident to a lot of people.

MR. STEWART: The UK feed material?

MR. BISTLINE: Yeah.

MR. STEWART: Do I understand correctly that that is a complex-wide issue versus a Mound issue?

MR. BISTLINE: I don't know how complex-wide it was. I know it was a big issue at Rocky in the weapons material that we used at Rocky. It was a big issue in the '60s.

MR. FITZGERALD: I think you can take the rest of it offline.

MR. BISTLINE: It's just something that you need to look into.

DR. ULSH: We'll check it out.

MATRIX ISSUE SIX: STABLE TRITIUM COMPOUNDS

MR. FITZGERALD: Number six is the stable tritium compounds. And generally, we've raised this at almost every site that handled tritium just because most sites did have some form of particulates. And the question is, I guess, the same as we've had in the past whether it's Savannah River or the other sites which is the extent to which dose estimation can be done with the information at hand.

And the ER does point in a couple directions here, but I think we didn't find a definitive basis for how you were going to do this. And I think that's something that it would be useful to have that dialogue perhaps separately but just get into how the mechanics of estimating dose with the varieties of STCs how that would be worked.

How that relates to OTIB-0066, certainly we grappled with that at Savannah

River, how that would apply as a means to get to a dose from STCs. There's a number of documents that were produced in the 2000 time frame. I guess 2003 the Department of Energy came out with a manual, and before that Mound had come up with some material.

So there's a number of things that speak to it, but I think we just need a clearer idea for the Mound-specific case. How one gets from what may have existed in operations to a dose contribution from that component.

MR. BISTLINE: And I guess one of the particular points that I was concerned with is the fact that it appears that there was quite a bit, I mean, of all the sites around the tritides were probably the most prevalent at the Mound, most any of the other sites. It appears that there were quite a number of different tritides, different chemical forms.

DR. ZIEMER: Let me make a comment. I don't think a tritide is a compound. I believe it's simply tritium absorbed into a metal --

MR. BISTLINE: You're right; you're right.

DR. ZIEMER: -- and so you can ask behavior-

wise, I think -- maybe somebody can clarify this. I don't think tritides behave as compounds. The tritium comes off as tritium. You get this with accelerator targets like titanium tritide. What you end up with the contamination is always tritium. It's just as you heat that stuff up or even at ambient temperatures, it just diffuses off as tritium gas. So I'm not sure why it would behave any different than any other tritium.

MS. BRACKETT: It behaves differently in the lungs. It gets retained in the lungs unlike normal --

DR. ZIEMER: You mean adhere, you're inhaling the particles?

MS. BRACKETT: Yes.

MR. STEWART: ^ matrix with the ^ of the metal --

MS. BRACKETT: That's right. So it could be --

DR. ZIEMER: It's still not a compound I don't believe. It's simply absorbed on the surface of the metal.

MR. STEWART: Technically, it's called a matrix, but when it's in that form from a

biochemical standpoint, the retention properties are different depending on what it is adhering to. So it acts like --

DR. ZIEMER: So if the metal is vaporized, you mean, and then --

MR. STEWART: It's one versus another the solubility would be perhaps different.

DR. ZIEMER: In terms of how it diffused off from the metal. I understand what you're saying.

MR. STEWART: Some are more soluble than others.

DR. ZIEMER: But they're not handling things like tritiated thymidine or something --

MR. STEWART: Well, we don't want to get into the specifics, but the different compounds would have different solubility dissolution rates. And those rates would --

DR. ZIEMER: Well, if they were handling organic compounds that had tritium labels, that would be very different.

MR. BISTLINE: And they did some of that, too.

DR. ZIEMER: Oh, okay.

DR. ULSH: Well, we understand your concerns

on this issue, and as you mentioned, we've got OTIB-0066 out. There's also a couple of articles in the general scientific literature. But we hear what you're saying.

MR. FITZGERALD: Yeah, I don't think this is a new issue, but for Mound in particular our interest is knowing how that would work in relation to the OTIB and specific information is available.

MR. STEWART: There's just a couple of issues here that we could put to rest. Real-time monitors were not affected. Spare monitoring data are not used to assign dose typically. In some special cases that happens. Transfer efficiency of insoluble particles to swipes has not been studied. Contamination data are not used to reconstruct internal dose. Surface contamination measurements same issue, and the monitoring instruments for field measurements of swipes, et cetera, again, we don't use that for dose reconstruction.

MR. FITZGERALD: Yeah, and I think this was just a contemporary, '96 snapshot, from a Mound individual who was express, this is

really from his memo. He was raising questions. Actually, I think his questions may have prompted -- I don't know. You can step in -- but may have prompted some of the work at Mound to come up with some onsite guidance which then informed the DOE manual that was generated in the early 2000.

So in a way these frustrations or these considerations I think prompted some attention to how do we actually do dose estimation with this stuff because it's a problem. And that then surfaced into a department-wide issue. So I don't think it's a new issue. It's a generic issue.

I think it's just a question that if there's a way to address that at a site with this kind of history certainly would be of interest to us. Because I think it's going to be tougher than perhaps some other sites where it was more limited.

MR. BISTLINE: It's only new in that the recognition of tritides has only come about in the last ten, 15 years of history and the problems associated with trying to monitor for it. It's the same question we've had before.

MR. FITZGERALD: So as far as an outcome I guess I would suggest that we deal with it as a technical issue. We're talking about these technical issues that perhaps we can deal one-on-one on. I think that might be a way to sort of since it is a, it is in a sense as Paul is pointing out, a very big technical question revolving around biochemistry and dissolution rates and specific --

DR. ZIEMER: Have any groups done studies on --

MR. BISTLINE: There's been some studies on it.

MR. FITZGERALD: LANL has looked at it.

MR. BISTLINE: Hanford's looked at it.

MR. FITZGERALD: LANL has written a paper. Particularly since the mid-'90s there seems to be a much bigger consciousness and a lot of write ups. So really there's a lot of analyses. But maybe the hardest thing is the context of retrospective dose reconstruction on the issue. I think the operational issues have been grappled with but not so much the retrospective.

MR. BISTLINE: Yeah, going back in time

because all the analysis was done using or assuming that to be water vapor over gaseous form.

DR. ULSH: Okay.

MS. BEACH: And these technical meetings will be set up by; are you going to take the lead on that, Joe, or Brant?

DR. ULSH: How about if Joe and I get together after this and we'll work something out and let you know.

MATRIX ISSUE SEVEN: REACTOR FUELS AND BYPRODUCTS

MR. FITZGERALD: Okay, number seven. This one really speaks to the early period at Mound where they dealt with the reactor fuels and byproducts of that. And looking at the feasibility of actually being able to dose reconstruct against fission activation products, without the SEC period it would have been, I guess, a more pronounced issue since all this took place in the '50s. But there are some, certainly, fission products that existed post-'59 that we're looking at here.

And looking at the King report, particularly in the 1960 up to '71 time frames in some of the labs in R building and some of

the labs in T Building, specifically R-167 and 169 and T Building, T-237 are places where fission products figured in what was identified. And again, it's unclear, in some cases King wasn't clear on what was the most pronounced. These may be very small amounts. Who knows? But that's the general question is whether or not the capability to estimate dose due to fission activation products for the reactor-related programs existed.

DR. ULSH: I'll let Don address the specifics, but something you just mentioned about how it's not ^ has been an issue in early years due to the SEC class. That's not necessarily the case which is making my road a little harder. Because even though we've said that we can't reconstruct radium, actinium, thorium, we still have a case of people who don't qualify for the class due to not having one of the SEC cancers or not having long enough employment, whatever. So there's still going to be some people for whom that class doesn't affect them. And the main fission product program I think occurred in the time period. So --

MR. FITZGERALD: Okay, I stand corrected. Yeah, I think again though it's a question based on the ER wasn't clear whether or not that capability and that data existed. It didn't appear to, but --

MR. STEWART: We don't currently have a table of concentrations of that material in the TBD. However, we do have ^ in contemporary Mound reports. And we have it available as radiochemical analyses for the most part. And that program is well documented. So we have, you know, our problem is to identify the people ^ and guys working on the process oftentimes, name by name. They talk about their processes sometimes to the literal degree of the amounts that they were working. And so we didn't talk about that in detail in the ER, but we have that source term information.

MR. FITZGERALD: Would you explain plutonium as an indicator? I guess it was unclear when we read that in the ER what that meant or what technique was being used because that seems to suggest that you would have to have plutonium monitoring information as a tag of some sort.

MR. STEWART: Yeah, certainly plutonium's going to be a part of it. I think that we primarily worried about plutonium. These are, this example is second cycle crib waste from Hanford and there will be plutonium as part of that mix.

MR. FITZGERALD: So the assumption of how much might be related to the plutonium if you picked up plutonium, which is the indicator, then the assumption would be you'd be getting a contribution of so much from the related fission products?

MR. STEWART: Right. We may not end up doing that. We may end up going some other way because we haven't had a chance to evaluate this in sufficient detail as yet. But certainly that's one resource that we can look at.

MR. FITZGERALD: And you don't believe there's any instances where -- well, okay, you're saying you may not stick with that. But the other question, of course, would be were there instances where there wouldn't be plutonium necessarily to be an indicator. I really don't have a good answer for that, but

instances where the fission product itself, whether it's just the yttrium or strontium, you know, whatever is the --

MR. STEWART: Titanium. You know, at this point we may find this process information itself may be the better bounding methodology for the few people involved. I would say that they would consider this with ruthenium and likely consider it as an external hazard primarily. It was very high dose rates from this material. And there is indication that that was one of the controlling hazards for this process.

MR. FITZGERALD: So really just to recap that then you were, this goes back to what you've done before looking at some analyses that you can provide us, I guess, at some time in the future that would kind of frame this up.

