

Centers for Disease Control
National Institute for Occupational Safety and
Health
Advisory Board on Radiation and Worker Health
Fernald Work Group
Friday, August 10, 2018

The Work Group convened via teleconference at
11:00 a.m. Eastern Time, Bradley P. Clawson,
Chairman, presiding.

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Members Present:

Bradley P. Clawson, Chair
Philip Schofield, Member
Paul L. Ziemer, Member

Also Present:

Ted Katz, Designated Federal Official
Nancy Adams, NIOSH Contractor
Bob Barton, SC&A
Ron Buchanan, SC&A
Stu Hinnefeld, DCAS
Jenny Lin Naylor, Hhs
Mark Rolfes, DCAS
Muttu Sharfi, ORAU Team
John Stiver, SC&A

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Proceedings

(11:00 a.m.)

Roll Call/Welcome

Mr. Katz: Welcome, everyone. This is Advisory Board on Radiation Worker Health. It's the Fernald Work Group and we continuation of our Site Profile Review today in preparation for the Board meeting a little later in the month.

For people of the public who want to follow along, the agenda for today's meeting and the materials for today's meeting is posted on the NIOSH website for this program under "Schedule of Meetings," today's date.

You can go there, pull up the agenda. The agenda's very simple, so there's not really much to gain from the agenda.

But there are also the background documents related to this discussion today on topics posted there. So, you can either pull them up and read them as we're discussing or afterwards, what have you.

And then, let me just also note for members of the public and others who are not accustomed to these meetings.

Please mute your phones except when -- I hear a dog barking now -- except when you're addressing the group. And, if you don't have a mute button, press star six to mute your phone. And then, you can press star six again to take yourself off of mute.

And, also, please, no one put this call on hold at any point. Just hang up and dial back in if you need to go for a piece. Because hold will disrupt everyone else's call as long as you're on hold.

I think that takes care of those matters.

Roll call, so I have -- and we're speaking about a specific site, so please, as we do roll call, address conflict of interest, but it doesn't really apply to the Work Group Members because they all, by virtue of being on the Work Group, do not have conflicts of interest.

And, there is Brad Clawson who is the Chair of this Work Group and he's in attendance.

And Dr. Paul Ziemer and Phil Schofield, Members of the Work Group. So, they have no conflicts and they're all in attendance.

And, let's go on and find out who NIOSH ORAU team is with us.

(Roll Call)

Mr. Katz: Okay, that takes care of all the administrative matters, and Brad, it's your meeting.

Chair Clawson: Well, now that I got off mute, that may help.

Well, I'd like to welcome everybody and thank you everybody for coming today.

I think, though, it's been a while since we've had a Fernald Work Group. So, John Stiver, could you give us just kind of a couple minute sound bite of where - - how we've come to where we're at right now and last remaining things that we have to go over?

Could you do that for me? Just sort of get --

Mr. Stiver: Yes, sure.

Chair Clawson: -- so everybody's getting back on the board of where we're at.

Mr. Stiver: Yes, the last meeting we had was back in March, it was March 15th of this year.

And, we were going over the Site Profile issues that

were still open. And, the ones that are still remaining after that meeting are the findings related to constituents and recycled uranium just for the period 1961 to 1972.

And also, the raffinates that are four in uranium and radium and how to handle those.

So, those are the two issues that we're going to be going over today.

Chair Clawson: Okay, thank you.

So, which one do we want to tackle first? Do we want to go into uranium?

Mr. Barton: Brad, this is Bob.

I think probably the quicker of these discussions is going to be raffinate issue.

Chair Clawson: Okay.

Mr. Barton: So, if it's amendable, what I can do is kind of just quickly tee that up a little bit and then isolate those events there through paper and then we can discuss it.

Chair Clawson: Okay, that sounds fine.

Reconstruction of Doses Associated with Raffinate-Area Exposures

Mr. Barton: Okay. And, as John said, what we're talking about is raffinate material that is pouring uranium and radium.

To reconstruct raffinates, there were two methods essentially on the table when this issue really kind of came to fruition.

The two methods, one is to use uranium urinalysis and ratios to get the other constituents that are in with the raffinate.

And then, you have intakes of all of the radionuclides of interest.

Now, of course, the problem with that, if we're talking about uranium-poor raffinates, there's not a lot of uranium there.

So, what is the bioassay program really going to see? They're going to, you know, throw a really large ratio on top of that if we're talking about uranium-poor material.

So, that didn't seem like a very feasible option.

And the other method was to use radon breath analysis, which, of course, requires that there's radium present.

And, again, if we have uranium and radium-poor raffinate material and you don't have the actual radon there, if there's no radium, then that doesn't really see like a viable option.

So, we brought up this issue of the uranium radium poor raffinates. And, initially the response was, well, we really don't think that there's exposure potential there.

And, SC&A came back and said, well, you know, what we do have is we have all of these air sampling studies, also known as daily weighted exposures in Plant 23 during the period of interest. Is there something we could possibly, you know, do with that data to either assign the constituent exposures from uranium and radium poor materials? Or, otherwise prove that the exposure potential is either not there and/or bounded?

That's kind of where we left it off at the last meeting. And, we have NIOSH's recent memo or White Paper on it that came in July.

So, at this point, I guess I'd like to turn it over to NIOSH ORAU and if they'd like to go through what

their response is and what their position is.

And then, I think we can probably have a fairly quick discussion about it.

Dr. Hinnefeld: Okay, this is Stu Hinnefeld. I'll go ahead and lead off and anybody who wants to correct me, go ahead and jump in and correct me from NIOSH or ORAU.

PARTICIPANT: Hello?

Dr. Hinnefeld: Can anybody hear me? Can everybody hear me okay?

(Simultaneous Speaking)

Mr. Katz: It sounds like someone's trying to break in. Is there someone on the line that maybe isn't needing to be on this Work Group call from the public?

Okay.

Dr. Hinnefeld: Okay, I'll --

Mr. Katz: Okay, go ahead, Stu.

Dr. Hinnefeld: I'll go ahead.

Well, we actually had two parts of our approach -- two parts of our paper here and, rather than go through the paper, I'll just sort of summarize.

The one thing we did was we went back, as Bob mentioned, there is a fair amount of air sampling data from the plants in these years that's called a daily weighted exposure information which is essentially air sampling analysis.

And, we looked at locations in the refinery that are - - these locations in the refinery that we think would be probably the most likely location for raffinate exposure if there were raffinate exposures.

And we -- and that was the location in the refinery called the combined raffinate area. And there are DWE studies for that area for a number of years, in these early years.

It's also important to know at this time that according to the information we found in the SRDB, the refinery ran ores from like 1954 through 1958.

They had used up the ores and they started operating -- started using for feed materials, things that were called ore concentrates.

These are materials that have been treated at a uranium mill, chemically treated uranium mill. And so, essentially, the radium has been removed.

It could still have thorium-230 in it. And so, you would still have that additional constituent in addition to the uranium when you were processing ore concentrates.

The -- so, the refinery appeared to run ore concentrates from about '59 through '61 to '62 when the refinery shut down for a number of years and all the refinery -- uranium refinery work was then shipped to Weldon Springs.

In 1966, though, the Fernald refinery reopened, this would be in fiscal 1966. So, it would be in the last - - the end part of calendar 1965.

They reopened the Fernald refinery. But, at this point, the feed materials to the refinery were reclaimed uranium scrap or scrap residue.

So, this is uranium, byproducts of uranium production that were then ran back through the refinery to reclaim the uranium that was still remaining in these uranium -- in these byproducts of production.

And, the key fact here is that, since this had previously been purified uranium, thorium-230 would

be gone from that. It would have been refined out before it ever became this uranium that you could then reclaim and send back through to refine, become reclaimed or recycled. It wasn't -- well, I don't want to use recycled, it was reclaimed scrap.

