**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**

# BLOCKSON CHEMICAL

The verbatim transcript of the Working Group Meeting of the Advisory Board on Radiation and Worker Health held telephonically on August 28, 2007.

*STEVEN RAY GREEN AND ASSOCIATES*
*NATIONALLY CERTIFIED COURT REPORTING*
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**C O N T E N T S**
August 28, 2007

**TRANSCRIPT LEGEND**

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-- (sic) denotes an incorrect usage or pronunciation of a word which is transcribed in its original form as reported.

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-- "uh-huh" represents an affirmative response, and "uh-uh" represents a negative response.

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

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

# P A R T I C I P A N T S

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KOTSCH, JEFF, DOL
MAKHIJANI, ARJUN, SC&A
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NETON, JIM, NIOSH
THURBER, BILL, SC&A
TOMES, TOM, NIOSH

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

(10:00 a.m.)

**WELCOME AND OPENING COMMENTS**

**DR. LEWIS WADE, DFO**

**DR. WADE:** Hello out there. This is the work group conference room. Is there anyone with us on the telephone?

**UNIDENTIFIED SPEAKER (by Telephone):** Yes.

**DR. WADE:** Okay, thank you. As long as we know it's working, we'll start with our formal introductions. This is Lew Wade, and I have the privilege of serving as the Designated Federal Official for the Advisory Board. And this is a meeting of the work group of the Advisory Board. This is the work group on Blockson Chemical SEC, Special Exposure Cohort. That work group is chaired by Wanda Munn, members Roessler, Melius and Gibson. Munn, Roessler and Melius are in the room with us.

Is Mike Gibson on the phone?

(no response)

**DR. WADE:** Mike, are you with us? Mike

Gibson?

(no response)

**DR. WADE:** That doesn't limit our ability to proceed. What I would ask, are there any other Board members on the phone? Any other Board members not part of the work group that are on the telephone?

(no response)

**DR. WADE:** Other Board members?

(no response)

**DR. WADE:** Okay, we don't have a quorum of the Board, which is important. If we did, we'd have to take steps to remedy that. So we can proceed.

What I'd like to do is go around the table here and have each introduce. And for the participants of the NIOSH/ORAU team or the SC&A team, I'd also like to, you to identify whether you have any conflicts relative to the Blockson site. Board members can do that as well.

I have two special introductions to make before we begin, and that is I have Dr. Christine Branche with me. As I mentioned previously, Dr. Branche will be working with

me, understudying me, and eventually the plan is that she'll take my role at some time in the future. And then on my right I'll let you say your name so I don't mispronounce it.

**MS. BURGOS:** Zaida, Zaida Burgos.

**DR. WADE:** Zaida Burgos, who will be taking on LaShawn's responsibilities and, in fact, an expanded role in serving the Board. And we have wonderful expectations of the service Zaida will be able to bring to the Board. So with those as early introductions, again, I'm Lew Wade. I serve the Board and work for NIOSH.

**MR. ELLIOTT:** Larry Elliott, I'm the Director of NIOSH's Office of Compensation Analysis and Support. And I have no conflicts regarding Blockson Chemical.

**DR. ROESSLER:** Gen Roessler, member of the Board.

**MR. THURBER:** Bill Thurber from SC&A, I have no conflicts regarding Blockson.

**DR. NETON:** Jim Neton from NIOSH, no conflicts.

**MR. TOMES:** Tom Tomes from NIOSH, I have no conflicts with Blockson.

**MS. MUNN:** Wanda Munn, Board and chair of this working group, no conflicts.

**DR. WADE:** John, we're doing introductions.

**MS. MUNN:** John is back.

**DR. MAURO:** John Mauro, SC&A, no conflicts.

**DR. WADE:** Now Dr. Melius has stepped out for a moment. I don't see him. He's a Board member, a member of this working group and has no conflicts at Blockson.

Let me go out onto the telephone and ask if there are other members of the NIOSH/ORAU team who are on the telephone to identify themselves.

(no response)

**DR. WADE:** Jim, are you expecting anyone else to be?

**DR. NETON:** No.

**DR. WADE:** Any other members of the SC&A team on the telephone?

(no response)

**DR. WADE:** John, are you expecting any?

**DR. MAURO:** No.

**DR. WADE:** What about other federal employees who are on the call by virtue of their federal employment? Other feds that are

working today.

**MR. KOTSCH (by Telephone):** Jeff Kotsch, Department of Labor.

**DR. WADE:** Welcome.

**MR. BROEHM (by Telephone):** And this is Jason Broehm in the CDC Washington office. I just joined the call.

**DR. WADE:** Welcome, Jason.

Other feds?

(no response)

**DR. WADE:** What about members of Congress, their staff or representatives?

(no response)

**DR. WADE:** Are there any workers or worker representatives on the call? Petitioners? Workers?

(no response)

**UNIDENTIFIED SPEAKER (by Telephone):** Yes.

**DR. WADE:** Would you like to identify yourself?

**UNIDENTIFIED SPEAKER (by Telephone):** No.

**DR. WADE:** Thank you.

Is there anyone else on the call who would like to identify themself?

Okay, Wanda.