MR. STEWART: Things that were not captured in detail in the early days that we to ^ evaluating.

DR. ULSH: So we'll get back to you with our evaluation of whether or not, to what extent there's exposure potential from this process,

who was involved, and how we would handle dose reconstructions where we have a possible exposure for this.

MR. STEWART: This is applicable to the '49 to '53 time frame. We have to go to those things for some of these other radionuclides.

MR. FITZGERALD: And this question going back to progress reports, is that still pertinent to this approach you're talking about? There were some descriptions here in terms of bioassay results. A progress report can be used to determine maximum dose. That seemed to imply the progress reports must have had some kind of measurements for --

MR. STEWART: For doses?

MR. FITZGERALD: Yeah. I was just curious about the progress reports that were cited in the ER as far as the fission products.

MR. STEWART: The title of this one is -- and I'm looking at some radiochemical analyses.

DR. ULSH: Well, the progress reports have the source term information, right?

MR. STEWART: Right.

MR. FITZGERALD: That was the implication

from looking at this that the progress reports actually were a key document that would frame the dose estimate. And that was kind of where we're questioning. Saying, okay, you don't have bioassay results. You've got progress reports. And the progress reports must contain source term information.

MR. STEWART: That is correct.

MR. FITZGERALD: So what we can hear from you is maybe some more definitive information as to how those, what's contained in those reports and how that would be carried forward and used.

DR. MAURO (by Telephone): This is John. I just had a couple of observations regarding the number seven that might be helpful. Regarding the fission products, the strategy that's identified here is similar to the one that was adopted in OTIB-0054 where you come up with a mix for different kinds of activities.

In OTIB-0054 the emphasis was on reactors and different kinds of reactors and the fact that just gross beta or gross beta-gamma analysis of urine samples were

available. And so I think in principle what's being described here is compatible and consistent with that approach which we found to be an appropriate approach.

We just wanted to point out that one area that might be difficult is knowing which workers you would assume should have been, if they weren't but perhaps should have been exposed, should have been monitored, let's say, gross beta, gross beta-gamma urine samples, and would therefore be assigned. The fission product exposure that you judge is appropriately to be assigned. So it's not so much, given that you have the data what mix do you use, I think that's tractable. The difficult problem is knowing what workers should fall within that category.

DR. ULSH: John, this is Brant. I think there's a fair degree of detail about who was involved in these programs in the documentation that we've got --

MR. STEWART: In some cases, yes.

DR. ULSH: -- but that's not to say that we can give you a definitive, all-inclusive list of everybody.

DR. MAURO (by Telephone): Oh, no, I just bring it up because it's come up before, and I think it's, if we it on our mind, then we can think about that at the same time.

MR. FITZGERALD: Yeah, we cite that in our statement that how many and what workers may have had such bioassays.

DR. ULSH: It's a small group, right?

MR. STEWART: Yes.

MR. FITZGERALD: There was a need for research, the returns from Hanford. So it's just a question of can one have a fairly good idea of what workers may have worked both. Were they the same workers? I don't know if they were or not, but I think that's worth mentioning.

MR. STEWART: Yeah, it was a process that actually set up a small process ^ site. And that activity was suspended and no further feed materials.

MR. FITZGERALD: So that might have actually turned out to be a simplifying situation where you had a common facility and potentially maybe the same cohort of workers that may have supported that facility even though it was

different campaigns.

MS. BEACH: And prior to John speaking we were talking about the programs. Is that a, can you explain that a little bit more and does SC&A have access to that?

DR. ULSH: Programs.

MS. BEACH: Yeah, you guys were speaking --

DR. ULSH: Program evaluation? Progress reports?

MS. BEACH: Is that what it was, progress reports?

MR. STEWART: It's in the SRDB.

MR. FITZGERALD: Yeah, I think the only thing we're looking for is to tie the specific progress reports that you're looking at and referencing here to the approach you're going to take. And I think that's similar to what we've talked about before and get a better understanding of how that's actually going to be working.

MATRIX ISSUE EIGHT: MULTI-PURPOSE LABORATORY

Number eight, we're dealing with again a familiar topic just trying to deal with a multi-purpose laboratory over fifty years. Once you get past the primary source terms you

do have this periodic table of other elements some which were understandably trace, others which were more substantial.

And I think for any of the weapons laboratories I think there's a challenge to understanding and validating that there was a means to encompass those that were in fact consequential in terms of dose. And that's what we're raising here is that it was not clear from the ER how the bioassay data or other information would be applied for -- and this is just an example list -- of just some of the constituents that were handled in the various labs and processes at Mound over that time frame.

And looking at the King document, I mean, it's pretty clear that, whether it's the T labs or the R labs, they did do a lot of R and D over a lot of different things. And just being able to envelope that history with some means to estimate what workers would have been exposed to and monitored for in those labs would be, I think, what we're looking for here.

DR. ULSH: Well, this is a multi-part

question.

MR. FITZGERALD: Yeah, that was a preamble without getting to A or B.

DR. ULSH: I think there's a cut-paste error here in your NIOSH ER position-SC&A reading. You quote us as saying that we, both demonstrated that employees with the greatest potential for internal intake were monitored and determined that we can, that available bioassay data can be used to reconstruct or bound potential internal radiation doses for those employees -- here's the problem part --

MR. FITZGERALD: Okay.

DR. ULSH: -- with the exception of those who may have been exposed to Actinium-227 -- that's okay -- Thorium-230 -- it should be 228. And you said Thorium-232, but we said that we can do Thorium-232. We also said we can do uranium and --

MR. FITZGERALD: Yeah, I see what you're talking about. This should be the actinium-radium-thorium which is the basis for the SEC. I don't know how that got in there.

DR. ULSH: That's a cut-paste I'm sure.

MR. FITZGERALD: Yeah.

DR. ULSH: So, yeah, I think this is very similar to the previous issues except that here you say, you know, earlier we talked about this straight line thing and how they D&D'd from the radium-actinium-thorium separations in 1959. And then it's at least our impression that you don't see a whole lot in terms of actinium exposure up until the R Corridor job.

And I think -- now, I'm making some assumptions here and maybe the wrong assumptions. But you're saying that assumes the bioassay data during one time period can be used to bound or estimate exposures during unmonitored times. Also indicated that for other potential exposures that D&D, decommissioning and decontamination, took place and no further significant exposures occurred.

Yet 20 years later it is documented that further exposures were occurring to those radionuclides thus indicating that D&D at the time most likely was not likely effective or complete. Are you thinking of the actinium there or is that something else?

MR. FITZGERALD: No, I think it speaks to, I think we addressed actinium elsewhere. It speaks to the R and D program primarily but not exclusively. And this exotic other nuclides that any multi-purpose lab would have handled over the early years when they were doing active research and how this presents itself in later contaminations and D&Ds.

But the exposure potential existed both during the actual R and D and afterwards when different facilities were being D&D'd. And what we're looking for is how -- and this is a general question. How did the site actually do monitoring? Meaning that --

And this question is not exclusive to Mound. We've had the same issue at Los Alamos and Livermore where you're dealing with the periodic table the first 20 or 30 years and monitoring was a state-of-the-art that was progressing at the same time that you were handling these nuclides understandably.

So the question was how did the site monitor or bioassay or whatever for these various species of nuclides as time progressed, and where in terms of gaps that

may have existed for certain radionuclides. And I think the point's made in the ER very well. Either it was negligible, in other words it wasn't something that you would go forward and monitor. Or it was more substantial but there was a way you could bridge gaps by using data from other periods of time or maybe indicator radionuclides.

There was different techniques you would use, but there's ways you could actually get some kind of a dose estimate, but that was all, I think, a compensatory approach to the fact that they did not have bioassay techniques for every single nuclide or would they need one.

But certainly there was a need to envelope what was a large spectrum of radionuclides that were handled some of which were not trace quantities, some of which were more substantially used. We include for actinium in that as well as cobalt and some of these other species, but that's the general question.

MR. BISTLINE: And I think that also in addition to that, Brant, it gets us into the

area of taking data from bioassay data from 1955 through '59, for instance, there were said can be used to bound doses over all operational time periods. There were back in those early days a lot of that Mound data indicates very poor efficiency in recovery in the bioassay program, ten percent recoveries and so forth. And then trying to apply data from that point on as a bounding issue and the concern as to whether that can legitimately be done from early data that is suspect data in terms of its quality to later periods.

DR. ULSH: Well, I understand what you're saying. And I think we would always be cautious about applying data from one time period to another. I mean, not to say that we never do it, but of course, there are issues we all know about doing that. In terms of the efficiencies, low efficiencies, there again, that would impact your MDA.

MR. BISTLINE: Yes.

DR. ULSH: But the efficiencies aren't zero. So that would indicate to me that this is more of a TBD issue than an SEC issue in terms of that particular part of what you said. Now,

that's not to say about applying data from one period to the other. There's a lot of other issues involved there.

But I would point out that during the D&D years, which I'm loosely defining as roughly the '90s, there are bioassay results for a number of different radionuclides: Protectinium-231, there's Polonium-210, Cobalt-60, Curium-242. There's a few. So I think for some of these, and obviously the major radionuclides at Mound are going to be your plutoniums, polonium in the earlier years, actinium in the earlier years, uranium to a lesser extent, thorium to probably a lesser extent and tritium. Those are the big ones.

You're right, Joe, certainly, I mean, who's going to monitor for whatever radioactive mercury is, or just as an example. But I don't, I guess I'm still not clear on when you say here 20 years later it's documented that further exposures were occurring, what situations you're referring to there. The implication there is that it was occurring the whole time.

MR. FITZGERALD: No, I think there was intermittent D&D of facilities and labs before the final D&D.

DR. ULSH: Exactly.