So, there is also -- now, that's -- we have -- so we have a difference in the feed material between '59 and 1962 and '66 through, I think we had data to around '69 or something like that.

So, the feed materials were different. But, when we looked at the daily weighted exposure data for this combined raffinate area for those two periods of time, the air concentrations were essentially the same to one significant figure.

So, that gave us some clue that now there didn't seem to be a lot of potential for this thorium-230 raffinate or thorium-230 that would have been in there from the '59/'62 period. There didn't seem a lot of potential for that -- for exposure to that.

Because, when they were running material that didn't have thorium-230, the air concentrations were the same as they were from '59 to '62.

So, that gave us some clue that we think maybe we're not -- we're okay here and that there's no real DWE value to use for thorium-230 intake for dose reconstruction.

The second thing to remember when we're doing dose reconstruction during this period is that this material, this uranium ore concentrate was not only handled in the raffinate area, it was also handled at the feed to digestion area.

In other words, the -- you know, they - the material had to be digested in order to be purified. And so, it had to be dumped into the digesters.

And, the thorium-230 would be present there. And

so, people involved in that operation would be exposed to the uranium with thorium-230 for lack of a better concentration, we'll assume it will be in equilibrium with the uranium because it wouldn't be any higher than that and we don't know that it wouldn't be any lower than that.

So, they would be exposed to the uranium and the thorium-230 at the feeding and the refining. Again, we're talking from the '59 to '62 period.

And so, since those people are getting exposed to that, we won't have any way for any particular employees' record of knowing whether they were exposed to their, you know, the feed and/or not. We'll just have to assume that everybody was exposed during that period unless there's a clear, clear reason to believe that they weren't exposed in the refinery and that would have to be pretty convincing evidence.

So, we'll just assume that pretty much everybody exposed during that period, '59 to '62, was exposed to the ore concentrates as they were fed to the refinery.

So, when we do a dose reconstruction based on the uranium bioassay for people during that period, we would add in the thorium-230 and the other constituents that are found in the cold metal raffinate, cold metal oxide tank in Silo 3.

So, all those radioactive contaminants would come along in the proportions in which they exist in Silo 3 with the thorium-230 and the uranium and that would all be applied to uranium bioassay for that period of years.

So, we believe by using that technique, we have clearly -- we feel like we have a bounding method or certainly a claimant-favorable method for doing dose reconstructions during this period.

And, I'll be glad to answer any questions or interested in Bob's reaction and SC&A's reaction to that.

Mr. Barton: Well, I guess, first, are there any questions for Stu before I get started?

(No Audible Response)

Mr. Barton: Okay, hearing none, I think really that second part, Stu, is really the most powerful piece of evidence. And, I know not all the Board Members appear to be on Skype, but I am using the NIOSH spreadsheet where they sort of did these calculations. I'll try to describe it as best I can for the Board Members who can't see it.

And, the first think we're looking at, I guess this is really answering the question. If there was going to be an exposure potential to thorium-230, that was, again, separated out and it couldn't really be detected in a great way by the uranium urinalysis, or at least that could be in theory, you would see that in the daily weighted exposures, you'd see high alpha activity in this raffinate area where the uranium's not supposed to be.

So, what NIOSH did, and I think it's an excellent approach to really get our heads around this problem is to say, well, you know, what are the actual numbers if we were going to kind of simulate this thing?

What kind of thorium-230 dose could we get based on the air sampling data? And, let's go ahead and compare that to the methods that Stu just described about the sort of the front end process where there is still uranium present and they're also adding in a thorium component.

How do components of that actually compare?

So, that's really what they did here. And, what I'm looking at, for those of you who can't see, is the

adjustment of the daily weighted exposures.

And, anything to those for those of you who can see, that's kind of highlighted in green, is sort of an SC&A addition to the spreadsheet.

So, what we're looking at is the air sampling data for that combined raffinate area was your exposures could have happened during the years of interest was almost universally -- it was universally point one times the maximum allowable concentration.

So, just to show that reference right here. You can see here the years of interest times the max and we're going to go down to the raffinate and it's all point one.

So, that's essentially what our starting point is to assess the air sampling data and see what potential do we have for thorium-230.

Now, of course, the assumption that it's all thorium-230 isn't really realistic and I think for the reasons she stated in sort of the first point. But, let's play the game anyway.

And, hold on, I've got to get this out of the way.

Mr. Katz: While you're doing that, Bob, let me ask, I just heard the phone ring and a constant -- there's a constant noise in the background.

Someone, unless that's your phone, I don't think it is, Bob Barton, someone has an open line either a member of the public or it's one of the participants.

And, it's driving everyone nuts. So, can you please either have --

I think that was Zaida trying to work the problem, but either hang up or put your phone on mute, *6 to put your phone on mute if you want to stay on this call, otherwise, we'll have to cut your line.

Thank you.

Okay, sorry, Bob.

Mr. Barton: No problem at all.

Okay, so the number to remember here, when you do very basic health physics calculation, it's only 1.2 meters cubed per hour and your breathing rate per day, a full ten-hour workday, times that value of point one times the max, you get an intake of approximately 26 picocurie per day and that's the number that we're going to keep in mind when we go to look at what happens when we go and use the urine data and a ratio approach.

So, 26 picocurie per day, and I highlighted it here because the point one times the MAC is actually the values given for the period and the location was in Plant 2/3 that we're really interested in. So, 26 picocurie per day.

And, NIOSH did it, they said, okay, we're going to go with the lowest potential of uranium exposure that we can. And it's a uranium missed dose based on solubility Type F.

So, basically, this is -- this would be the lowest uranium intake that you really could calculate.

And, what they came up with is that when you do just the uranium intake, you get about 24 picocurie per day. And, when you add in the ratios, it gets up that -- so that uranium combined with the thorium-230, you're up around 52.

And then, if you only look what would be the non-uranium component which is essentially your alpha component which is mainly thorium-230, based again on that bare bones calculation, you end up with an intake rate of 27 point --

So, anyway, using the uranium urinalysis data and sort of the minimum intake rate assumptions, you

get 27 picocurie per day which actually bounds what we get if we assumed it was all thorium-230 based on the air sampling data.

So that's, again, so it's bounded right there with the bare bones analysis.

Now, I just want to point out, that's Type F highlighted up here in yellow. If you use type M, it's up around a 100 picocurie which actually translates, as you see down in here in green to about a 111, 112 picocurie per day for non-uranium alpha.

If you use Type S as the assumption for -- and, again, this is missed dose -- now you're up around 1,600, 1,700 picocurie per day which, again, we're comparing to 26 picocurie per day predicted by the air sampling data.

And then, one more piece of evidence, I actually went and looked and saw what are the coworker assignments?

And, for Type F, the coworker assignments are more than double that. So, at the ratio, it directly related to -- the thorium intake is directly related to the ratio to uranium.

Again, your thorium intake is going to double. And, that's just the 50th percentile of Type F.

And, you can see these numbers get quite high compared to what the actual thorium intake estimate would be if we used the air sampling data available to us that's in the area where you would expect these uranium and radium for rapid exposures during the period of interest.

So, essentially, what this shows is that even though you wouldn't expect exposures to thorium-230 alone where uranium's not present to be bounded by the uranium urinalysis data, the assumptions made by NIOSH and the TBD, even with the most bare bones

case of Type F solubility, and a missed dose, not even a coworker dose or anything like that, you're still bounding the intake based on the air sampling data.

So, what that tells me is there really isn't the potential to miss a significant exposure to thorium-230 which is the main concerns of these uranium and radium-poor raffinates simply based on using the methodology of ratioing to the uranium when it's present in the front end of the process.