One brief caution about telephone etiquette, although we have a very small group today. Remember that for this group to be able to participate fully with those on the phone, it's important that you observe some rules, those of you on the telephone. If you're speaking, speak into a handset and don't use a speaker phone.

If you're not speaking, mute the instrument that you're dealing with so we don't hear background noise, and be particularly mindful of background noise at your location. Sometimes people will put the phone on hold and we get Muzak, and that's very distracting for us. The older of us appreciate it. It puts us to sleep and sometimes those naps are helpful.

We do have Dr. Melius. No, we don't have Dr. Melius with us. Now we have Emily. Introduce please.

**MS. HOWELL:** Emily Howell, HHS.

**DR. WADE:** Wanda, you can begin.

**MS. MUNN:** As a first issue, are there any additions or revisions to the agenda which I forwarded to each of you by e-mail earlier

this week?

(no response)

**DR. WADE:** Let me see if I can secure Melius.

**INTRODUCTION BY CHAIR**

**MS. MUNN:** If not, then we'll proceed to address the limited number of issues that are before us. Originally, our contractor had brought to us six specific findings of their review of our TBD and two secondary issues.

In each case those had been resolved with only two remaining outstanding issues. The primary one revolves around the thorium issue, what transpires with the raffinate. How much thorium does and does not stay with the uranium as it goes through the process at the Blockson Chemical Company.

If that issue is adequately resolved, then the other minor outstanding issues will fall into place because they are all intimately connected to what happens to the thorium.

**THORIUM ISSUE**

I propose to begin this discussion by asking NIOSH to comment on the report that was

given to us by Dr. Elzerman. That's Elzerman, isn't it? An R. And the response to Dr. Mauro's e-mail memo of the 20th. I don't know which of you gentlemen wants to address that issue first.

**DR. NETON:** Well, if I might, I might suggest it would be better if SC&A would provide their commentary on the fate of the Thorium-230, and then we could take it up from there.

**MS. MUNN:** I would appreciate that. I would also appreciate having on the record a little bit of background with respect to how the individuals were chosen to give us the report on the chemistry. I was a little surprised when I read that report because it was not what I had anticipated coming out of the Blockson meetings with the workers.

I had thought that what we were doing was looking for some very specific responses from chemical experts who could tell us with some degree of authority what could be expected. I found more of a review of the literature and not nearly as much specificity as I had expected out of that report. I was

also a little surprised that our contractor's report was cited as one of the authorities for their information.

So with that having been said, any information that anyone can give me with respect to the selection of these individuals, whether the charge that was given to them was more extensive than was actually given in the report which we got back -- please.

**DR. NETON:** Maybe Tom can speak more to the --

**DR. WADE:** Before we begin, Mike Gibson is now with us.

Mike, you have no conflict with regard to Blockson. Is that correct?

**MR. GIBSON (by Telephone):** Right.

**DR. WADE:** Okay, thank you.

**MR. TOMES:** Yes, our contractor, ORAU, had, George Fargo, was given the task of looking at this issue for us. And we, through conversations we've had with him, we thought that it would be appropriate to have a expert in the field look at the Blockson chemistry, thorium specifically. And there was a few individuals identified. One of the

individuals that was identified who has published a number of papers was not available and could not meet our schedule we were looking for. And Dr. Elzerman was one of the people who was recommended, and he's also involved (unintelligible) industry. And he was available and could meet our schedule roughly that we were looking for. Not as fast as we would have liked to have it, but he could do the work. And that is the reason that he was selected because he had experience in the field, and he had credentials where he published and studied the industries.

As far as the task he was given, his report is pretty much, and I won't say it's verbatim, but it's pretty much identical to the task he was given in the statement of work from ORAU. He was simply asked to look at the uranium. What could have (unintelligible) with the uranium. It was identified as an issue by SC&A in the review.

And he also was asked to strictly look at thorium in Building 55 and what behavior that may have been in the chemistry. And part of that I think was being able to take many

references that are out there that's to evaluate the past and have an expert opinion to interpret all those references. And that was one of the things that we wanted to see in that report. And that is pretty much what he gives.

**MS. MUNN:** It is, yes.

John?

**DR. MAURO:** Yes.

**DR. MAKHIJANI (by Telephone):** John, before you start. This is Arjun. I just joined a minute or so.

**DR. MAURO:** Okay, Arjun.

I'll sort of set the stage a bit of what we did, and probably I'd like to turn it over to Bill who really was, Bill Thurber, who you folks may have just met, who led the effort.

The bottom line is we had, when the thorium issue emerged and we originally identified it, there's some history here. There are a series of documents. We don't have to go all the way back.

**MS. MUNN:** No, no, we don't.

**DR. MAURO:** But in the end, in the end where

we merged was that NIOSH in their most recent version of their site profile addressed our concerns regarding Thorium-230 by saying that, well, as you process the uranium, the thorium goes with the uranium, and in the end there's this big 55 gallon drum filled with uranium and all the Thorium-230 is sitting there also.

And we felt that that was certainly could be a very reliable, genuine claimant-favorable approach except for one possibility. And that is if for some reason along the way when you start with the original ore, and you go through all the chemistry, and at the back end of the process you come out of this 55 gallon drum yellowcake, is it possible that somewhere along the line the nature of the chemistry was such that the Thorium-230 would part ways from the uranium.