MR. FITZGERALD: And during those time periods they were potentially exposed to, you know, if it was a lab exposed to the source terms and would have been presumably monitored for them. But it's not clear anybody every was monitored for a lot of these exotics and nuclides.

And I guess reducing it to just the very basic level, if you took these laboratories that were in some of these buildings, whether it be T, whether it be, I guess R had some facilities, and look at some of the species of the isotopes that King identifies being handled in these facilities, you know, there's a large number, the question is just a very basic one. How did the site or did the site monitor for the nuclides being handled in the laboratories? And if so, how was that done in a way that would enable you to dose reconstruct?

If somebody was a lab worker and

worked in T lab, one of the T labs, for 25 years, they weren't, Cotter concentrate, they weren't messing with the plutonium, but they were simply working in the lab itself but were handling over time the kinds of nuclides that you would handle in a lab by just doing active R&D.

How would you go about giving credit to the potential for exposures if, in fact, very little bioassay information existed for much of these because they were other nuclides or more exotic nuclides? And that wasn't evident from the ^.

DR. ULSH: Let's start with what we know. We know that for some of the radionuclides that were present at Mound as listed in King, they did not do bioassay for them. I don't think bioassay existed for them. We know that. But there's a couple of steps before we can conclude that we have an issue here.

One is what were the quantities involved. What was the dosimetric significance of that material? I mean, if they're making a standard in a lab, that's a whole lot different than doing a major

program. So that's something that we've got to consider and also the dosimetric significance.

There's some elements that, radionuclides that you can get a whole spoonful, and it's not going to make a hill of beans difference in terms of dose. So I guess the question would be then are there any gaps. Are there those radionuclides where there was a potential for a problem here and there's no bioassay, what do you do then?

MR. STEWART: I'll just point out that King mentions in a number of locations that labs used for one purpose are decontaminated ^ used for process are disassembled and disposed of. So they've got an ongoing program to utilize the space that they've got. And it seems to me, and he talks about this, this lab was decommissioned and used for cold work from 1981 to 1996, and there's a number of rooms where he talks about that. So I don't think we should assume, and once again it's a straight-line exposure down the line. Once we've used this in R-149, then it's going to be available for uptake in significant

quantities compared to everything else that's available for uptake for perpetuity.

MR. FITZGERALD: Again, what was provided in the site profile in the ER just speaks to the fact that the capability exists to, I think, bound these doses. And the only question we have it's not clear given the history and given diversity and not knowing sort of the relative significance and practicalities involved, how you would do dose reconstruction for somebody who may have been exclusively a lab worker that might have gone through these evolutions of different R&D programs.

And it may very well be that you make judgments as to which, you know, there's no bioassay, assume that for most of the stuff, not all of it but a lot of it, that you make assumptions that certain of these isotopic, these radionuclides, are in fact radiologically significant. There's enough of it. There's maybe enough contact or potential for contact and maybe even some instances involved where you have events where people were exposed.

And you key in on those and perhaps

those are the ones that would be factored into a dose reconstruction or at least considered for some estimation. But there's not much to work with from the materials that we've looked at so far that tells us how one gets their arm around the laboratories that handled most of this stuff.

MR. CLAWSON: Also, I'd like to make a comment, too. From some of the interviews and so forth was performed, you may kind of agree with this at Mound, a lot of these facilities were used for different things, different time frames. One of their corrective actions was going down and pouring a little bit of concrete across the top of it.

One of the things they came to find out is that as a project would come to an end, there'd be a time frame or sometimes it'd happen automatically, to go in there and tear it down or build it up or change it and so forth for something else to come in. But a lot times drilling back into a lot of this for scabbling or whatever like that brought up a lot of the old history I guess you could say.

And it was just interesting to me to

talk to some of the people that were there and so forth like that because the process here was just ripping out only dealt with this that in re-suiting it or whatever you'd want to call it, it brought up some other objects.

MR. PRESLEY: Hey, Brad, Bob Presley. Did anybody ever bring up any information that might pertain to what they found when they went back in and redid this?

MR. CLAWSON: As far as radionuclides?

MR. PRESLEY: Yes.

MR. CLAWSON: A little bit, but some of it was I don't know if we can talk about.

MR. PRESLEY: Oh, yeah, okay, I agree with that. But I mean, if that information is available, then they can go back and get it.

MR. CLAWSON: Well, this is just, what I'm trying to paint is the picture that I saw from it. Granted I wasn't at Mound or anything else like that, but in some of the interviews and so forth like that, there were a lot of corrective actions and from what I look at as Mound is like a lot of our facilities. They kind of build facilities on top of facilities and use different rooms and so forth, go

different directions. And it's, there was kind of a legacy of stuff in there.

MR. PRESLEY: Right.

DR. ULSH: Well, there were some specific instances. I want to see if I can take a shot at what you're talking about, Brad. When they D&D'd the old cave as Don mentioned earlier, the way that they D&D'd it was to pour concrete on top. And then they had office space and what, labs on top? So that's certainly one example of I think maybe what you're talking about.

MR. CLAWSON: Also, too, you know, it's a site-wide practice to be able to use paint or epoxies or whatever to be able to just cover up. We still use that today. Part of the issues even we are getting into today is that we're D&Ding these buildings. We're looking for certain things but part of our history comes out.

DR. ULSH: And that was certainly the case in the R Corridor job for instance. When they went in to scabble that, then they uncovered that spot of actinium contamination. So I understand what you're saying there. I guess

I'm looking around here for a path forward on this issue.

We can certainly take a look at this list of radionuclides that you've got listed here and do our best to figure out a little more details on what was going on at the lab. At least get our arms around the scale of it. If there's a couple chemists in a lab with a test tube, that's a different issue.

MR. FITZGERALD: Yeah, I think very clearly from a pragmatic level if you're dealing with laboratory, with a history that's going to go over a number of decades in terms of handling material, how would you actually dose reconstruct for an individual that was in those laboratories understanding that you're not going to deal with the negligible source terms.

You're not going to deal with situations where it's a sealed source. You're not going deal with situations where it's, we talked about a hot cell earlier where the proximity wasn't there. But certainly if there's potential for some of the other items, and there's no bioassay I guess I'm at a loss

to how you would actually manage to do any kind of estimation unless you had some bounding assumptions or something about what the people could have been exposed to.

MR. BISTLINE: Yeah, kind of going along with that, the issue, they found equipment that had been used and was contaminated. A year later they found a contaminated equipment. How are you going to bound that I guess is the question, the exposures to things like this.

DR. ULSH: I think that issue is going to come up in a later matrix issue, the contaminated equipment part. But it seems to me that King has done, King has done part of the job here loosely. I mean, he says these are the major radionuclides of concern, these are the raw maybes and these are the, no, never minds. I'm paraphrasing here. We'll see what we can do about explaining on that.

MS. BEACH: So I basically have you're going to investigate the issue and get back to us --

DR. ULSH: Yes.

MS. BEACH: -- what you found and how to get a possible path forward.

MR. CLAWSON: And maybe I didn't make myself clear. I know that the painting and so forth, but the individuals that spoke to us during the interviews were basically talking about that they went in and yanking power cables --

DR. BRANCHE: We have an individual on the phone who needs to mute their phone, please. If you don't have a mute button then please use star six. We can hear all parts of your conversation. Thank you.

MR. CLAWSON: -- he was actually in a clean area, but they were pulling conduit, pulling wires, cracked himself up, opened himself up. He wasn't part of the monitored group so forth like that da-da-da, and this is what brought up some of these issues with pulling stuff in from it. On the other side, you know, it was sealed off okay like you do in any kind of situation, but the electrical conduit and so forth and it brought up the issue of his monitoring and so forth like that. And basically it can contaminate himself and his colleagues and so forth. And this is kind of an underlying issue of the questions. And this is what I was just trying to bring out.

DR. ULSH: Yes, and we'll take a look at the interviews that you all conducted, what, last week.

MR. FITZGERALD: Two weeks ago.

DR. ULSH: We'll take a look for that.

MR. CLAWSON: No, this was actually at a Fernald work group meeting, but the guy that worked was asking me because he knew I was on this, and so I was discussing with him what his concern was. And he says this is what I'm looking at because he had looked at the Mound TBD and so forth, and he was issued, he just discussed with me are they looking at this because this is what we got into, how they added on the facilities and so forth like that. He says it wasn't an uncommon practice to be able to get into situations like this. So that was kind of where my concern was coming and so forth.

MR. SCHOFIELD: I think that's true of just about any of these facilities because they could be up there with electrical trades. They could be out there in the nooks and crannies of unistrut* and stuff that they use for mounting equipment, glove boxes to the

walls. So they do a quick paint job, cover up what they could find loose and then somebody sits in that office, and they use that for different purposes yet there is this loose contamination in the nooks and crannies where people couldn't reach.

DR. ULSH: Right, and actually that -- okay, talk ahead just a little bit. It goes back to your issue, Bob, about the instances where they found contaminated equipment in what were supposedly clean areas. And we interviewed a few people, a couple of people about that and one was particularly helpful, a rad tech.

And he described situations like that where they would survey the exterior surface, the accessible surfaces, of the equipment, find nothing and send it to different areas inside the plant for shipment offsite. Well, when they went to disassemble that equipment, then they found some contamination on some of the inner surfaces of the equipment.

And that certainly happened. I don't want to say it happened all the time, but it was not uncommon. I mean, it happened more than once. But the question you've got to ask

yourself is, well, if this contamination was on the inner surfaces that were not accessible, what was the exposure potential. Until you pop it open and find the contamination, there really isn't much of an exposure potential there.

MR. BISTLINE: It depends on the equipment.

DR. ULSH: Right, it depends on the specific situation.

MR. STEWART: I think Health Physics practice has been pretty consistent in that when you're entering an unknown condition that you characterize the conditions in the area prior to conducting work, and then you assign the personnel monitoring based on those conditions.