So, what basically NIOSH showed is that their method is going to bound anything that we can come up with using the actual air sampling data which is really exactly what we were looking for and sort of discussed at the last meeting as a way to put this to bed.

So, I was very glad to see that, but I think it's a very pragmatic way to go about the problem and I think it shows that, at least from where I sit, we can put this issue to bed.

Anyway, I showed a lot of numbers out there, probably hard to follow without a flowchart, but if I can answer any questions on that, I'd be happy to.

Member Ziemer: This is Ziemer.

I think the logic follows pretty well. I think, to me, it's a convincing argument. So, I'm -- I certainly support the recommendation to use this.

I do have one sort of question on some of the related documents that were provided in paper. Let's see, I'm looking right now at the one called Fernald DWE Missed Intake. It's a brief paper from NIOSH.

What I'm wondering, as I look at the paper, the first page is called page 1 of 2. And the second page is called page 2 of 3. And the third page is called page 3 of 4.

But, I'm trying to figure out if something's missing

here or is it? Do you see what I'm looking at?

Mr. Barton: I'm looking at the one that was directly off the website and the page numbering is correct on that one. I wonder if it could have been a mistake in the original transcript?

Member Ziemer: No, I'm looking at the ones that Ted distributed. Actually, both of the -- the one called Fernald DW Missed Intake and the one called Fernald Recycled Uranium Constituents, both have the pagination issue which I just want to confirm that we got everything that's supposed to be there.

Because they both start with page 1 of 2. They both follow as page 2 of 3. And then, they both have page 3 of 4.

So, it makes -- it looks like something's missing but wording wise, it looks okay. Do you see where I'm looking down in the lower right hand corner of these things where the pagination is.

Mr. Barton: Yes, Dr. Ziemer, this is Bob. I'm not sure, the one I'm operating off of was on the website and it is -- it's numbered correctly there. I'm not --

Member Ziemer: Yes, okay. So --

Mr. Barton: It could be an error in transmittal or something.

Member Ziemer: Yes, as I read through it, the paper looks fine, so I'm just assuming those are just somehow the pagination ended up in a screwy way. But, the rest of the material follows, I think, the logic is there, the reasoning as well and I'm okay with it.

Mr. Katz: Phil, Brad?

Member Schofield: It seems like a logical way to go to me.

Mr. Katz: Did we lose Brad?

Member Schofield: May be on mute still.

Mr. Katz: Yes.

Chair Clawson: Yes, somebody muted me so I talked there for a while to myself, that's nothing new.

But, anyway --

(Laughter)

Chair Clawson: -- it sounds all right with me. I'm -- it's just I'll need to talk a little on it, but I'm just trying to get my head around all this.

But, anyway, so I guess I'll talk to the other Board Members about this and if we're good with this process, then this will close this issue, correct?

Mr. Katz: Right, right, I think so.

Member Ziemer: It's as pretty clear to me and Bob with this what we're asking here.

Mr. Katz: Okay.

And, Phil?

(Simultaneous Speaking)

Chair Clawson: Yes, it does --

Mr. Katz: What's that?

Chair Clawson: I was going to say, based on the data and everything, it looks like they have managed to bound it.

Mr. Katz: Okay.

Chair Clawson: So, I don't have a problem with that.

Mr. Katz: Okay, so, Bob?

Dr. Hinnefeld: Brad, can you hear me now?

Chair Clawson: Yes, I can now.

Dr. Hinnefeld: Okay, because a few minutes ago when Paul was speaking about the pagination issue, I was trying to speak and I had my mute off but no one could hear me.

I just wanted to explain the paging issue if anybody's interested in that.

Chair Clawson: I'm more worried just about the data than anything.

Dr. Hinnefeld: Yes.

Chair Clawson: But, yes, I believe Zaida went around and muted us all and --

Dr. Hinnefeld: Yes.

Chair Clawson: -- I've got a mute button on my headset that I use. So, I've been talking to myself, too.

But, if you want to just take a minute, I know Dr. Ziemer had that issue. So, if you want to take a minute.

Dr. Hinnefeld: Yes, it'll take a minute, it'll be very quick.

I sent to Ted a version when it was ready to distribute to the Work Group Members and I also sent it out to SC&A so that they would have the text and the content of the memo.

And, I had not paid much attention to the pagination or other of the accouterments that go with it.

And so, our web team, our web person, when she got this -- the copy to post, corrected all those things and corrected the pagination.

So, the version on the website, the paging is correct but it's exactly the same paper.

Member Ziemer: Okay, so, if we got it afterwards --

Dr. Hinnefeld: It has, again, a better cover sheet on it, a better title sheet on the web.

Member Ziemer: Yes.

Dr. Hinnefeld: So you have correct copy.

Member Ziemer: But, we've got everything we're supposed to get, right?

Dr. Hinnefeld: Yes, you did.

Member Ziemer: Yes, got it.

Chair Clawson: Okay, well, that takes care of that issue. So, let's go to the next one. Bob, are you going to do that one?

Reconstruction of Recycled Uranium Constituent Exposures

Mr. Barton: Sure, I mean, maybe in a similar way we just did the raffinate issue. I can quickly tee it up and then Stu or his team can talk about where their position stands and then we definitely have a few more questions on this issue than on the raffinate issue. So anything could happen.

So, anyway, recycled uranium, I'm sure it's, you know, it's been an issue for a long time if we recall way back in the 2011 to 2012 time frame.

For this period we're talking about which is prior to 1973, the ratio that had been agreed upon at that time was a 100 parts per billion plutonium on a mass uranium basis. So, a 100 parts per billion.

And, that -- the whole issue was really put in abeyance until the TBD was revised and we could kind of see those numbers, you know, in the flesh, so to speak.

When the revised -- until TBD came out, though, we

noticed that, for this time period, the 100 parts per billion had been reduced to 10 parts per billion.

So, over at SC&A, our natural reaction was, well, what's the reason that the agreed upon ratios have been reduced?

At that time, it was postulated that, well, we re-examined the underlying data which is in the very sensitive report, we refer to it was DOE 2000, but now, it's basically an entire report on recycled uranium that includes a lot of data for recycled uranium.

And so, we said, okay, well, when we went into that database, we couldn't figure out who you knew which samples were for the period we're looking at. So, from that period prior to 1973, or more specifically, 1961 to 1972.

That's when NIOSH sort of gave us the information which is contained in the same report that says, well, you know what? DOE 2000 says that these lot ID numbers which are a string of alphanumeric numbers associated with each sample, there's actually a way to decode them or a certain portion of them to obtain the month and year in which, you know, that lot was on site and being processed and whatnot.

And so, we went in and we did --

(Pause)

Mr. Katz: Bob, did you just go on mute?

(No Response)

Mr. Katz: Bob, we can't hear you.

(No Response)

Chair Clawson: Hello?

Mr. Katz: Who's that?

Chair Clawson: That's me, Brad.

Mr. Katz: Oh, Brad? Okay. All right, I'm trying to -
-

Chair Clawson: Yes, I think --

Mr. Katz: We lost Bob somehow.

Dr. Hinnefeld: This is Stu.

If you'd like, I can try to pick up for Bob and describe what he did.

Chair Clawson: Well, we need to -- we need to make sure Bob is back on the line, though.

Dr. Hinnefeld: I think he will.

Chair Clawson: Because, we just --

Dr. Hinnefeld: I don't know if what happened to him happened to me because earlier, I was chatting and my mute button is a light on my phone. I push it to go -- it comes on and push it and it goes off.

So, I clearly was off mute and no one could hear me.

Chair Clawson: Yes, right.

Mr. Katz: Zaida hasn't --

(Simultaneous Speaking)

Mr. Katz: -- recently, so it's not Zaida in this case.

Dr. Hinnefeld: Well, his phone could have dropped him.

Chair Clawson: Yes, Bob are you out there?