And if it does, does it part ways in a way that could actually have higher concentrations in terms of curies per gram than it would in the 55 gallon drum? Because if it could, and it could become airborne, then in theory that's a scenario where a worker who might be handling that waste

stream, that raffinate, whatever it is, could, in theory, experience higher exposures to Thorium-230 airborne than the worker who was handling the can of uranium. And we didn't have an answer to that.

So what we did is we had two individuals with our organization. One is Dr. Bill Richardson, coincidental name, who is a professor at Auburn University, inorganic chemist, and independent of that, Janet Schramke, who is also a geochemist, independently looked at it.

And it turns out that the nature of the problem has to do with, you know, you start off with the ore, and you go through these steps where, in effect, you're changing the pH, and you're causing various materials to precipitate out, some materials to stay in solution, and there's an ongoing process of dissolution and re-precipitation. So that in the end you get as pure a product of uranium as you can.

Now along this sequence of events, and I'm going to ask Bill to go into it a little bit, the question that was raised, really more

of a question was a concern that in our opinion it did not appear to be self-evident that the thorium will, in fact, go all the way through this process and end up in the 55 gallon drum. And there are particular nodes in the process where the nature of the chemistry was such that it could have parted ways.

Now we're not saying that if that happened, in fact, our feelings are it probably did part ways, but whether or not that resulted in an outcome that had a greater potential for a thorium exposure than the one that was used, we don't know. And I guess the next step would be, I guess, I would ask -- by the way, in the process we were able sort of like the eleventh hour to -- I don't know if everyone got a copy of this memo that I sent Wanda. I'm not sure what the distribution was -- where we reviewed Dr. Elzerman's report. And the bottom line as best I can tell, Dr. Elzerman was asked by NIOSH to take a look at this very same question. It reads to me that he came out more or less in the same place we did.

**DR. NETON:** Not exactly.

**DR. MAURO:** Not exactly, and it's important that we understand that difference in there. But it was sort of in the same theme. It wasn't that clean cut. That's where we come out.

Now with that as an introduction what we can do if you like, I made copies of a flow diagram that many of you may have seen before in some of the documents. I made 20 copies. And Bill could explain the places along the flow diagram where the uranium and the thorium may have parted ways, and if it did, what the possible implications are from a dosimetric point of view. And then maybe at that point you folks, we can say, we can understand if there is any disagreement. And if there is, what its possible significance is. Is that a plan?

**MS. MUNN:** That's feasible to me, and one of the things that would be helpful for me also is if you could tie the diagram that you have in your hand, John, to the one that was in Elzerman's report.

**DR. MAURO:** I think it's the same one. It

is the same one.

**MS. MUNN:** Is it?

**DR. MAURO:** It should be. Oh, no, it's different.

**MR. TOMES:** It's not the same one.

**MS. MUNN:** For those of us who are not chemists it would be helpful, I think --

**DR. MAURO:** Would you prefer to work with that one?

**MS. MUNN:** No, no, the one that you have is just fine. We've seen both of them, and having seen both of them --

**DR. NETON:** This one is in the TBD. It's in the site profile.

**DR. MAURO:** We found it very useful.

**MS. MUNN:** That being the case since it varied from the data capture discovery review document that we had from Dr. Elzerman, I made a preliminary attempt to match the two of them in my visual framework and had a little bit of difficulty following the two. That's why I asked. We'll rely on the one that was in the TBD that you've just passed around unless we have indication that there's a major difference in the two. And I'm assuming that

you're going to be able to tell us that, right?

**MR. TOMES:** To my knowledge there's no major difference in the two.

**MS. MUNN:** Okay, Bill?

**MR. THURBER:** I think if you start at the top line there, the Blockson monosodium phosphate process, during this step the pH of the solution is raised from a very low value for the phosphoric acid to a pH of about four. And that is done here with sodium hydroxide or sodium carbonate.

And it's not clear which reagent was used although in the Elzerman Report, he chose to assume that it was sodium hydroxide. There was other evidence provided and included in the Elzerman Report that says that Blockson at the time was purchasing large quantities of sodium carbonate so it could be either one.

We don't think it makes a great deal of difference. If it was sodium carbonate, it would probably increase the solubility of the thorium passing out of this box on the flow sheet, if you will, because of the possibility that the thorium might form some complexes

with the carbonate ion. But we identified previously, and as did Elzerman, the possibility that some thorium would be precipitated during this set because as the pH is increased to about four, the Blockson literature notes that a number of species such as iron and calcium and so forth do precipitate.

And there is a possibility that some of the thorium may precipitate there. And I think both we and Elzerman identified this as one point where the thorium might be removed in a waste stream. Now whether it is concentrated in that waste stream, we can't say. We just don't, there's not enough information on the chemistry to come up with any really positive conclusion as to the concentration.

**DR. NETON:** Where would this precipitate out and be removed from the process though? I don't see a filtration step here or --

**MR. THURBER:** But if you look at the Elzerman document, I believe he includes that in there.

**DR. ROESSLER:** Where does it happen on this

diagram?