And a lot of facilities have signs that say overhead areas are unsurveyed. Contact radiation protection prior to entry. I think you're going to have that situation in all these legacy facilities. And I would think that Health Physics surveys are a necessary first step when entering the facility.

MR. FITZGERALD: Yeah, I think that's

underscored by King who speaks to these overhead areas in some of the labs that were contaminated even into the ‘90s with actinium and what not.

DR. ULSH: But I don’t want to confuse the issue in some of these, you know, like you said, the alphabet soup or Periodic Table of Elements to indicate that they were spread all over and you were constantly running into surprise situations where you encountered them. They did run into some surprise situations for some of the major radionuclides. You know, find the plutonium where you didn’t expect it maybe or finding actinium where you didn’t expect it. There was an example of that. But it’s not like you were going to find Mercury-203 or, is that Scandium-46 all over the place. It wasn’t like that.

MR. FITZGERALD: No, I think again we’re just responding to the reference in the ER. And we didn’t read this, but it’s set to the point from technical and published reports, process data such as proportions of exotic radionuclides -- this is under (b) -- in

process material can be determined and the maximum dose estimated.

So essentially that's the work around when you don't have bioassay for somebody saying that you have to go to your source term information and try to come up with a estimate. The situation is somebody's in that environment and that would be probably your avenue. I guess our only question is in a practical way would you need to do that for the kinds of things we're talking about here. And if so, --

MR. STEWART: Not in all cases. A number of these are external hazards only, Krypton-85. Zn-65 and Iron-59, those are in summary -- and correct me if I'm wrong because they were a constituent of the aluminum cans used for the polonium processing. Is that how they ended up in here?

MR. FITZGERALD: I can't remember exactly now.

MR. STEWART: It would be dealt with separately, and I think that it's probably not inaccurate to say the Mound considered them primarily external dose --

MR. FITZGERALD: I think in this case we're just talking about maybe another level of explanation. I think this gives us an indication of where you're headed, but we couldn't go much further than this reference, one-sentence reference.

And I certainly wouldn't recommend anything that would be comprehensive, not this massive matrix with a hundred nuclides on one side, no. Just really some sense of that, what matters, how you would, in fact, use the process information to come up with a bounding dose. I think that would help us understand that this balance of radiological source terms is being addressed adequately because there was quite a bit.

And this has been an issue at other multipurpose laboratories just because there was so much, so little bioassay that was keeping pace. There were some questions for certain nuclides but not all. Some of it was tracer quantities and not significant radiologically anyway.

MR. STEWART: Yes, and it is certainly true for some of these as well.

MR. FITZGERALD: Yeah, I was surprised at some places where there were certain isotopes that because of the particular interest at that particular time there was enough that you definitely could get exposed if the controls were not stringent and back in the '40s and '50s they weren't. So it may matter in some cases.

DR. ULSH: All right, we'll try to provide, like you said, an additional level of detail as to the scale of some of these things and what to do.

MS. BEACH: And that's going to take us through all issues for number eight?

MR. FITZGERALD: We went from the preamble to eight to (b), and there's an (a), but actually I think we managed to back into a lot of (a) in an earlier conversation on Cotter concentrate which is where you have bioassay data available for protactinium and where it was not available and can one demonstrate that process data, which is the backstop to not having enough bioassay data, whether that combination would cover the later years.

We were only able to find the bioassay

data for ’55 through ’59, and yet, obviously, the program or the exposure for protactinium existed after ’59 as well. So without bioassay could you extend that information to use it in a way that would give you a bounding analysis?

MR. STEWART: You’re talking about the Cotter concentrate?

MR. FITZGERALD: Yeah, on (a), 8(a).

DR. ULSH: I don’t think that we would necessarily try to apply the Protactinium-231 data from the ‘50s into the Cotter concentrate. Don mentioned the makeup of the Cotter concentrate earlier, and that was 60,000 ppm uranium, so much -- what was the next one, thorium?

MR. STEWART: Thorium-232, 10,000 ppm.

DR. ULSH: So those might be the things that you’re looking for rather than --

MR. FITZGERALD: Is that the process information that you’re talking about here? That term kind of throws me a little bit. The process information would be those indicators --

MR. STEWART: Constituents.

MR. FITZGERALD: -- constituents --

DR. ULSH: The makeup of the source term and also the facilities that they were doing it in, the hot cell again. And we'll certainly make sure that you get a copy of this document that we keep talking about.

MR. FITZGERALD: Right, right. That's what I'm saying. I think we backed into this a little earlier. But when you talk process, you're talking about this specifically then.

DR. ULSH: Yes.

MR. FITZGERALD: Okay, well, I think this doc's going to help us on that one then.

MR. STEWART: Well, it's just information that to me is information about the radionucleic makeup.

MR. FITZGERALD: Right, okay.

MR. STEWART: It's a word. It's a word.

MR. FITZGERALD: Well, it actually helps because I looked at process and was thinking the production process or the operations as opposed to the necessarily the radionuclitic makeup.

MR. STEWART: And the process is concern as well because the stuff is capturing the

concentration cell with no human presence. That would also be something that we could use to reconstruct the dose.

MR. FITZGERALD: And again, this document is -- what's the name of it again?

MR. STEWART: We'll get you a copy of this. It's called "White Paper, Re-evaluation of the Cotter Concentrate". It's not a white paper that we generated, but --

DR. ULSH: BWST, right?

MR. STEWART: Yeah, it's a USCPA document.

MR. FITZGERALD: I think that would probably satisfy this issue as well once we have a chance to look at that.

MR. STEWART: August 1998.

MR. FITZGERALD: August 1998.

MS. BEACH: And you said it was an EPA or --

MR. STEWART: BWST.

DR. ULSH: A CPA?

MR. STEWART: CPA?

MS. BEACH: Maybe I just heard you wrong.

MR. STEWART: USCPA ID number -- it may have been done by somebody under contract to CPA.

MR. FITZGERALD: So we'll take a look at that when it's available and offer any

feedback to NIOSH or to the Board.

MATRIX ISSUE NINE: HIGH-FIRED ISSUE

Number nine, this one is kind of another clarification issue because, again, we're aware as you are that they ceramatized Plutonium-238 oxide is a high-fired issue. And we didn't see any really treatment, treatment meaning sort of an explanatory text in the ER or the site profile. The site profile does mention pure -238.

So this is really just an open question as to how you're addressing that particular high-fired question at Mound. Because a lot of it was handled and certainly going through the King report it's fairly extensive as you can expect. It really was everywhere Plutonium-238 was practically because of the way it was handled. And we think it obviously has implications for how one monitors for it, and we ran up against it.

And sorry for the obscure reference here, [name redacted]. We interviewed [name redacted] at Los Alamos as far as site profile review and he kind of waxed eloquent about the problem he had when he had an event involving

PU-238 oxide at the lab and how difficult it was to find it. And he just went on and on as to, it was a fascinating story, but it certainly informs this whole thing that, yeah, it's certainly a different beast when it comes to trying to monitor for it and makes perhaps follow up on events harder unless you know how to do it.

And so I guess our question is we didn't see a whole lot to explain the approach being taken. So it's just an open question. We just wanted to frame the issue up and sort of leave it to you to tell us what you think you're going to do with it.

DR. ULSH: There's a few issues. You mention in here OTIB-0049, which is the Super-S TIB. And that relates to Plutonium-239.

MR. FITZGERALD: Right.

DR. ULSH: And that was developed in support of the Rocky Flats. But that is not going to be applied to Plutonium-238 because we've not seen any evidence that Plutonium-238 behaves in any way like Super-S Plutonium-239. In fact, it's specifically mentioned in that TIB that it's not going to be used for anything

other than -239. And the reason is because the high specific activity of -238 tends to break up that ceramic matrix.

And so what you see, at least in the short time that I've spent trying to locate references on this -- I found about ten dating all the way back to the '70s by someone named Bob Bistline -- this is an issue that's, I mean, health physicists have been aware of since at least 1970 and probably earlier, that Plutonium-238 behaves a little differently than Plutonium-239. But I've not seen any evidence whatsoever that it behaves like high-fired, in other words, highly, strongly retained.

Now, let me clarify a little bit. There's some evidence, a fair body of evidence, that at first it can be strongly retained. But that as time goes by, within a short period of time, those alphas from that high specific activity -238 break up the ceramicized matrix and it starts to be excreted. So certainly there are data available. There are data available from Mound cases of people exposed to some

ceramicized Plutonium-238.

There's also some data from the USTUR, Transuranium Registry, about people exposed to this material. So it's not an unknown. And some have even looked at whether or not the ICRP models adequately can handle the behavior of Plutonium-238. And the conclusion, at least from this one in 2003 -- this is from the general literature, this is general health physics -- is that they can indeed handle that kind of material, just have to appropriately designate the solubility class which we do on a routine basis.

I mean, every time you do an IMBA run you designate the solubility class. So we're aware of the differences here about Plutonium-238. We don't see it as an SEC issue. I mean, it's not unknowable. The models that we have with appropriate parameter selections can handle that. And we are currently considering putting together a TIB on this.

Maybe you can speak a little bit more about that, Liz.

MS. BRACKETT: Well, you mentioned the [name redacted] interview being --

MR. FITZGERALD: Well, just as an illustrative --

MS. BRACKETT: Right. You said it was obscure, but really one of the papers is based on that case, and that's what we're looking at to develop the OTIB from. And, in fact, when MJW did the Mound dose reconstruction we did come across several cases where it was pretty clear that if the people had a lot of bioassay samples, and you could see it increasing over time, and we did special ^. So in the case where a person has enough data, you can just take their data and adjust the parameters in IMBA to get a good fit.