(No Response)

Chair Clawson: Hey, John, you may want to text him and let him know he's talking to himself.

Mr. Stiver: I was just getting to do that. Hang on, sir.

Chair Clawson: Appreciate that.

Yes, because I was going through and every once in a while I'd hear mute is off, mute is off and mute is on. And, I thought, well, maybe, you know, they're just checking to make sure where the -- somebody had an open mic or something because mine is actually in the cord that I mute with. But I talk to myself, too, Stu. So, you're not the only one.

Dr. Hinnefeld: I still talk to myself even though there's a light on my phone that tells me when I'm on mute.

(Laughter)

Chair Clawson: I know very well.

Mr. Katz: Kind of lonely doing that.

Chair Clawson: Well, sometimes, you know, the responses back are a lot more cooperative.

(Laughter)

Mr. Katz: That's true, that's true.

Bob, are you with us yet?

Mr. Barton: Oh, can everyone hear me?

Mr. Katz: Now we can, yes.

Mr. Barton: Okay, so I just gave my spiel and apparently nobody heard it.

Chair Clawson: And, you know what, Bob? It was a magnificent one, but I had a question right at the beginning there.

(Laughter)

Mr. Barton: What was the rest of it? Was that the question?

Chair Clawson: Yes.

Mr. Barton: Okay, so, I'll try to do it again, maybe a little quicker than I did the last time.

But, recycled uranium, you know, as everybody in the Work Group knows, this has been an issue that's been kicked around for a very long time, even going all the way back to the 2011, 2012 time frame.

At that time, the Work Group and NIOSH and SC&A had agreed upon RU constituents. And, just for the sake of simplicity, we'll just talk about plutonium.

The agreed upon ratio was 100 parts per billion plutonium during the period of interest prior to 1973.

And so, it was put in abeyance again until the TBD was revised and we could see that number as actually in a document. And the TBD was revised and when we went through it, we thought, well, that 100 parts per billion was actually changed down to 10 parts per billion.

So, naturally, our question was, well, you know, what's going on? Why -- what was the rationale for lowering it by a factor of 10 from what we agreed upon before?

And, at that time, the response was that the data had gone under I think what was described as a qualitative reassessment and that would basically show that all of the data or 95 percent of it was essentially below one part per billion and that the remainder of the data was still lower than 10 parts per billion.

So, the 10 parts per billion would certainly bound that situation.

So, SC&A went in to sort of verify that analytically

and we couldn't figure out how to associate the given samples in this recycled uranium database with an actual date when it was on site.

So we brought that back, you know, and asked NIOSH, how are you guys actually decoding this to get a date?

And, NIOSH pointed us to a section in the source report where the data comes from that allows you to use a certain sequence in the lot ID number, which the lot ID number is a series of alphanumeric separated by dashes.

And, if you look at one specific section of it, you can essentially decode what the month and year was for that lot sample.

So, when we did that and we analyzed the data, our results were coming back in line with this notion that, well, all of the data is less than one part per billion. And, if not, it's definitely less than 10.

So, we wrote that up in a memo to distribute it and that's actually on the website.

And so, NIOSH took another look at that database and came to the conclusion that, well, you know what? The whole decoding the dates from the lot ID doesn't look like it's actually a valid solution.

And, that absent that, we really have no way to tell which of these RU data points are prior to 1973 which is the period that we're talking about.

And so, Stu sent that out in the email with NIOSH's rationale behind that. And, last week, they provided a new response absent analysis of the data since it was deemed that that data is not usable on why they still feel that 10 parts per billion is a bounding value and appropriate.

So, if everyone heard that spiel, I'll try to hand it over to NIOSH again, Stu or whoever to present their new

White Paper.

Dr. Hinnefeld: Okay, this is Stu and I'll -- first I'll explain how we came to the conclusion that we should look at these, it's called the lot sequence number, the number that we originally told the Work Group could be used to date the samples in the DOE 2000 report.

And, we reconsidered that. And, what I was doing was, I was essentially trying to recreate what Bob had done in his memo which I thought was quite well done.

And so, I'm looking at that, I said, well, my initial read of it was, oh, he's kind of got it locked here, this was just about right.

But then, when I started looking at the data and looking back at the lot marking numbers guidance which is also in the DOE 2000 report, it's somewhere around, oh, PDF page 670 or so out of 1,242 pages, that tells you how big that report is.

When I looked back at that, I saw that there are actually several options for assigning lot sequence codes given in that guidance document for how to assign lot sequence codes.

It can be, as we thought, it can be a monthly tally starting in January of '61 or '62.

It could a specified number of containers of -- and there was a qualifier. It can be a monthly count if there's only one lot produced per month or less than one lot produced per month. Or, I guess if there's one lot produced per month.

It could also be a specified number of containers which would not necessarily correlate with the date.

And, it also can be a lot size that's specified by criticality concern.

So, there are several conditions right off the bat that say, well, maybe this isn't exactly a monthly tally.

Another section of that report says that this lot sequence code for materials generated off site is a particular number that's drawn off the material shipping form that sites had to fill out when they shipped materials between accountability codes. They sent this off, in this case, they sent it off to DOE.

And so, that didn't seem like that correlated -- would necessarily correlate with months, either. And, in the interim, ORAU has actually checked some shipping records that we have, I don't think we have a comprehensive set, we checked some shipping records of these forms where materials -- that the sites had to fill out when they transferred materials. And, there doesn't -- it doesn't seem to be a date or related to date.

And, in fact, today's instructions for filling out that form, at least for the NRC, says that you just number your forms in sequence.

So, the first time you as Holder A ship to Holder B, that is form number one. And, the second time you as A ship to B that would be form number two.

So, in the case of materials generated off site, the sequence number certainly couldn't be used to identify the date.

Now, you can identify materials that were generated off site by a different set of numbers in the materials in the lot code. It's the -- I believe it would be probably the production order number or either the production order number or the source code.

But, there's a three-digit, there is a section of the lot sequence number that is -- it's alpha, it's letters if the material is generated off site and it's numeric if it's generated on site.

So, what I did when I started looking at the data to see if I could -- what effect this information would have on the data in the database that actually has the Excel spreadsheet that Bob had worked on.

I first of all, sorted essentially by lot sequence number and got all the lot sequence numbers that would correspond to the early years up through 1972 and just looked at those.

And, I got approximately the same number of data lines that Bob used in his analysis. So, I figured I'm on the right track.

And then, I look for materials that were generated off site. And, I exclude -- took those out of my analysis and just deleted those from the spreadsheet I was working on. And, that was quite a large number of the data, not all of them, but quite a large number of them.

And so, I was still left with, oh, I don't know, somewhere around a 100 or so data lines.

But, every one of these data lines had a notation that it was UO₃ generated from feed plant ash, that's not quite right. Almost all of those data lines, there were maybe two or three didn't have that notation.

And, they all were saying UO₃ generated from feed plant ash. And, I said, well, that doesn't seem like there would be that many analyses in those from way early. And, in fact, the feed plant ash didn't show up until later according to the Ohio Field Office reports, that DOE 2000.

And so, it seems like these lot sequence codes really can't be used to date any of this data. So, I'm not sure how much of this -- if there's any data that I can find that I can use lot sequence codes would give us any information about the date.

So, that's where I started, you know, so that's what

led me to the conclusion, that's what we sent out -- that Amy sent out the email about correcting some incorrect information we have provided.

And then, we went ahead and worked on our analysis as best we could recognizing that there's not a lot -- it doesn't seem to be a lot of analytical data that's in that big analytical spreadsheet that relates to the early years.

So, we looked elsewhere in the Ohio Field Office report and I ought to probably get my paper out here to see what we covered in our paper.

There are other things from the Ohio Field Office report, there is a table in the Ohio Field Office report that identifies when materials were received from off site.