**MR. THURBER:** Monosodium phosphate is a box which embraces several unit operations. It's a great oversimplification of what happened in that process because what actually happened in the process is you add a base. You increase the pH; species are precipitated, and they are filtered and disposed of. So those steps all occur in that box, but they don't show in the flow diagram.

**DR. ROESSLER:** And so it doesn't show where the other route would go if it doesn't go with the phosphate liquid.

**MR. THURBER:** No.

**DR. NETON:** But in your opinion as a professional chemist, would that likely be a quantitative separation of Thorium-230 at that point? I mean, you're talking --

**MR. THURBER:** No, no, we think it's probably small quantity --

**DR. NETON:** Very small quantity, that's important though.

**MR. THURBER:** I didn't say very small. We don't know.

**DR. NETON:** That's important though. It's

not a quantitative separation where one would have pure Thorium-230 in these filters.

**MR. THURBER:** We do not believe that to be the case, no.

**MS. MUNN:** And frankly, this is one of the kinds of issues that I was disappointed in with respect to the report. I would really hope that we would have a clearer definition of what the possibilities were. What the probabilities were.

**MR. THURBER:** There's just not enough information on the chemistry, and what they actually did. We thought, we looked at the FUSRAP Report, and it had in there some measurements of the thorium content of the disodium phosphate. I thought, gee, this is good, but it's totally irrelevant because that was done at a later time when presumably they were making a different end product than the monosodium phosphate that was being produced at the time of the uranium recovery.

So to repeat, unfortunately, the available information on chemistry just is not good enough to predict what we would all like to be able to predict about the concentration

of the thorium in that strip. We think it's small, but beyond that we can't say.

**MS. MUNN:** I would have liked to have been able to say if were carbonate, then this is what you would expect. If it were phosphate, then this is what you would expect.

**MR. THURBER:** All we can say is qualitatively if it was carbonate, then less would have been removed at that step. But that's very quantitatively.

**MR. TOMES:** One thing. There are a couple references that did use the carbonate. There is a couple references that they did.

**MR. THURBER:** I'm sorry?

**MR. TOMES:** There are a couple references that they used soda ash, the carbonate for the neutralization.

**MR. THURBER:** Yes, indeed, and I pointed out, but that was not the assumption that Elzerman made. He assumed it was sodium hydroxide. But it was the view of our people that it was not a substantive difference which reagent you assume. Small difference, not substantive.

**DR. NETON:** I think your point is there

wouldn't be much difference, and you agreed that it would be a small separation, not a very quantitative concentration step. And at this point as far as I could tell, what we put into the drum isn't more highly concentrated than this stuff would have produced.

See, we have to keep in mind the end product of what we ended up putting into the drum and how concentrated that was relative to all these different steps where there may have been some separation. We don't disagree with that. But you have to look at the end product of what we dumped into the drum and exposed the workers to on a chronic basis versus the small potential separation.

I've done a lot of (unintelligible) chemistry in my earlier days working with (unintelligible), and I know that it's somewhat difficult to separate thorium from uranium. You have to work --

**MS. MUNN:** Really hard.

**DR. NETON:** -- not really hard, but it's not, you have to do some special things to make sure thorium is removed so you don't have thorium contamination uranium end product. So

that's why I'd be interested to hear in these various chemical steps where those quantitative separation steps would have happened. If they were like --

**MR. THURBER:** As we said, we cannot --

**DR. NETON:** But I think you can make some value judgment as to how concentrated it could have been in each of these steps. And that's what I'm interested in.

**MR. THURBER:** The other point where there's a small difference I believe, and again, I believe it is not a substantive difference, is that we think there's, if you look on the diagram, you'll see next to the filter box filtrate return to the monosodium phosphate production kind of on the second tier of the figure.

**DR. MAURO:** Left-hand side?

**MR. THURBER:** Yeah, you'll see a caption there. It says filtrate returned to monosodium phosphate production. We think, again, that there's a possibility that not all of the thorium was precipitated with the uranium at that point. And so some of it was returned downstream to whatever Blockson did

with the material. Again, we don't think it's a quantitative separation in your terms, but we think there's a possibility that some thorium may have gone in that direction.

**DR. ROESSLER:** Let me ask you a question. There where it says filtrate returned to monosodium phosphate production is the one you're talking about. Does that mean it recycles through the process?

**MR. THURBER:** Well, it ends up in the end product where it's not concentrated presumably.

**DR. ROESSLER:** This makes it sound like it goes back up and goes back through --

**DR. NETON:** No, this will go back out of the plant.

**MR. THURBER:** You have to take product out at some point. That's what you're trying to do is make a product to package and sell.

**DR. MAURO:** You know how it helped me to think about this? The way I visualize this or I'm reading this is that you have this operation ongoing where they were making monosodium phosphate. This was what they did commercially.

And they had this system, and they knew that the whole system was such that when they finished their product, the uranium stayed in the system. And they wanted to build a kidney, in other words, they wanted to stick on to this process that was making monosodium phosphate a way to bleed off the uranium because that was a special product they want. So what this step is, the one that Bill just pointed to is, in effect, what they just did is go through that kidney.

In other words they sent the phosphoric acid which contained the sulfur, the phosphoric acid with the uranium, with the thorium into this kidney, the side stream. And then they returned the monosodium phosphate, the arrow going to the left, to back where it started from to resume their normal commercial production.