In the case of people not having that kind of data, adequate data, then what we're looking at doing is taking that paper from the Lawrence data, and I think there's six other cases that were looked at in there. They mention seven cases. Only one was a Transuranium Registry case, but looking at that and coming up with a model, and it's similar to what we did with uranium aluminide.

What we would do is try to compare it against the other material types to see if it

would ever give you a more living value. If not, then we would just stick with our default and use whichever one gave you the largest dose. But if it turns out that this particular model would give you a larger dose, then we would use that in that particular case.

MR. BISTLINE: How about the situation where it's, Plutonium-238 is in a matrix with another zirconium, something like this. There seems to be some difference showing there as far as solubility in some of the studies that I've seen.

MS. BRACKETT: Would that be the one, the paper that you wrote? Is that the --

MR. BISTLINE: No, this comes out of some studies that Los Alamos showed me on some rat studies that they did with zirconium oxide. And very highly insoluble particles lodged in the lungs and just stayed there.

MS. BRACKETT: And that would be Plutonium-238?

MR. BISTLINE: It's -238.

MS. BRACKETT: I guess that would be something we'd have to look at. Is that

something Mound would have also?

MR. BISTLINE: As I recall I think there were a couple of cases where they, a couple of compounds like that which were ceramicized particles that were made.

MS. BRACKETT: And yet it's different than the other material that --

MR. BISTLINE: It appears to be somewhat different from what you see in --

MS. BRACKETT: Then I guess that would be something we'd have to look at.

MR. BISTLINE: Yeah, it may, certain ceramicized conditions made for different durometers.

DR. ULSH: Is that something you could provide to us? These citations where we could go get it?

MR. BISTLINE: I'll try to see if I can dig it up somewhere. It's all in my file.

MS. BRACKETT: You wouldn't happen to know if that was in the Health Physics Journal or not, do you?

MR. BISTLINE: I can't remember where that was published, but I was down there visiting and they were showing me pictures of the

zirconium oxide particles. On one of my trips down there back a number of years ago, they were showing me pictures of the zirconium particles in the lungs of the rats.

DR. ZIEMER: Well, the plutonium, is it a plutonium oxide mixed with the zirconium oxide?

MR. BISTLINE: Yeah, it's a zirconium and it's ceramicized together and real ^ stable mixture that the zirconium particles just stayed there. They had a lot of ^.

MS. BEACH: Bob, where was this study from?

MR. BISTLINE: This was done at Los Alamos. It was a study being done out at Los Alamos a number of years ago.

MR. FITZGERALD: Going back to what you were saying, Liz, so if you have enough data as I understand it, you can go back to somebody who has a urinalysis record for plutonium and fit a curve depending on the solubility class that you would assign to that particular worker in that particular location, whatever work they were doing. Is that how you would make the adjustment for that contribution?

MS. BRACKETT: No. Well, if you mean in

general, do you mean have enough data for the person?

MR. FITZGERALD: If you have enough data for the person, he was exposed to plutonium, you know, he's got some data in there, urinalysis data, say, from the '70s or '60s or whatever. Are you talking about adjusting that dose to reflect the high-fired solubilities that you know now that weren't reflected --

MS. BRACKETT: So it would be taking the data and making adjustments in IMBA so that you fit that data. You don't take any knowledge of anything they were exposed to that would fit their individual data.

DR. ULSH: Which is what we always do.

MR. FITZGERALD: Right.

MS. BRACKETT: Well, not to this extent. This would involve modifying parameters that you didn't normally modify, but if it exhibited that --

MR. FITZGERALD: But you need dissolution --

MS. BRACKETT: Right, in that case that would only be done if a best estimate were required for the person. Oftentimes an overestimate or an underestimate. If we

needed to go to that level of detail, it would come probably to me or Tom LaBone to do that.

MR. FITZGERALD: How would you assign the solubility class in a circumstance where even in the Mound documentation it's sort of across the board depending on the actual process involved?

MS. BRACKETT: Well, the way it's typically done, and this is pretty much for all sites, is that the dose reconstructor runs all the possibilities. Well, ICRP assigns plutonium to M and S. We're talking -238, the dose reconstructor would run the -238 to both M and S, whichever gave the larger dose, that would be assigned. And then for -239 they'd run M, S and Super-S, whichever gave the largest dose would be the one that was assigned.

MR. FITZGERALD: And you wouldn't have any instances where sort of similar to what was established at Rocky and the OTIB-049 thing where you have something that's even more insoluble than what would be in a class, I guess, in this case?

MS. BRACKETT: Super-S?

MR. FITZGERALD: Well, yeah, Super-S.

DR. ULSH: Now we're estimating.

MR. FITZGERALD: Not the -238, really, the S --

MS. BRACKETT: Right, well, that's what we're talking about developing an OTIB to see if that would give you more dose than M or S would and under what circumstances. I'm guessing it would be limited in time as to when it would be more limiting since you get the dip down, and then it's back up. I think it's probably going to fall in between the others except in certain circumstances. And that's what we'd look at to see what circumstances there would be that it would give you the largest dose.

MR. FITZGERALD: So I guess in sum this is, you would consider this a very tractable issue?

MS. BRACKETT: Yes.

MR. FITZGERALD: Okay.

DR. ULSH: Well, before we leave the, issue nine, it still mentioned uranium and thorium compounds in terms of Super-S.

MR. FITZGERALD: Yeah, any -- this is sort of a question. Given the processes involved

is there any evidence of any of that, I guess, in terms of the effects that would be not as pronounced perhaps with plutonium but where high-fired would have some bearing on those?

DR. ULSH: Well, I think if I recall correctly, you also raised this question in terms of the Rocky Flats things when we were handling Super-S plutonium there. You asked about uranium and thorium. Our answer wouldn't be much different from there. And that is that we have never, we're not aware of any worker who's ever observed Super-S behavior for the uranium or thorium.

Now in answer to your question we specifically talked about the microsphere project where they draw small particles through a plasma torch, and they did do that with thorium oxide. I know that, at least on one occasion. I don't know how many times.

MR. FITZGERALD: I think only briefly. I think it was only a couple --

DR. ULSH: I think so, too. But we're not aware of anything that suggests you should treat uranium and thorium as Super-S material. This question keeps coming up, and if you guys

are aware of something that we're not, we'd love to see it. But we haven't addressed that question; we'll see if it comes up.

MR. FITZGERALD: On this particular one though, on Super-S, I think it would be Super-S now, high-fired oxides, it would be helpful to, I think we'll take it upon ourselves to give you a review just to raise some questions on that. We don't have to take the time now, but just to sort of put this to bed in terms of some of the technical questions associated with the approach. And I think we can deal with it as a technical issue and just kind of cross the T on that one.

MS. BEACH: And I also have Bob to try to provide NIOSH with the study from Los Alamos if possible.

We're on to number ten. Does anybody, do you want to take a five-minute break? We have about an hour and 15 minutes left.

MR. FITZGERALD: Are we going too fast now?

MS. BEACH: My question is would you like to take a break or would you like to continue?

MR. FITZGERALD: For those who have to drive, I guess that would be one issue. Do we

want to keep going and get this done early?

DR. ULSH: Let's take five.

(Whereupon, the working group took a break.)

DR. BRANCHE: We're ready to get started again. We don't have much time left, and I would just ask again for those of you who are on the phone, at the risk of sounding like a broken record, if you could please mute your phone, then when you're ready to speak you can unmute your phone. If you do not have a mute button, then please dial star six. Thank you so much.

MATRIX ISSUE TEN: D&D ERA

MS. BEACH: Are we ready to move on to number ten?

MR. FITZGERALD: Yeah, number ten I think is more or less a place holder. I think the ER is pretty clear that the D&D era is being investigated still. And I think certainly we believe it's an important era to look at. So there's nothing, I don't think there's anything unless you have any new developments that --

MR. STEWART: Well, there is one observation I'd like to make. And that is that DAC-hour

tracking was not used in the dose reconstruction project. The site may use it to assign doses, but we don't use site-to-site doses in the ER.

DR. ULSH: And that kind is a good lead into a concern that I have on this particular issue. I'm not sure if there's any significance to be read into the bold statements down there. I mean SC&A goes through a couple of issues that they see as problems like lapel sampling, DAC-hour tracking being used to track internal dose rather than routine bioassay.

I think reliance on cohort lapel air sampling and samples randomly assigned to D&D workers, and then as I read the statement, SC&A agrees that issues like these associated with internal exposure during D&D for special consideration. That tends to imply that that was NIOSH's concern, too, and that you're agreeing with it. And that's not the case. I mean, we never mentioned a concern about lapel sampling or DAC-hour tracking.

In fact, it's our understanding that, yes, they certainly did use those for more

real-time sampling, but that was laid on top of routine bioassay like at other D&D sites. So we never made that an issue. The cohort sampling we've already talked about. So I just want to make it clear that -- and if you guys want to raise those issues, that's fine, but it's not issues that we're raising.

MR. FITZGERALD: I agree. I think that wording needs to be certainly changed, and we will do that.

DR. ULSH: Our concerns with the D&D era relate to the Price-Anderson Act violations, specifically the R Corridor job with regard to the handling of the actinium bioassay samples and how broad of an impact or narrow that might have on the reliability of the bioassay data for that time period. That's what we're concerned about.

MATRIX ISSUE ELEVEN: ADEQUACY OF INTERNAL DOSE RECORDS

MR. FITZGERALD: I think we just go to number 11. This 11 and 12, actually 11, 12 and 13 get into the data completeness, integrity question that we got through earlier. And I think what I had said earlier was certainly we're impressed with and feel

that the MJW QA process for what was done on bioassay was, at least from what we've read -- again, we haven't done anything more than just read what was in the file, but it seemed fairly complete and would mitigate some of the concerns that we would normally have.