And, this is in the, let's see, just give me a second here to catch my thought.

Yes, this is found in the table, Table E.2-4 of DOE 2000, that's on page E2-A. There are tables that show when materials in different categories were sent from other facilities to Fernald.

And, that table -- and one of the categories of materials that are listed in that are feed plant ash and tower ash are the material categories.

And the earliest receipt for any of the three gaseous diffusion plants for 1973 for those materials.

There's quite a bit of other information either in the Ohio Field Office report or in other Fernald documents that say the Ohio, you know, the feed plant ash clearly was the bad actor.

Overtly, it was the source of material from 1981 and later was 17 hoppers from Paducah that were identified as feed plant ash.

That material and the aftermath of that material is

pretty well characterized and there are lot of samples, in fact, virtually all the sampling for transuranics took place as the result of the identification of that material and then the effect that that material had on the products going on to the plant.

So, there's other information in other Fernald documents about how Fernald was aware and on the lookout for contaminants in recycled materials.

There was a sort of shipping specification for movement of materials between DOE sites of -- sometimes it was quoted as 10 parts per billion, some places it's quoted as 1,500 GPM of transuranic alpha per gram of uranium.

So, I mean there was some knowledge of -- watch out for this stuff. We don't see -- I couldn't find any convincing evidence that material, particularly high in transuranics were received prior to 1973.

So, it just seemed to us that, well, lacking data to the contrary, it's seems like this 10 value which seemed to be sort of in place, maybe not firm -- a firm specification, but seemed to be in place for certain kinds of shipping, you know one to one site agreements seems to be about the best we can do.

Keeping in mind that we are in the SEC for the SEC period, '61 to '72. And so, we're going to reconstruct what we can. We know there was some transuranic so we just feel like the 10 parts per billion was a suitable number.

I know Bob has questions about this because I saw his slides about 15 minutes before the meeting started.

So, anybody else, before we start with Bob?

Member Ziemer: Well, it's not clear to me what the bottom line here is.

Dr. Hinnefeld: Well, part of the bottom line is that there's almost no information, analytical data before 19 -- in this particular data from '61 to '72.

There is a 1985 report, this report -- that report was generated when the recycled material first, you know, in my experience, really came to light. That was in the early '80s and that was the Paducah feed plant ash, the 17 hoppers.

Member Ziemer: Mm-hmm, mm-hmm.

Dr. Hinnefeld: From that point on then, there was quite a lot of investigation into transuranic content.

And, there was a report published in 1985 that attempted to claim to report this is what we know about the recycled materials that we have received from various places and the plutonium content.

And, there's not a lot of data in there, but the data that is in there, in each case, whenever there was data for recycled material, the plutonium content was left as 10 parts per billion.

So, our bottom line is that that number's out there, the 10 part per billion number is out there. That seems to be certainly there was some. Or, you know, people recognized there was some transuranic contaminant in the recycled uranium. But that seems to be a number that is supported.

And so, we feel like that is about the best we can do in this period when we're reconstructing, you know, like we say in our SEC rule, we'll reconstruct what we can reconstruct.

Member Ziemer: Yes. And you would consider that a bounding value in those cases, is that what you're saying?

Dr. Hinnefeld: I think it's an appropriate value. I'd say I'm less confident of bounding in the case of --

Member Ziemer: Oh okay.

Dr. Hinnefeld: -- transuranics than I was in the case of the raffinates.

Member Ziemer: Mm-hmm.

Dr. Hinnefeld: I'm pretty sure that was bounding.

Member Ziemer: Yes.

Dr. Hinnefeld: I think in this case, I think it's the appropriate value to use. But, again, we're in an SEC Class period here when we are reconstructing what we can reconstruct.

Member Ziemer: Right, right. Which is an occasional case, I guess, right?

Dr. Hinnefeld: I think that happens on occasion. I mean, we --

Member Ziemer: Yes.

Dr. Hinnefeld: -- can do what we can do. And, in our view is that, you know, there's not data that takes us anywhere higher than 10 parts per billion.

Member Ziemer: Right, that's what --

Dr. Hinnefeld: Until the ash shows up, one --

Member Ziemer: Yes, it's not bounding in essence but it's --

Dr. Hinnefeld: Right.

Member Ziemer: -- a value that you believe is justifiable to use in those cases where you can do a partial reconstruction?

Dr. Hinnefeld: Right, that's what we think.

Now, I will point out that the feed plant ash that was analyzed that we know was really high in plutonium

came in, oh, somewhere around '80, around 1980. I think it was a little after 1980.

But, the -- that's the material that we know is bad.

Member Ziemer: Yes.

Dr. Hinnefeld: If there was feed plant ash received in 1973 that was not analyzed and so we're saying we're completely comfortable with keeping the same values that were generated based on the 1980 values back to 1973. Because feed plant ash that came in '73 wasn't analyzed so we don't really know.

Member Ziemer: Mm-hmm.

(Simultaneous Speaking)

Member Ziemer: There are --

Dr. Hinnefeld: -- our position. Our position --

Member Ziemer: Yes.

Dr. Hinnefeld: -- was essentially timed with the arrival of feed plant ash. And that's what --

Member Ziemer: Yes, got you.

Dr. Hinnefeld: -- materials really got higher.

Member Ziemer: Well, Bob Barton has got some additional questions on this. Then where are we, Bob, on SC&A's?

Mr. Barton: If we -- can everybody hear me, first of all? Because last time I was on mute.

Chair Clawson: Yes, Bob.

Mr. Barton: Okay, great. Okay, great.

I do have some questions, you know, we kind of had to throw this together pretty quickly just because of, you know, the difficult timing trying to get all these

things together.

But, we did have some questions. Before we sort of completely discard the DOE 2000 database, I did have a couple questions on that.

Based on your email, Stu, and removing lots that came from offsite and they had the alpha designation that you could tell they were coming from different facilities and there's a way to actually decode that to see which facility they were coming from.

Just to get rid of that, I do see what you're saying in general.

I will note that in this database, about 25 percent of the data actually have a specific date listed with them, there's an actual date column.

Unfortunately, again, that only covers about a quarter of the data points. And, only one of those, one data point out of the entire lot had a specific date provided prior to 1973.

I would note that that single value, if you use the lot ID method, the dates match up exactly. And, of look at the period past 1972, so the later period essentially.

There's almost a 1,000 entries that specify a date. And, in each one of those, the lot ID method works, again. But, again, that was only when there was a specific date listed.

If they only had the lot ID and no date, we really have limited options how to verify or try to figure out when those things actually were at Fernald.

So, my first question was, for all the ones that don't have a specific date, we know that if it had a specific date, when we did the lot ID method works. If it doesn't have a specific date, we don't know as much.

Do we have any idea what those remaining samples

that have a lot ID number that, if you decoded it using the date method, what would those numbers - - do we have any idea what those numbers actually match up to?

I heard you say that, for the outside receipts, you were able to match shipping records. I'd say that, yes, that's what the lot ID was referring to. It wasn't a date, it was the number on the shipping record.

And, it sounds like from your previous discussion, there were some other options. I think I heard criticality or the number of lots in a sample or something like that.

Have we been able to take any of these data points for which we're not sure of the date, we don't trust that the lot ID is giving us the correct date, for all those remaining samples, do we have any idea, were we able to match them to any other documentation to show that, yes, this is clearly not representing the date of the sample, it represents A, B or C?

And, so I know you said that the team was able to match things up for off site receipts based on the shipping records. Was there any ability to match up the remaining data to say what those lot numbers actually represented?

Because I think that would be a good piece of evidence to say, yes, well, clearly, you know, we can match this sample to this, you know, this, you know, any number of the sort of characteristics that you had just described?

I guess that's my first question.