**DR. ROESSLER:** It doesn't go back through --

**DR. MAURO:** And what it looks like to me is that here's a place where when they, that little box called filter just to the right of that, that's where all the action is. That's where they're tweaking the pH or the

(unintelligible) or whatever so that we can pull the uranium out but let the monosodium phosphate stay in solution and go back to where Building 44 wherever they were doing their normal thing.

And the question becomes at that tweaking spot, there may very well have been good reason, maybe reason to believe that some of the uranium -- I'm sorry -- some of the thorium may have gone off in that direction.

Correct me if I'm right, Bill. I don't believe that issue was addressed in the Elzerman Report, that possible option. And I guess our folks felt that that was a possibility, which by the way, the only reason I bring it up is if, in fact, there was some substantial amount of thorium that stayed in the liquid that went to the monosodium phosphate process. What happens there, well, we don't know. It may stay and be diluted in this enormous volume of the phosphate product. Or it may have come out in some purification step.

You could correct me if I'm wrong.

So there's an unknown there if some of

it did go that way.

**MR. TOMES:** Let me ask you about the Elzerman Report. I believe he did not specifically address the monosodium phosphate that was returned to, but he did evaluate that step in the process.

**DR. MAURO:** Okay.

**MR. TOMES:** He did do that.

**DR. MAURO:** Did he come out saying that that might have been, that the thorium might have been --

**MR. TOMES:** He did not identify that as any significant --

**DR. NETON:** Again, I don’t know if this would be a quantitative separation of thorium. Here again, I view these as sort of chemical losses in the recovery of thorium. If one were trying to recover thorium --

**DR. MAURO:** You’re going to lose some over there.

**DR. NETON:** -- you’re trying to recover uranium, but let’s say that the chemistry is sufficiently similar that the thorium will track the uranium for the most part. I think we all agree with that. And you’re going to

have some line losses, so to speak, along the way. And we don't disagree with that.

**MR. THURBER:** And I think that's a reasonable perspective to put on it, just what he said.

**MS. MUNN:** But the concern for those of us who are not physical chemists is how significant is that loss? How significant would the thorium exposure be? And the frustrating part of it from my perspective is I didn't get that out of the report. I had hoped to try to get at least a range out of the report, and we didn't get it. But I don't mean to interrupt.

Just want to make sure -- Dr. Melius has joined us at the table. Did you get a copy of this, of the pass around?

**DR. MELIUS:** I've been here for quite awhile, Wanda.

**MS. MUNN:** Well, I know you have. This is the first opportunity I've had to mention that you're back, and I wanted to make sure that you had the handout.

**DR. MELIUS:** Yes, I do. Thanks.

**MS. MUNN:** I'm sorry. Go ahead, Bill.

**MR. THURBER:** Well, I think that really pretty much summarizes it.

**DR. MAURO:** There was one more step in the back end if I recall. There's a purification process for the uranium. That's sort of weighted down in the throw. You almost envision, okay, now we've got, at that step where you see the filter and to the left of the word filter it says filtrate returned to monosodium, at the filter, here's where you're pulling the uranium out. Here's where the, you're finally making a product of uranium. But the uranium itself is not very purified. So as I understand it there's a series of steps of dissolution and re-precipitation along the way to try to get as pure a product as you can.

**MR. THURBER:** That's right.

**DR. MAURO:** It was my understanding that during that process somewhere along the way there was another opportunity for the thorium to go separate ways. The degree to which it could occur I wish we had better answers for you.

**DR. NETON:** But I think we can say there's

probably not a quantitative separation again at that point.

**DR. MAKHIJANI (by Telephone):** Could I ask a question? This is Arjun. Isn't part of the question here the ratio of uranium and thorium rather than the amounts of thorium which go off into the raffinate stream? Because the amount of uranium in the raffinate streams would also be an issue even if most of the thorium goes off with the uranium.

The ratio of thorium to uranium in the raffinate streams may be much bigger. I think given that we have uranium bioassay but not thorium measurements, I think the ratio would be important. Perhaps I'm wrong, but that's the question that seems to me central.

**DR. NETON:** I'm not sure, Arjun.

**DR. MAURO:** Let me jump in. I think I understand, and I think that that's a valid concern. Think of it like this. You've got this 55 gallon drum of uranium. And let's for the sake of this discussion assume that all the thorium for all intents and purposes ends up in that drum. Then you say, okay, now we have people that are filling the drum. In

other words you have these hoppers, and they're filling the drum. And the dust that's coming up off the process is going to be some kind of milligrams per cubic meter of dust that people are going to breathe. And that milligram is made up of uranium yellowcake and thorium in equal amounts because they're in equilibrium.

**DR. NETON:** Activity wise.

**DR. MAURO:** Activity wise, so if you've got a curie of uranium in the can, you've got a curie of Thorium-230 in the can.

**DR. NETON:** Exactly.

**DR. MAURO:** And then if you kick up a milligram, whatever the specific activity is you've got to know that you have equal amounts of, so now you have, now you're inhaling x amount of uranium and x amount of thorium. So it's the ratio. Now, let's for a second presume that it goes that route and that's exactly the method that you folks adopted so that you account for the intake of thorium.