The issue number 11 just gets to concerns over the basic radiochemistry, radioanalysis going back to the early years. And I guess this is just a question for Liz and for others who have looked at this. Has anyone kind of examined the radiochemistry or just the analysis itself to determine whether or not there's validity in that quite apart from the bioassay per se?

MR. STEWART: Sorry, Liz. I guess we had a radiochemist in the bunch and there was a concern over that issue. And I don't have a good answer to that either. It just didn't seem like I could find anything that spoke to the confidence on that early radiochemistry radioanalysis.

MS. BRACKETT: Are there particular nuclides or you're just questioning --

MR. FITZGERALD: It's just a broader

question. I think I kind of pushed the individual for some examples, and that's what these are, but just to illustrate what we're talking about. But could you point in the direction as to where that information or analysis could have been done so that we have a clearer idea of whether -- because I keep getting feedback that certainly in the early years -- it's not specific to Mound -- that was a big limitation to the reliability of some of the data that was being collected was just that it was very primitive time for a lot of the radioanalysis that was being done.

And I don't have a good answer to that because I looked through the documentation and couldn't find anything that per se. And this is almost a QA/QC issue in a way, but it gets to the data reliability.

MS. BRACKETT: Well, the polonium, for example, that was reviewed in more recent times. You've probably seen the papers for the New York University study where they reproduced the polonium measurements and determined that the recovery was less than what they believed that they had at the time.

So I think my interpretation of that was that the method's fine as long as you use ten percent recovery because that's what they were able to obtain.

MR. ELLIOTT: That's [name redacted]report?

MS. BRACKETT: No, well, he was involved later, but it was New York University, [name redacted] did his Ph.D. on that I think.

DR. ZIEMER: [name redacted] ^ was involved.

MS. BRACKETT: Yeah, there were a lot of people involved in that.

The plutonium, I mean, a lot of it was just standard gross alpha kind of thing. I don't know the details about plutonium. Some of these key other radionuclides as we call them, the primary reason for proposing the SEC in the early years was because of the interpretation of those data.

DR. ULSH: The radium, actinium, thorium.

MS. BRACKETT: Right, because that was, it's very complicated, and I'm sure at the time they knew what they were doing. But in going back and looking at the records it's very difficult to see all. They were plotting radium and making assumptions about the time,

and it was just very complicated. So we don't feel that we can use that now.

DR. ULSH: The one example you give here about thorium urinalysis data for insoluble forms of thorium have been shown to be ineffective in detecting thorium uptakes. I don't know that we would agree with that. I think we would go back to the characterization that Paul gave earlier in another context. And that is that the MDA is high, and we would certainly agree with that. But that just leads to high missed doses. We don't see that as an example of an SEC-type issue.

DR. ZIEMER: That is true in (a) I think if you're getting low recovery, it just affects your sensitivity.

MS. BRACKETT: Right.

DR. ZIEMER: Actually, for a claimant, given two people with the same numbers, it probably helps them because the uncertainty in the missed dose is higher.

DR. ULSH: Yes, I think that's right.

DR. ZIEMER: But you used the ten percent figure. Very few uncompensated lung cancers.

DR. ULSH: Joe, I can maybe provide a little

more -- I'm trying to recall. I think the Meyer document, the history of the internal -- at least Don told me this is where I saw it. There's a table in there. It shows the major programs, and then underneath it shows the MLM report that talks about the bioassay method that they used to cover those programs. I'm going to go try to find that again and get that to you or at least find out where it is. But that might provide more details about exactly what kind of analysis they did. That would help.

MR. FITZGERALD: Yeah, it would help. And I think from what I understand is that other than the actinium, radium, thorium, that process in terms of analysis, the confidence on the other analytical techniques in terms of the time frames involved is sufficient with adjustments necessarily for polonium. The ten percent, it's reliable enough for dose reconstruction.

DR. ULSH: That's certainly our impression at the moment. Yeah, we don't see any issues with the exception of the radium, actinium, thorium that they're insufficient. And, Joe,

if you want to write this down, that reference is "The History of Bioassay" by Meyer. It's on page --

MR. FITZGERALD: Oh, yeah, I think we have that.

DR. ULSH: -- page 21 --

MR. FITZGERALD: In a certain volume, right?

MR. STEWART: Yeah, the bioassay's a single volume, 990 pages.

DR. ULSH: This is on a PDF, page 21.

MR. BISTLINE: What page?

DR. ULSH: Twenty-one. And it lists the report. It has like a, well, I think these are report numbers: MD-20738. I think that's --

MR. STEWART: This is an internal dose procedure.

MS. BRACKETT: I was just going to note that there's been a bioassay conference that's been going on for around 50 years. I don't remember exactly where we're at now with it, but that was something that was started within the AEC complex for the sites to get together and develop bioassay techniques and discuss what was going on. And Mound was a very early

participant in that. In fact, they gave papers almost every year, so they were very involved with the latest techniques and all in keeping up with what was going on.

MR. FITZGERALD: Okay, well, we'll take a look at the reference and decide whether did we solve this issue the next go around on that.

MATRIX ISSUE TWELVE: INTEGRITY AND COMPLETENESS OF INTERNAL DOSE RECORDS

The next two issues are really getting into something we talked about earlier which was how to handle the data integrity, completeness and whatever validation the work group believes we ought to do in the databases themselves. And I guess I would probably go ahead and defer to the interim -- I don't even know what you would call it -- sort of an interim approach that you offer with certainly our awareness of the 1996 QA that MJW did on internal.

So we're acknowledging that, but just grappling in the internal and external and address that maybe in more detail next work group session. It would be helpful I guess if

possible to get that before we actually sit at the table if there's any way to take a look at that.

I think that would inform whatever strategy the work group would want to go ahead and take as far as the data integrity and completeness. Because I think at this point there must be a happy medium using Rocky as one extreme and using, and not doing anything on the other but just simply being able to come up with an assessment of data reliability that would be suitable for the Board.

DR. ZIEMER: What's going to happen then when this thing is --

MR. FITZGERALD: I think what we're saying is that these next two items speak to the data integrity and completeness on the internal side. I think what Brant was offering earlier was to provide the work group a path forward based on what QA/QC is available in the Mound literature.

And I was just proposing in maybe internal plus external we could do it in one piece. But then that would require a work group session to decide what the strategy

ought to be as far as any further review on that subject.

MS. BEACH: Part of our number 18 discussion.

MR. FITZGERALD: Yeah.

MS. BEACH: Is there any idea, Brant, of time? How long it's going to take you guys to come up with some kind of summary? And I'm not putting any specific dates down, just --

DR. ULSH: I don't know, Josie, because we're going to have to go, I've got a couple of things that I'm going to do. I'm going to talk to the Mound folks that I'm in touch with for leads on where you can find some of this information. We might include this in our next key word search to D&D Legacy Management. So I'm not sure how long that particular item might take.

MR. ELLIOTT: Are we talking about item 13 here or --

DR. ULSH: No, 12.

MR. ELLIOTT: Just 12.

DR. ULSH: Well, I don't know. You can answer that, too.

MR. FITZGERALD: Well, I think 13 is a

related issue, a different issue. Well, maybe we should treat 13 differently.

MR. ELLIOTT: I was going to say if the two you're talking about is 12 and 13, then 13, I think we've already got some information on 13.

MS. BEACH: We haven't got to 13 yet.

MR. FITZGERALD: That's all right. I was completing 12 and 13. I think you're right, 12 is different than 13. So we're talking 12 and 18?

MS. BEACH: Eighteen.

MR. FITZGERALD: Twelve and 18.

DR. ULSH: So without knowing how readily available this data is, I can't really say. But if it's going to take a long time, I'll let you know.

MS. BEACH: Fair enough.

MATRIX ISSUE THIRTEEN: MOUND EMPLOYEES RECORDS

MR. FITZGERALD: I guess on 13 this is certainly more of a petitioner issue and again I would defer to the work group, but there were questions raised about what was in fact scanned, what was actually the criteria for choosing what came out of the records. Some

of those questions of -- we don't have anything more than what's in the ER.

And the question before the work group is in terms of validating that particular question that's been raised in the petition process whether or not that's sufficient or not. I think there could be some further information gathered or it could be left as is. I mean, I don't, again, I think it is what it is. At this point whether or not there's any need to review that information in terms of what was imaged, I don't know. But I don't know if NIOSH has information -- we just simply have what's in the ER at this stage.

DR. ULSH: Well, there's the ^ record? When I say the ^, it's called the History of --

MS. BEACH: I'm looking it up right now.

DR. ULSH: It's got a 2000, I think, page document.

MS. BEACH: Let me get you the number for it.

DR. ULSH: That certainly describes that situation. I would also refer you to our interviews with Ms. Brackett and Ms. Kirkwood who are intimately familiar with that whole

situation. To briefly summarize, and I --

Feel free to fill in.

There's a number of reasons why we don't believe that the --

MR. STEWART: Before you go on, this is not an O drive issue. It's been on the O drive. There are some DOE documentation, a record transfer decision, making documents on what went where. Why these boxes were pulled aside and sent to Los Alamos to be buried. And in those decision-making documents it explains what our belief is that there are other documents that replicate or duplicate the information that has been buried.

DR. ULSH: Right, and I know that those were presented to the Board. I don't know whether they are --

MR. STEWART: They were presented to the Board. I don't remember which meeting it was, but we can resurrect those documents. And that's the basis of our position that we have not lost anything here because we can reproduce other sources.

DR. ZIEMER: Isn't there an index or something that was in the other boxes?

MR. STEWART: It included an index of all of the records that were so contaminated and not scanned or put to CD.

DR. ULSH: Just going back to first principles there's no reason to assume that the types of data that we use in dose reconstruction, so we're talking film and TLD results, bioassay results would have been included in this records collection because it's a classified records collection. It's not dosimetry records. And that was confirmed by -- I guess now that she works for ORAU I can say -- Cheryl Kirkwood, if that was the case.