Dr. Hinnefeld: Well, I can --

Mr. Barton: So, if we don't think of it as a date, do we have any idea what they are?

Dr. Hinnefeld: I can -- I have an idea that is that I can show on some documentation that leads me to a

particular conclusion.

But, you guys can decide how convincing this is.

And, this really relates to the data lines from the -- from the spreadsheet that has all the sample data on it.

It relates to the data lines that I was left with from the -- where the lot sequence number initially led me to believe that these were pre-1972 or pre-1973 samples. But then, I later concluded were not.

It's a big long list of UO₃ from feed plant ash. And, the production order number, which is another segment of the lot ID number, is in each case, is S as in Stuart, 125.

And so, when I looked at the procedure for assigning lot sequence, and this is the procedure from 1999 and this is in DOE 2000 and I'm looking specifically at PDF page 681 of DOE 2000.

It describes how that production order number is assigned and, at this point in 1999, that number was being assigned by the Nuclear Materials Disposition Organization.

Now, that's relatively -- and now, this is relevant to this time period, so this is 1999. So, this was the environmental remediation period. Because production stopped in '87.

So, this is -- now they're remediating the site and so the Nuclear Materials Disposition group is assigned these numbers.

And, the paragraph of -- says, 2.12 says, when enriched and uranium materials of a regular percent U-235 content for which no production order is applicable are received or generated special designations are assigned as outlined in the following paragraphs.

The first one is, S, the letter S, followed by three digits indicate the onsite producing plant's best estimate of highest G-35 content processed over a particular campaign.

So, this S-125 material that is -- that originally I thought had the early dates based on lot sequence numbers, that material, I believe, was the material that was in the refinery, that had to be cleared out in order to be dispositioned as they remediated the plant.

Because, there was, when the recycled uranium, quote, with the high Pu content was, quote, discovered, those 17 hoppers had already been emptied and the material had been processed in various ways including had been dissolved and there was quite a lot of material, liquid UNH, in the refinery that they had produced from that that had Pu contents and somewhere around the 40 part per billion range.

And so, there was quite a puzzle about what to do with that. There was a short-lived attempt to try and turn it into green salt in Plant 4 that was the material in Plant 4 was not well enough contained to deal with it in the DOE's judgment so that stopped pretty quickly.

And so, they still had all this UO₃ they had to rid of and I think it was dispositioned in order to be, you know, it was processed in some fashion in order to be disposed of as excess material.

And so, that's how that production order number, S-125, was assigned.

So, I can't make that judgment for a whole lot of other things and what other lot sequence codes meant, but it seems like that, for whatever reason, the nuclear materials disposition, by the time they started cleaning out the refinery and generating material to get this high Pu content UO₃ out of the

way so they could disposition it, it seems like they maybe started sequencing over again. Because, those sequences start very low.

So, that's my speculation on those. But, I haven't gone through and identified other things that the lot sequence code might correlate to.

Mr. Barton: Okay, I think I understand that explanation.

I did have a couple other questions on the database, but I think it's probably going to be better just to move on, because I don't think we're ever going to get to a point where we're going to trust the actual data in DOE 2000 to be able to use it.

So, I think I'm just going to skip up to my next -- okay.

Now, this is really talking about the 10 parts per billion limit. And, it's trying to look at when was this actually in place at Fernald.

And, you had discussed some of this as it is in the report from the NIOSH memo.

It says, Cavendish 1977, that's a reference to 1977, also indicates that there was an established permissible limit of 1,500 dpm per gram uranium, for transuranic uranium products to be shipped.

Now, we went into that report and it appears to me, at least, that that was not a Fernald requirement, that was from Paducah and that was for the product material.

So, I'm not sure, again, it's not necessarily a Fernald guideline, but that's what Fernald had to get it down to be able to ship it back. And, again, we're talking about 1977 and so, this is, you know, five years after the end date of the period we're talking about.

And, I'd also point out that that one was actually just

slightly higher than 10 parts per billion, but not much, you know, it's like 11, 12 something like that.

And, the other part of this is from that 1985 report on page 5 says, a second finding of the task force on recycled uranium was that most DOE facilities do not have specifications for acceptable levels of TRU and fission product impurities and recycled uranium.

Consequently, the recycled facilities were directed to develop such specifications. The specification adopted by FMPC, Fernald, was that the total alpha activities from TRU elements in recycled uranium shall not exceed point one percent of the alpha activity from uranium.

This equates roughly to 10 parts of plutonium per billion parts of uranium on a mass basis if the plutonium was the only TRU element present.

This was adopted in late 1985. So, it seems like the 10 part per billion wasn't really a stringently adopted limit at Fernald, again, until late in 1985.

So, this kind of raises the question, you know, what was being looked at during this period of interest? Can we back-extrapolate this policy both to the 1977 Paducah limit for shipping product back to them and then this 1985, it looks like the 10 parts per billion plutonium wasn't really in effect until late 1985 at Fernald.

So, that's kind of a rhetorical question, I'm not really -- I don't know if you have a better answer for how we can establish that 10 parts per billion was the limit used prior to 1973?

Dr. Hinnefeld: Well, I'm not sure how much documentation I can find about this. I do know that I'm confident that Hanford's PUREX had specifications on its product that it, you know, the recycled uranium that shipped.

And, it was just sort of to make sure the process was running correctly, if for no other reason. But, it was -- I'm sure it was -- I'm pretty sure it was in the order of 10 parts per billion and that was sort of an agreed to number that they would meet.

But, I don't know if I can find any documentation of that.

So, that was, you know, that was a big receiver.

And, I don't know how old that or when they, you know, when these worries really started happening, you know.

The recycled uranium we talked about arriving in '61, that means that's when the stuff that had been through I think it was the Hanford, I think it was Hanford, it could have been Savannah River, started to be arriving at Fernald.

And, I'm pretty sure that, during those times, the PUREX process was, you know, was evaluated and seeing how good it was, it was kind of in those areas or kind of in that range.

They can certainly make 10 parts per billion and so we would make sure they do that.

But, there was not -- as that '85 report points out, there is no -- there was no universal GB standard for shipping this stuff around and we're trying to reconstruct information from pretty far in the back - - in the past based on, you know, what little documentation we could find.

So, I don't, you know, like I was explaining to Paul, can I say firmly bounding like I did with raffinate? I don't know that I can.

I just think it's appropriate based on the way the process -- things were handled.

Recall that, you know, the feed plant ash was

material that was actually accumulated at the gaseous diffusion plants quite a while as kind of a byproduct that had uranium content in it, some uranium values in it, so it wasn't thrown away.

But, it got to -- it had to get to the point where did we really want to use that uranium in order to go get it out of that stuff?

So, this was really, you know, an out of the ordinary experience. It was not the typical shipping around of, you know, well-processed stuff through PUREX, sending it right back because that went on for a long time or the well-processed stuff through Savannah River sending that back.

This -- it was special because it was so different, it was really one up step kind of equilibrium condition.

So, that kind of -- where I'm coming from, I don't -- I kind of despair finding definitive information that will make us feel really, you know, the same way we feel about this that we did about the first issue.

But, I just don't think there's a better number to choose here or a better place to go.

Mr. Barton: I understand, especially, you know, since that rationalized database seemed like it was going to be an excellent place to start so I --

Dr. Hinnefeld: Oh, I know, when I found that out I was disappointed. I was all ready to address your, you know, bless your paper and pick like a rank order of 95th percentile.

Mr. Barton: Yes, I understand.

And, I think the discussion about whether it's appropriate versus bounding and putting it in the SEC context is important. I think that's important because, ultimately, what we have here is really a lack of data that we can actually use to make a distribution and to find out what the upper bound

values might be.

And so, it really is, it's a judgment call as to do we go with a value that's sort of as close to the mark as we feel we can get? Or do we select something that's bounding in the interest of all this uncertainty surrounding those contaminant levels during this earlier period?