Now, Arjun's perspective is, oh, wait a minute. Let's say for a moment that only a small fraction, let's say 20 percent -- I'm

making this up -- of the thorium goes in a different direction, and it ends up in some small volume raffinate, relatively small volume raffinate. But for all intents and purposes its specific activity, the number of curies per gram of material is much higher.

Now I think there's a lot of curies or millicuries in that particular box that we don't have on this chart, but if it has a much higher specific activity in terms of curies per gram, even though the total curies is lower, the curies per gram might be higher even though the volume is smaller because that creates potential for the guy whose job it is to get rid of that stuff to go in, clean out that pit, wherever that side stream is generated. And if it dries out, and I guess it's a question we don't have the answer to.

**DR. NETON:** Let me try to put some perspective on this issue because I've thought about this some in the last week or so. We feel it's claimant favorable to put all of the thorium into the drum for several reasons.

One is that the processes are similar. The chemistries of thorium and uranium are

similar, and we've already discussed the fact that in general thorium will follow uranium unless you do some pretty specific things to try to concentrate it. We see no evidence anywhere in the plant that that occurred.

Now, when you dump the thorium and uranium in equal activities, uranium has an activity, Uranium-238 of about 330 nanocuries per gram. So for every gram of uranium you dump in that drum, you're also dumping 330 nanocuries of thorium. That's 330 nanocuries of thorium per gram of material. That's a huge amount.

In fact, if you take the original input stream which is 40 picocuries per gram of each, and if you assume that you've got 100 percent recovery, which is not necessarily true, but it can get that high, you have concentrated that thorium by a factor of about 8,000. That's a pretty good concentration step to assume in this process, and probably not unreasonable given the similarities of the chemistry.

So we dumped it all in there. We concentrate it by a factor of 8,000, and we're

giving simultaneous exposure to both uranium and thorium to every worker on a chronic basis. I know of no other step in the production process of this material that concentrates thorium to that extent or I've not heard of any either.

Secondly, if one looks at the DOE history of raffinate, admittedly the chemistries could be different, but a raffinate stream that would produce 330 nanocuries per gram of Thorium-230 is pretty darn high. In fact, I went back and looked at what the Thorium-230 in the raffinate at Fernald is which was a well-known raffinate-using, highly concentrated Belgian Congo ore. The entire Silo 3 at the Fernald site had about 60 nanocuries per gram of Thorium-230. So I am at a loss to think of any other step in this process that would have concentrated to a higher degree than what we put into the drum of uranium. I'm open to suggestions.

**DR. MAURO:** Oh, no, no, I didn't know that what you just said. And what you're saying that when you search for it, because you're processing uranium all the time. And you're

saying you would have to generate that kind of side stream, and you haven't seen it.

**DR. NETON:** Well, I've not seen 330 nanocuries per gram generated on a basis like this.

**DR. MAURO:** Has anyone ever taken a sample of the 55 gallon drum to see what's in it?

**DR. NETON:** Of this material?

**DR. MAURO:** Yeah.

**DR. NETON:** No, I don't think so.

**DR. MAURO:** Or a similar operation to see how much thorium makes it over?

**DR. NETON:** No. But I think the point is not that did it quantitatively go. I think we all agree that it probably did. But the question is did it quantitatively concentrate anywhere to a greater degree than what we put into the drum. And that's really the relevant issue here.

**DR. MAURO:** I agree.

**DR. ROESSLER:** But what you're saying really to me is speculation. The question, which we don't have an answer to, and I think what you have to do is evaluate this ratio or whatever --

**DR. MAURO:** I agree.

**DR. ROESSLER:** But the other thing you asked about, has anybody ever measured in the drum. Are there any measurements in these off-streams? Is there any indication from any process or anybody who's done any measurements to show that there is thorium in it?

**DR. NETON:** I've looked a little bit at the Florida Institute of Phosphate Research report which they're voluminous reports, 300-page reports. I've seen nowhere in any of those reports, now, admittedly this is more current day chemistry of these phosphate products. I don't think it's fundamentally different than what happened back in '55.

There is nowhere that I have seen that anyone was concerned about the presence of Thorium-230 concentrated in raffinates to an extent that we have to get to that would be higher than 330 nanocuries per gram. In fact, the most recent study in 1998 that was put out, of which Wes Bolch is one of the authors, did a fairly extensive -- extensive is probably too strong -- a reasonable survey of the chemical phosphate industry including the

wet chemistry process.

And there are air samples out in the plant where they're not seeing high airborne concentrations of materials. In fact, I think the highest concentrations they could get were about a picocurie per cubic meter of activity in the air at a location where they were actually changing out filters and such.

So I've not identified in the phosphate industry a place where a filter would (a) have to have a huge, more than 330 nanocuries per gram of Thorium-230, and be dry and manipulated to the extent that it can generate these large air concentrations to expose the workers greater than what we've done in the drum.

So there's sort of a --

**DR. MAURO:** What you're saying is there are some powerful circumstantial evidence that says that that's just not happening. And you're not getting something worse than what you've assumed.

**DR. ROESSLER:** I think it's bounding what --

**DR. NETON:** It appears to us to be a pretty good, solid logic flow to this versus the

hypothetical scenarios that have been presented.