So you wouldn't expect to find primary dosimetry records in that collection in the first place. And then it was sent down to Los Alamos. This was right around the time MJW was doing their pre-'89 dose reconstruction, and Liz and I don't know, a few others, Liz and one other person went down just to make sure that there wasn't anything in that collection that they would need for their dose reconstruction process. And she identified a number of boxes that required further

checking, pulled those back and I don't know. I'm a little unclear what happened after that.

MS. BRACKETT: To be honest I'm a little unclear, too. I've gone back and read the notes from the time, but we weren't doing that in conjunction with Joe sending anything, I don't remember. At the time we knew that they had just been sent to Mound to identify boxes that might be useful.

On our trip there we did not look at very many. I think we looked at seven boxes. Because we were supposed to go for a week, but then Los Alamos didn't want us there, and we ended up spending a day, and there were very strict requirements for coverage. And so we ended up not having a lot of time. And so after that we looked at several boxes that looked like they would have bioassay data in them. And we found some bioassay data.

When we got it back, it turned out that some of it was duplicated. It was the original logbooks, but there were cards that had that same data. They did fill a few gaps. We found I think a handful that were missing, you know, they were from the '40s for

polonium, nothing other than that.

And then there was the identification of a larger number of boxes, and those were returned. There were 43 I believe is what it said. Those got returned to Mound later on. And those were all reviewed. Although to be honest as I told them in my interview, my memory is not that good.

I really don't recall what we might have found there or why the particular boxes were identified. What I do recall though is that for the large part we found that we had already looked at these logbooks in microfilm form. That they were still in existence onsite but just in a different format.

MR. ELLIOTT: I think it important to note for the working group, for the full Board, for SC&A and members of the public that under the moratorium that DOE established on destruction of records each time one of the sites comes forward and says here's a series of records that we are proposing to destroy, they turn around to us and ask us if there's any epidemiologic or compensation interest in retaining those records. In fact, today some

of the, you've seen me busy on my Blackberry. I've been dealing with two of these requests right before me today on should we throw away records or not. And so we look at those very carefully when asked to do so.

MS. BEACH: So we never did get back to on what you suggested, the records transfer information decision. Can we have somebody put that on the O drive so it's --

MR. ELLIOTT: It's on there.

MS. BEACH: It is on there.

MR. FITZGERALD: It's on there. I think we have looked at that. And I think the only question, and this gets to -- that's why I'm saying I kind of conflated this one with the previous one because it gets to whether the work group wants any validation of the transfer of some of this information or not. And the information is strong in some respects, but it's the issue of whether or not the records are complete. It gets to the completeness question.

I don't have a good answer for it, but I think this notion of what's a measured response to establishing the reliability of

the data is an ongoing question that we've grappled with from site to site to site. And we kind of indicate that Rocky's is extreme. And I believe that was an extreme, but what is that middle road that allows the work group and the Board to feel that the database is reliable including the records that were implicated in that situation at Los Alamos.

And that measured response I think is what we're trying to grapple with. And I'm quite comfortable waiting, I think, to hear from Brant and NIOSH as far as strategy but then trying to weigh that. I think it's a similar issue we're going to have at many sites where you don't have necessarily an alleged deficiency or gap per se, but still there may be some questions about how reliable is the data going into the dose reconstruction and being able to put the Board in position to independently answer that question.

And in this case I feel that there's been a fair amount of corroboration. We talked to Liz about it, and ten years is a long time to remember those details. I can't remember back in those days much either. So

the question is, is there a way, and I think the DOE is one way. We're going to go to OSTI as another way. I feel confident we can probably corroborate if the work group, sort of the judgment on the reliability, for example, this issue.

The other issue I think we would want to wait and see what comes out of the thing that Brant's putting together. But I think in general all these issues we're trying to come up with whatever the measured response would be that would give sufficient confidence that the database can be relied upon. And I'm open to different approaches on that, having lived through some of the other approaches.

DR. ZIEMER: Well, on this particular issue, Joe, were you asking whether or not there might have been some records that we don't have that are in there in the other boxes that didn't get in. What is being asked --

MR. FITZGERALD: I think the premise is, you know, I think Liz touched on it that the notion was were the relevant records scanned, in other words, recovered from the boxes that would be, whether it be bioassay operation

information, not necessarily everything that was there. A lot of it was not particularly relevant. And is there a way without prejudging it that you could sample to come up with that information or not. Or, as Larry's suggesting, if you have enough corroborating references to this information, you know, it was scanned and here's what was scanned, and here's what came out of it. Or here's --

DR. ZIEMER: Or here's, they still exist elsewhere.

MR. FITZGERALD: -- they exist elsewhere, then I think that could be a way forward on that. I guess the way we wanted to couch this was you could sample. You could do something to verify. The verification I think is something that we'd like to provide the work group just so that question can be answered in the end. Whether it's this issue or the other issues that the database itself is, has been looked at and is reliable.

Perhaps on this one, even though it's a not the same specific issue as the other data completeness, integrity issues, if the gold standard is the DOE transfer

documentation, perhaps that would be one way to establish that this is probably going to be the basis for judging the reliability as it stands now for this question of the boxes. I'm just thinking out loud that that might be the path forward to --

DR. ULSH: That's certainly one piece of important information. But I would also encourage you to, well, when you talk to Liz, look at her interview with Cheryl Kirkwood as well on this topic, and then ^ those three documents. Those together form the set of documents and interviews that we've used to address this issue.

MS. JESSEN: I think you'll find that ^ document pretty thorough.

MR. ELLIOTT: How far does 13 go to be, to relating to database reliability though? That's not clear to me. Do we have any sense of that? I mean --

DR. ZIEMER: If the issue is, were records destroyed that we don't have independently, I'm not sure you'll ever quite answer that. But --

MR. ELLIOTT: I'm not aware if these records

ever were a part of what was assembled into a database. That's the question I'm raising.

MR. FITZGERALD: Yeah, the logbooks, for example, would not have gone to the database, but they would have been mined, I would assume, for bioassay information that would have been perhaps --

MR. ELLIOTT: On cards probably.

MR. FITZGERALD: So the scanned logbooks are essentially the only information that has been saved from all that file.

MR. ELLIOTT: It's one thing to ask the question have we lost something here that's critical for dose reconstruction, and it's another question to say did something happen in these set of records that confounded the reliability of the database. And maybe both questions are appropriate, maybe not. I don't know.

MS. BRACKETT: Well, when we went looking, I think the reason we looked was because for polonium, we were the ones who created the database. And we noticed -- and people were pretty routinely sampled weekly. It was pretty constant for a number of years. And we

could look and see that there seemed to be some gaps maybe months at a time here and there. And we said, well, maybe there's some data missing and that was when we started looking at other records. And we did retrieve a few logbooks that filled in those gaps. And so I think that we are relatively confident that we have, that we did retrieve all of the polonium records because, like I said, you could, I think one of the final reports addresses that that said there were gaps here, and we found the data that went there. We didn't identify gaps for any other time, and those were from the '40s. We didn't find anything from really later times that we didn't already have, so very old data.

One thing I should point out is that when we were looking at the records, we were strictly focused on internal dosimetry. So we would not have looked, we wouldn't have identified any external dosimetry records as part of that. But I think we only found a few that we didn't have anywhere else, and they did fill in some gaps. And that was having through looked at lists of what were in the

boxes and saying okay, likely in these boxes. And we did find what we were looking for in those boxes.

MR. FITZGERALD: Now, we haven't gotten to the scanned logbooks. I guess this information sits in the records file at Mound. We haven't done any data retrieval there at all yet. So there's at least some way of examining that and adding that to, I think, some of this corroboration as to what was pulled and what it actually was. We have descriptions but we actually haven't seen the specific pieces of information. I assume that those scanned documents are in the, I assume they're not classified, and they were in the repository. I think they are.

DR. ULSH: I think they're in OSTI.

MR. FITZGERALD: Yeah, and we're going to OSTI, too. So I guess I would say we have a, we certainly have a concern, but I think maybe we're talking a little bit more data review, document review and not coming to any conclusion as much as trying to find a path forward as to how one could perhaps provide some validation, whether by using these

various pieces of information or looking at all the records at OSTI, but just coming to an aggregate that we can offer the work group and say that given all these sources we feel pretty confident on the reliability of this information per se.

MS. BEACH: Hopefully, we'll get to that point.

MR. FITZGERALD: Well, you know, this is early; this is early. But, yeah, so we'll follow that course with this particular piece, and we'll have to come back and advise the work group on where that is.

DR. ULSH: Nineteen? Is that where we are?

MS. BEACH: Yeah. I think we actually got through it.

DR. ZIEMER: Twenty.

MATRIX ISSUE TWENTY: AMBIENT ENVIRONMENTAL INTERNAL RADIATION DOSE CONTRIBUTION

MR. FITZGERALD: Now, on the original matrix, which has lost its headers, there used to be a header right here that said that everything above the line we thought was a -- I forget the term now --

MS. BEACH: Potential SEC -- it's in small

print.

MR. FITZGERALD: Okay, the print has changed. It was about ten inches high before.

So these are ones that we have more questions with how the phraseology was in the ER. And I guess we had one of these former Mound environmental folk who raised questions about the comment about the environmental ambient contamination. So that, I think, is less an SEC issue and more of leaning towards a site profile question as to whether the ambient environmental sources would have been contributors or not.

And I think what we're saying there is we feel this number of sources that would have been contributors -- certainly the radon was what we talked about today, but there's other sources as well. But I think we would offer that as more -- since we're drawing a line of sorts -- more the commentary maybe with a site profile context about the contribution of environmental sources, onsite environmental sources.