And, I'll just move on quickly, because I think it's better if we just kind of get into a discussion of whether the appropriate value is appropriate or whether a bounding value is a better choice.

So, here, this is, again, from the NIOSH memo and it goes right back to this and sort of supports the conclusion that the average plutonium contaminant level did not exceed 10 parts per billion.

And, again, this goes back to what I was just talking about, is the average concentration sufficiently bounding? And, the answer is, well, we really don't know.

NIOSH gives the appropriate value, but, as we said earlier, are less confident that it's actually a bounding value. So, that's really a question for the Work Group and everyone is, how do we feel about using sort of the data we have or average concentrations versus trying to put a bounding number on it?

This is also from one of the references, I believe this is also the 1985 report, okay, here we go.

And, it really -- it's really the bottom here during the past few weeks we have initiated plutonium analyses on a routine basis in our laboratories in order to characterize our present inventories.

And so, I guess my question there is, and there's probably, I imagine, not a great answer to this, but when it says present inventories, we're talking about 1985 and I guess my immediate knee-jerk question

was, well, are those representative -- what you had there in 1985, is that going to be representative of what was going on prior to 1973?

I'm not sure that that's a question that can be answered.

Dr. Hinnefeld: Well, I was there in 1985 and I was personally involved in that 1985 report. You've probably seen my name on it. And, there's -- you'll see my name on a lot of stuff from 1985 around this.

I'm pretty sure there was probably not much inventory sitting around from 1973 still in 1985. I think they didn't tend to, you know, to accumulate a lot of waste, which I don't think they accumulated a lot of inventory that they intended to use and kept it around that long.

So, I'm guessing, the current inventory was material that had been generated fairly frequently -- fairly recently.

I do know --

Mr. Barton: I know --

Dr. Hinnefeld: -- the specification. I'm very familiar with this one and it is, you know, 1,500 parts -- 1,500 dpm per gram is a little higher than the 10 parts per billion plutonium.

But, remember there's some neptunium that comes along all the time, also.

So, the combined neptunium plus plutonium had to be less than 1,500 dpm or less than point one percent.

And, 1,500 dpm per gram, that's natural uranium as point one percent of natural uranium's alpha activity.

Mr. Barton: Yes, different ends on the calculation. I really was under the assumption that this specific

activity is plutonium, you know, really quashed the contribution of neptunium in any other --

Dr. Hinnefeld: Yes.

Mr. Barton: -- but --

Dr. Hinnefeld: The plutonium is essentially obviously the dominant player but there always is some neptunium along and you had to consider both. And, the, yes, natural uranium is 1.5 million dpm per gram. So, 1,500 is point one percent of that.

Mr. Barton: All right.

So, the answer to that is really that the analysis done, at least in 1985 where it talks about that, was for present material.

Dr. Hinnefeld: Yes, I'm pretty confident there was nothing sitting around from 1973 still that he was referring to in terms of current inventories.

Mr. Barton: What we're looking at now is an excerpt from that 1985 report. And, all I really wanted to point out here is that, you know, we have some data here that was referred to in the NIOSH memo.

And, what I pointed out here is that there are several, especially in the early years, where, you know, it started out because there's no analytical data for plutonium, not even an average data.

So, again, I'm -- what I'm really trying to point out is, there's a lot of uncertainty and lack of information here as far as to try to actually characterize it and putting a number on it.

Which really brings me to my last point is, how we could think about how you deal with these sort of situations at other sites?

And, one immediately came to mind because it just crossed my desk recently, and this was a site where,

during the earlier time frame, they had radionuclides that they had no bioassay data for, no way to really construct an intake.

But, what they found and used was that a NUREG document that, well, if you know how much was actually used or (telephonic interference) in a given year, you could multiply that by a simple factor and that would give you a reasonable approximation of what the intake.

Now, obviously, there's a whole lot of certainty is preceded with that.

And, in this particular instance, this is actually from Report-90 and it talks about what that factor is, they talk about where it came from. And, at the end, and they kind of bolded it here, factor of 10 was added to ensure conservative evaluations.

So, I know it's always dicey. There's a lot of nuances between sites. They're all sort of different.

But, the commonalities I see here is, we have radionuclides that we don't have monitoring data for, bioassay data. And, we're trying to figure out a way to come at the problem and, well, I guess the question is come at the problem either bound or make a reasonable assessment of what those intakes were.

And, at this site, they had the same problem. They had radionuclides with no bioassay data and they had a method that obviously had a lot of uncertainty to it.

And, they -- and NIOSH elected to throw sort of an arbitrary factor of 10 on it to ensure that the evaluation was conservative.

So, I guess that was my last point. You know, I think this -- believe this comes down to a judgment, what is appropriate?

Is it appropriate to try to really bound the numbers? In which I think SC&A certainly feels that the original values agreed upon back in 2012 of 100 parts per billion are bounded -- bounded those exposures.

And, let's not forget, that value changed essentially because we felt we had usable data that indicated that that number was really bounded sufficiently by 10.

And, as it turns out, we can't use that data for the number of reasons explained today.

So, essentially what we have is less knowledge than we had back in 2012 yet we're at a lower number. And, you know, usually that door sort of swings in the other direction.

But, as you say, this is really a question of whether the appropriate number is acceptable to the Work Group or whether a bounding number is preferable, in which case, you know, a 100 or something certainly higher than 10 would likely bound it.

And so, there's a whole lot of uncertainty, again, about what the site limits were. What was the actual material handled there at the site during this time frame?

You know, we're trying to back-extrapolate the policies.

So, again, when you have all this uncertainty surround a value, and if you were going to try to bound it, that is, then it's certainly been done at other locations where sort of an arbitrary number like a factor of 10 is thrown on to ensure that it's conservative.

And, as it so happens, a factor of 10 on 10 parts per billion really gets us back to what the original agreed upon ratio was.

But, again, it's a professional judgment question

about whether we want to be comfortable that we're bounding these exposures or if we're comfortable that the original 10 parts per billion is closer to the mark and appropriate, I guess, given the SEC considerations.

But, I would say, yes, these are partials, but the SEC was not for uranium, it's for thorium. So, it's kind of a different exposure source altogether.

So, anyway, I don't know if anybody has any questions for me. That's really all I meant to say on the subject.

John, I don't know if you have anything you want to add here. I know you were heavily involved with RU back in the -- back in those early discussions back in 2011, 2012 when we had the original ratios.

I don't know if you have anything you wanted to add.

Mr. Stiver: Well, Bob, I'm kind of feeling at the time, we were actually part of the full SEC issues. And, we were really concerned with bounding at the time.

I believe that 100 parts per billion number really did come from a factor of 10 upon the -- what was kind of the, I guess, agreed upon product specification. It wasn't really put into kind of a formal basis, but we really kind of followed and, you know, because the PUREX process could produce material at that level.

But, because of all these uncertainties that you've outlined here, I believe that's where the factor of 10 came from.

So, I guess, once again, the question for the Work Group is, you know, are we happy with just the best guess estimate or do we want to try to bound it?

In the past, when we have these kind of uncertainties, at least I've seen, and at least Bob demonstrated here with Report-90, the most recent example, yes, a factor of 10 was deemed

appropriate.

So, I guess I'd put that out there to the Work Group and if they feel this is the best factor to go forward with.

Dr. Hinnefeld: This is Stu.

If I could just say one or two things.

Report-90, I hadn't looked up, I didn't know what it was. It's for exotic radionuclides produced at the Oak Ridge National Laboratory in the Isotopes Division. So, that would be essentially a laboratory probably with hot cells.

And, because --

Mr. Stiver: Yes.

Dr. Hinnefeld: -- NUREG-1400 is, you know, takes 10 to the minus 6 times the quantity you're working with in essentially in a laboratory for that possible intake.