**DR. MAKHIJANI (by Telephone):** This is Arjun. I think maybe I didn't make my point. I wasn't understood or something. The question isn't the degree of thorium concentration from the ore to the uranium drum. I mean, anytime you process ore, you're going to get poor quality ore, you're going to get very large concentrations as the concentration factors.

I think the question is the ratio of uranium to thorium in the various streams. Is the ratio of uranium to thorium in the drum bigger than the ratio of, or comparable, to the ratio of uranium to thorium in the raffinate streams. And this is not different than the problem we had in Mallinckrodt in terms of internal intakes. Although the chemistry is different, the conceptual issue is the same.

**DR. NETON:** But, Arjun, what I was suggesting is you have to find a mechanism where the concentration factor was higher than around 8,000.

**DR. MAKHIJANI (by Telephone):** No, that's not the point, and that is what I'm trying to get across is if the ratio of thorium to uranium in the raffinate streams is 20-to-1, it doesn't really matter because you don't have a measurement of thorium. You're trying to base your thorium intake estimate from your uranium measurement --

**DR. NETON:** No, no, no, what I'm saying is --

**DR. MAKHIJANI (by Telephone):** -- and it's a 1-to-1 ratio in the drum. And I think the ratio's more important.

**DR. NETON:** What I'm saying is picocuries per gram of material inhaled, you would have to concentrate it more than 8,000 times to get more picocuries per gram inhaled, per unit mass of material inhaled, than what we have put into the drum. I'm not considering uranium as radioactive. I'm just saying it's a gram of substance, and there are 330 nanocuries of thorium per gram of material in the drum.

Forget the fact that it's uranium. Now, what I'm saying is you would have to find

a mechanism that would produce more than 330 nanocuries per gram of filtrate somewhere where it concentrates to that extent in the plant, and we just don't see that. I'm not seeing any evidence of that occurring.

**MR. ELLIOTT:** We have an outreach meeting that we've scheduled where we're going to speak to workers about how we have changed the site profile technical basis approach here. And is there a point in the diagram here that we should try to pursue a little better elucidation of the processes that occurred at that point or that step? Do you know what I'm trying to say here?

**MR. THURBER:** Yes.

**DR. MAURO:** Jim, I think you've nailed it in terms of what is the question. Sometimes that's the whole ballgame; what's the right question to ask. Is there any reason to believe that there are any components anywhere along here where the picocuries per gram, not uranium, picocuries per gram of matrix, material, it dried out. And is it possible that you could have more picocuries per gram of material, dry material, that is greater

than the picocuries per gram that's in the 55 gallon drum?

**DR. NETON:** Exactly.

**DR. MAURO:** And I never thought of it in those terms. But if a case could be made, an argument could be made that says we just don't see it. We just don't see it as you had pointed out from looking at the literature. Notwithstanding you may get these bifurcations. The out product, even if it dries out, and it may not even dry out, but even if it dries out we're saying it's still going to be lower than what's in the can, the 55 gallon drum. I find that to be very compelling.

**DR. NETON:** We may need to look at the literature a little more on this. I have not done an exhaustive search, but certainly in the raffinate processes that I'm aware of, it would be hard to get that high of a chemical separation of the thorium into a mass of material like that.

Larry has an excellent point. We intend when we go out, I think it's September 12th.

Tom, is that right?

**MR. TOMES:** Yes.

**DR. NETON:** We're going September 12th to Blockson, and this is certainly going to be high on our list to try to learn any additional information from the workers about these filtrate steps and mass of the filter, that sort of stuff. Because that would help me out as well.

If you notice, a lot of these filtrate steps have what they call filter aids and stuff which are inorganic/organic flocculent matrices to try to help precipitate the material. Because the fact is there's not much mass of Thorium-230. I mean, per gram of uranium in that drum there's a ten to the minus 13th grams of Thorium-230, the specific activity is so high for Thorium-230.

And it's been my experience in my earlier days as a radiochemist, if you've got little bits of material like that, it's hard to get it out of solution. You can't get, there's just sort of a process where you have to have a sufficient critical mass, not a nuclear critical mass, but a critical mass to

be able to precipitate quantitatively material out of solution.

**DR. MAURO:** You need a carrier.

**DR. NETON:** You need a carrier, exactly.

So you would need significant amounts of carrier to bring that stuff out to quantitatively isolate it in one location. Which again brings me to the fact that it's going to be hard to get more than 330 nanocuries per gram of this stuff in one location.

**MR. ELLIOTT:** I think you also have to figure out if you can from the workers what the conditions of working with the material were. Was it a wet raffinate? Was it a slurry? Did they dry it before they removed it as a filter cake and placed it in the drum?

And, you know, you talk about milligrams per cubic meter, that puts a lot of dust in the air. I'm thinking more on the order of micrograms per cubic meter of exposure. So I think those kind of questions need to be pursued here.

**DR. NETON:** I think an 8,000 times quantitative isolation of materials is a

fairly good chemical process.

**DR. MAURO:** I think we're going to get to the point in this where it's going to be weight of evidence. We're going to get to the point where there's not going to be an absolute answer where we have measurements made, and we've got the definitive proof. You know, something that we all would have liked to have seen.