DR. ULSH: Yeah, I mean, you might be talking semantics here in terms of our

statement. I mean, at Mound we do just like we do at other sites. We do assign a greater than zero ambient environmental dose, and we do that at Mound, too.

But when we say that they generally didn't experience site-wide ambient contamination, I wouldn't be opposed to removing that statement. But the examples that you've got here, the contaminated canal, that was offsite and that was contaminated sediments which workers were not routinely exposed to. So that's not an example of site-wide contamination.

The leaking storage drums I assume relate to the Thorium-232. We've already talked about that, that that was one area, the southern part of the site, remote again, not site wide. The leaking waste lines were underground so that's not site wide. Radon, we need to talk about radon.

MR. FITZGERALD: Now on the underground pipe I think there was an event. I can't recall, it was a D&D. They were working on the pipe and were exposed or something. I seem to recall that being a --

DR. ULSH: Yeah, they dug it up to remediate it.

MR. STEWART: Several people.

DR. ULSH: But again, that's localized. It's not site wide.

MR. FITZGERALD: Without getting into trying to come up with a list to substantiate the comment, I think the concern was that there were ambient sources that already factored in. I don't think you're disagreeing with that. It's just that it wasn't clear from this whether it was going to be not addressed. I think what you're saying is it's going to be addressed. That's one reason I put it down below the line. Seeing the comment I just wanted to clarify what your intent there was.

DR. ULSH: Now there was one thing here in SC&A's statement. It says given that the officially estimated source terms for air emissions at other DOE sites have been shown to be incorrect in the past, often in the direction of significant underestimation by independent investigations, we wouldn't necessarily posit that as a given without knowing the specifics that you're referring

to.

MR. FITZGERALD: Okay, well, we can provide examples, but I'm not sure it changes, but we'll go ahead and provide the examples just to expand that a little bit.

DR. ULSH: I agree with you. I think that this should be included in dose reconstructions, and it is at Mound. So like I said, I'm not so wedded to this comment that it causes heartburn for anybody if you would take it out.

DR. ZIEMER: But you're saying it's not necessarily the same value for each part of the site; and therefore, it's not a site-wide value. Or are you --

DR. ULSH: No, we do have --

DR. ZIEMER: -- you are going to assign a site-wide value for ambient --

MR. STEWART: We'll take the maximum value.

DR. ZIEMER: Whatever it turns out to be.

MR. STEWART: Yes. Typically. We have the provision to scale those back if we know a particular work location, but we rarely do it. I don't know if we've ever done it. Typically, would be in a minimizing case.

MR. FITZGERALD: I think that's all we have.

DR. ULSH: Only one we agree. Investigation's ongoing.

MS. BEACH: How's that going by the way?

DR. ULSH: That's another one of those 2000 pagers so we're plowing our way through that as well. Yeah, maybe I should wait until I've --

MS. BEACH: I think that's a good idea.

MR. FITZGERALD: To be done.

MS. BEACH: Does anybody have anything further?

DR. ULSH: Actually, I've got something to just mention.

Joe, I know I told you about this. I hope I told you about this, but we have been working, the ORAU team and NIOSH ^ Museum Association to access their collection of the MLM reports. It's been represented to us that they represent about 85 percent of all of the MLM reports.

Just for those of you who don't know, like most national labs, I think, Mound documented pretty much the results of all their research in these technical reports.

These are MLM reports. I'm not sure what the acronym stands for. So we're in the process of working with the Museum Association to first create an index of that collection, which once that's completed, we will share it with SC&A and the working group.

And if you will let us know which ones you want us to go retrieve, we can go to the Museum Association and copy those, capture them. And that effort is ongoing. We estimate it will take about maybe a month to index that collection. It's quite large. But that should help us.

I mean, I know that like a lot of folks, DOE is facing some resource limitations. So to the extent that we can lighten the load on what we ask for from them by getting it through the Museum Association, that might be helpful to all involved. So we'll get that to you as soon as the index is complete.

MS. BEACH: Can you give us enough time to be able to give you a list of what we'd like to have also?

DR. ULSH: Yes.

MS. BEACH: Because I know there was a little glitch on the last time you retrieved records. Or SC&A didn't have enough time to give you their list of four boxes.

MR. FITZGERALD: That was sort of a train passing at the same time that we were beginning to think about how to coordinate it. I guess I would comment that we're more than likely going to need to do a data review or document review at the Dayton Center at some point, maybe at the end of ^ early May. And we'll share pretty much what you have essentially already, but we may augment that a little bit and go offsite with the understanding that, again, if there's anything to withdraw for you, we'll go ahead and do that.

But that won't happen for awhile. I think the last time I was there, they were, I think they had plenty of visitors and weren't looking for visitors for at least another month and a half. So I have a feeling that we'll probably get there sometime in May.

DR. ULSH: We're talking about three separate things. One is the Museum

Association. There won't be really any time pressures with that. I don't anticipate that collection going anywhere. So we'll provide you with the index and --

MR. FITZGERALD: Yeah, this is separate.

DR. ULSH: -- take the time that you want with that index.

Secondly, there are situations that you just mentioned about the records. These are ones that we had requested back at the end of last year, and they just came in. And this is where we're implementing, as Joe said, the coordination-type thing. I think we're still holding those boxes.

MR. FITZGERALD: We just missed that. We had sent them back. We just missed it by a day or so. So again, it wasn't the building specific. I can't remember the building, but it wasn't those boxes. It was the rad boxes that were relevant. But we'll probably go back in when they're ready to host us again and take a look.

DR. ULSH: Anyway, I just wanted to let you know that was going on.

MR. ELLIOTT: Don't forget, if they say they

have no money to support your visit, let me know. Because that's not supposed to be happening right now. And for your OSTI visit please don't pay for any documents down there. They should provide those. That's their responsibility.

MR. FITZGERALD: What we're going to try to do with OSTI is in spring there's going to be an Oak Ridge visit, and we're going to try to dovetail that visit and also look in OSTI. And I'm sure that we'll again share what we're going to ask OSTI for in case there's anything from that file that you would want to add onto. I think that's going to happen toward the end of April. I'm not sure. We just talked a little bit about it. So a couple things in the works on that. Anyway.

MR. CLAWSON: I just had one other question. You know, we keep falling back in the lawsuit that you guys got involved with. Is that part of the CEP issue that come up with those bioassays? Was that totally different?

MS. BEACH: That's a separate issue.

MR. CLAWSON: You said in this that any data that CEP had provided, bioassay or so forth,

you basically ignored?

MR. ELLIOTT: I said that.

MR. CLAWSON: You said that.

MR. ELLIOTT: I said we'd look at it in the time frame when we know that CEP data was corrupt. I'm not sure that we can say all CEP data is corrupt.

MR. CLAWSON: I just, I know this is --

MS. BEACH: That's the stance that we're taking though.

MR. ELLIOTT: Yeah, that it's all corrupt?

MS. BEACH: Yes. That's what I was told.

DR. ULSH: That was the CEP data -- sorry -- the CEP Laboratory was involved in the actinium situation in the early '90s, the Price-Anderson Act. That was one of the labs that they sent the samples to -- I think that was the problem -- which were determined to be unreliable.

MR. ELLIOTT: I say what I say because we've recently run into some new CEP data that we'd have -- Stu would know this. I don't know. And we raised the question is this considered corrupt or not. And once we looked at it we said yes. But we had heretofore recognized

CEP data attributed to that site.

MS. BEACH: And is it fair to ask for a report on the CEP data and what years are corrupt, not corrupt? Because I know this came up a couple of meetings ago, and it's going to come up for NUMEC and now --

MR. ELLIOTT: All of NUMEC.

MS. BEACH: Right, well, I guess I would just like something real standard if that's possible. I don't know, Larry, if it is. That's why I asked if it was fair to ask.

MS. BRACKETT: I mean, it's basically all CEP data where we are not using any CEP data, and they operated from the '70s to the '90s.

MR. CLAWSON: Now this is maybe where we're going to take care of it, the Board finding out how many sites this actually affected because we're seeing bits and pieces of it coming along.

MS. BRACKETT: I don't think that we know that because there are some facilities used them as just a minor part and they were one of several labs that were used at a time. And we seem to keep coming across data that is from CEP. It's not, I don't think it's a large

issue for most of the large DOE facilities.

MR. ELLIOTT: A-W-E's that had other work for AEC or DOE, Department of Defense work. That's what CEP was primarily supporting.

MS. BRACKETT: At Mound it was only 30 samples. That's all that they ever sent to CEP.

MS. BEACH: And those are totally discounted at this time.

MS. BRACKETT: Right.

DR. ULSH: The site ^.

MS. BRACKETT: Right. Because the site at the time they sent them it was just before it all came out that there were problems, and so they were aware at the time that shortly after getting it done that it was a problem.

MS. BEACH: NIOSH, anything else?

DR. ULSH: No.

MS. BEACH: SC&A? Joe?

MR. FITZGERALD: No, I think that's it.

MS. BEACH: The working group?

Deb, you've been so quiet. Do you have anything you want to ask since we have a minute?

(no response)

MS. BEACH: And we did talk about notes. You're going to send notes to me. I'm going to share them with Joe, and then we'll get out a copy to the entire work group.

Thank you.

(Whereupon, the working group meeting was adjourned at 3:15 p.m.)

CERTIFICATE OF COURT REPORTER

STATE OF GEORGIA

COUNTY OF FULTON

I, Steven Ray Green, Certified Merit Court Reporter, do hereby certify that I reported the above and foregoing on the day of April 1, 2008; and it is a true and accurate transcript of the testimony captioned herein.

I further certify that I am neither kin nor counsel to any of the parties herein, nor have any interest in the cause named herein.

WITNESS my hand and official seal this the 8th day of July, 2008.

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STEVEN RAY GREEN, CCR, CVR-CM, PNSC

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