But, I think Bob's point more was like to if you have an estimate maybe at, you know, at an order of magnitude and putting conservatisms in to make sure you're bounding.

And, there is no Class recommendation here. I mean, they really made sure they had been bounding dose estimates.

Is that my feedback I'm hearing back on my phone? Because I'm hearing something kind of a little after me -

Mr. Katz: Yes.

Dr. Hinnefeld: -- that's kind of strange.

Mr. Katz: It is. It's not necessarily your feedback, it's a feedback from someone's not muting and it's coming through their phone or whatever and going

into their mic. But, so --

Dr. Hinnefeld: Okay.

Mr. Katz: So, but it's been going on.

Dr. Hinnefeld: So, in that situation where that factor of 10 was added, they really were trying to bound the dose because it was not a SEC Class and they wanted to make sure they had a bounding dose then.

As to the point that the other Class was added for thorium, that's true. I think if -- but just because of that and because this particular constituent wasn't called out, I don't interpret that to mean that you need to have a bounding estimate for every other component.

You need to have a reasonable dose reconstruction for, you know, which is the standard for dose reconstruction has to be reasonable.

And, I believe this is a reasonable dose reconstruction is that to use the number that certainly seems to be the prevalent number until the unusual treatment, stuff that was not treated usually, this feed plant ash, was introduced into the system.

You know, PUREX can get far better than 10 parts per billion. I mean, they just made sure they were, you know, most -- almost all the stuff that came from PUREX was below that.

So, and I would agree that there's a lot of missing data before 1973, actually before 1980, there's just not a whole heck of a lot of data and we're trying to make the best sort of informed judgment we can here with, you know, where we can't -- where we don't have enough information to view analytical data.

I just feel pretty strongly that, look, if you -- we're in an SEC Class. We've said that, for partial reconstruction -- dose reconstruction as an SEC Class, we'll do what we can do and, to me, you know,

10 parts per billion is the number to stand on because there's really no reason for any other number to stand on, or at least, some qualitative discussion type information that 10 is probably the right number.

Mr. Stiver: This is John.

Actually, I was the culprit, I had my phone unmuted while you were talking.

But, yes, I understand the reasoning here. I'm just trying -- I always feel like when there is a high degree of uncertainty and maybe a bounding approach is probably more appropriate.

But, I guess to ensure, you know, maybe there was some stuff that came through that was quite a bit higher. And, they just have no record of it now, there's no identifiable data.

So, we have to err on, you know, the side of claimant-favorability while still trying to maintain, you know, sufficient accuracy and so forth.

But, I still try to tend to lean towards a factor of 10 because, I guess, we disagree on that. But, I certainly understand your logical sequence that you were going through there.

Dr. Hinnefeld: Yes, my only take on this is that anything, you know, this factor of 10, anything that's just speculative and arbitrary. Why a factor of 10, why not a factor of 5?

Mr. Stiver: Exactly, what do you decide how much uncertainty --

Dr. Hinnefeld: So, if anything beyond that is just speculative and we have at least some basis for saying 10 is probably an appropriate number.

Member Ziemer: Well, and the other thing is that I think the equal of having a bounding value is to what reality?

Mr. Katz: So, Paul, you're hard to hear. John Stiver, can you mute your phone again?

Go ahead, Paul.

Member Ziemer: It just seemed to me that introducing a bounding value at this point where you already have an SEC and you have a situation where you weren't able to bound things to start with, it's hard to believe that that's the way to go on something like this.

If you do go that way, how -- what do you do in cases where you're trying to partially reconstruct? You can't go wrong when you have an SEC.

Do you always have to use a bounding value? I don't think we have that in the past. We used the data that's available and --

Chair Clawson: Well, this is kind of an unusual one but Fernald always has been one.

I think, you know, looking at this and this is just my personal take on this whole thing, we're already in an SEC issue. We're trying to get the best value for those that do not fall under the SEC and so that we'll be able to use this information, we have a goal.

I don't think that we thought -- we also want to go to the most claimant-favorable that we can. But, I don't think that we're going to attempt to -- I'm kind of sitting here looking at this.

You know, we've done about everything that we can for it and we're going in there and we are trying to be the most claimant-favorable as we are.

I'm just -- I'm looking to the other Board Members of their suggestion to fast forward this.

I agree with what Stu said and I understand what John is saying. But, I don't think, in this situation, where we've already got an SEC that we need to

make sure that we're bounded by this.

So, I guess I look for Dr. Ziemer, Phil, of you guys' feelings on this, too.

Member Schofield: This is Phil.

I think that, you know, 10 parts per billion seems like a reasonable number, especially since this is -- under the SEC. As you said, we're not really looking for a bounding number here.

Chair Clawson: Right, and actually, if you remember, when we started off into this, how many years ago, Mark, have been battling around with this, we didn't really have the SEC in at this time.

And, I think we've got to this position. And so I think we're just going to have to, myself, I'm seeing that we ought to just go with the 10 parts per billion and go on.

Paul, what do you feel?

Member Ziemer: Well, as I indicated, I think that we don't need to look for a bounding value on this part of it. I think that -- I'm inclined to support the -- you go with what looks best, the value that --

Chair Clawson: Okay. Paul, you're kind of cutting out there a little bit. So --

Member Ziemer: Yes.

Chair Clawson: -- I take it that you're kind of in agreement that we go ahead and go with NIOSH's recommendation?

Member Ziemer: Yes.

Chair Clawson: Phil, you're good with that, too?

Member Schofield: Yes, I am.

Chair Clawson: Okay, then that being said, I think -

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(Simultaneous Speaking)

Review Status of Fernald Site Profile Issues/Plans
for August ABRWH Meeting Report

Mr. Stiver: If I could just jump in for a second?

I think you guys are probably right on this. You know, given the situation we're in, if there is an SEC and that's the best number we've got. I guess SC&A is fine with that, too.

Chair Clawson: I appreciate that.

So, that being said, we'll go off NIOSH's recommendation.

But, I would like, before that, Ted, I would like to say one thing, I appreciate the work and everything that went into these. And, I am in agreement, but Stu, as usual, you brought some sound judgment into these things and made us look from a different point of view and I appreciate that.

I appreciate -- tell everybody I appreciate all the work they've done on this.

So, Ted?

Mr. Katz: Yes, two things, I just want to applaud the coming to a conclusion. I think that's great.

And, then, I think John and Bob were both of them have already gotten a head start on preparing a presentation for the Board meeting. I had asked them to do that and just leave gaps for the stuff that's unresolved, which it looks like they did.

So, we should be able to get a presentation out from Bob and John pretty quickly I think, is that right, Bob? John? So that we can be ready for the Board meeting?

Mr. Barton: We have placeholders in the presentation that's ready to go. It just needs to be updated from this meeting and then we can move forward with it.

Mr. Katz: Yes, so that's great, that's great. And, again, I just also applaud the Work Group, which has gone through an enormous amount of work and consideration on this site and I think it's a great day that you've gotten through all that work.

Thank you.

Chair Clawson: Okay, that being said, do we have anything more that we need to cover on these? I believe this is the only issues we had.

Mr. Katz: Yes. Well, I think just reflecting in the presentation at the tail end, that the Work Group is recommending the Site Profile review be considered complete and then, that'll take care of it.

Mr. Barton: Very good.

Adjourn

Mr. Katz: Yes. So I think we are done then, right?

Chair Clawson: Yes, that's correct. I just wanted to make sure that there wasn't any outlying issues that we still needed to take care of from either side from SC&A or NIOSH to be able to complete this.

So, not hearing any, this Fernald Site Profile will be complete.

Mr. Katz: Okay. Thank you, everybody.

(Whereupon, the above-entitled matter went off the record at 12:30 p.m.)