But what I'm hearing is the weight of the evidence in terms of the quantity of material in terms of mass and is it possible that enough thorium went into that relatively small mass to create a situation where you have much higher specific activity than in the 55 gallon drum. And it dried out, and there was enough there to create an airborne aerosol that could have been inhaled over a protracted period of time the way it was, obviously, in the 55 gallon drum.

So it's all this coming together that you would argue, well, where do you come down on this. But unfortunately, I think we're going to end up in a place where it's not going to be definitive. It's going to be

weight of evidence that seems to make the most sense.

**MS. MUNN:** You know, during the worker meetings that were held at Blockson earlier, there were several individuals who had first-hand knowledge, were actually there at the time and were able to provide a great deal of what I thought was informative data. Unfortunately, I have not seen the minutes from that particular, from the workers we had at the meeting.

I'm assuming that you have, Jim, and you've been on that.

**DR. NETON:** Yes.

**MS. MUNN:** I only am going from memory, from what I heard there. But I did not have the impression that there were dry processes anywhere except at the end of the line. If that's the case, then the issue should be able to be tied down a little better. Both Gen and Mike have indicated that they're going to be available for this worker, upcoming worker meeting at Blockson, which is very good. I'm glad. I'm not going to be able to be there.

**DR. ROESSLER:** You're glad we're going to be

there since you can't be there?

**MS. MUNN:** I'm glad you're going to be there for more than one reason. One of the things I would like to see happening going into this meeting is I would like to have this group define precisely the question that needs to be asked of these workers because the previous opportunities that they had were to tell us their stories. And they did, in fact, do that. It was a well-run meeting. The workers had plenty of opportunity to speak for as long as they wanted to about information that they had. And they did provide excellent information.

This time, if we're going to continue to have meetings, rather than having the workers run open as it were, it appears to me we're at a point where it's crucial we identify the questions that need to be asked and try to make every effort, ask Laurie to make an effort to see that the people who were there the last time or any additional people who might have information that will bear directly on those limited issues be asked to be present.

Can we put together, in my view, no more than three, actually, I see only two questions that need to be asked specifically. Can we do that? Is it within our purview to request of Labor that their meeting proceeds with the concept that these are the specific questions we need responses to?

**DR. NETON:** This is our meeting. When you said Labor, I thought you meant the Department of Labor.

**MS. MUNN:** Well, I, no, the workers.

**DR. WADE:** I think it's certainly a purview for this working group to make that recommendation. I wouldn't limit it just to that. You always want to give people the floor to say anything they want, but to ask specific questions along with an open session I think is perfectly reasonable.

**DR. ROESSLER:** I haven't been at an outreach meeting so at any meeting who actually runs the meeting? Is it you? It's NIOSH? So you --

**MR. ELLIOTT:** There are various purposes behind an outreach meeting. This particular outreach meeting's purpose is to walk out for

the workers a revised technical basis approach that speaks to all of the types of dose that needs to be reconstructed for this workforce. And in that we also have a purpose and an opportunity in this purpose to explore certain issues or questions that we still need an answer to.

So that's, so NIOSH will be leading this meeting. Yes, we'll have our contractor there to capture minutes, and we'll share those minutes with the folks who attend and make sure that we are correctly and accurately compiling what their thoughts were and their responses were.

**DR. MAURO:** For the record, just some of the feedback from SC&A regarding areas that we think that might be worth exploring, and it doesn't go toward talking about thorium because I don't think we're going to get much help on talking about thorium. For example, in the chart there are, I guess, three points where we'd like to know more about what went on. Something that they probably would know about because they lived it.

**MS. MUNN:** And we've only talked about two.

So where’s the third?

**DR. MAURO:** I have three. The three are in the drawing on the very, very top line where it says the square box that says Blockson’s monosodium phosphate process. Then we’ve got a more complicated box that’s shown here, and there was some separation activity going on in there where there was some purification of the stream where they pulled off some particulate material to allow, the next step is the monosodium liquor.

In other words you see moving off to the right of that box is the liquor. Well, the question becomes right now we’re operating on the premise that all the uranium is sitting in that liquor, and all of the thorium is sitting in that liquor.

Well, we suspect that to some degree there’s some activity going on in that box where they’re pulling off some particulate material to help purify that stream, make it a better stream is what they’re trying to do. The question is what did they do? In other words what were those streams like? What did they pull off?

And the product that came out, if those streams did exist, what did they do with them? Did they dry them? Put them in a box? Dispose of them? Or were they staying wet, and they ended up some place else in some slurry? So that's the kind of question they probably know the answer to. They wouldn't be able to say anything to the effect whether thorium went that way, but if we knew that was dry, that's point number one.

**MR. ELLIOTT:** And how many steps that box includes.

**MS. MUNN:** Yeah, what happened with it.

**MR. THURBER:** Was it just put down the sewer?

**DR. MAURO:** Or did it go down the sewer, yeah.

Now the other place where I see some action that they could talk about is the next tier down right in the middle of the page where you see the word filter, and then to the left it says filtrate returned to monosodium phosphate production. Well, that's that place where the monosodium phosphate, the commercial product, goes back into the commercial line.

Now we believe that there's a good chance that at least some of the uranium -- I'm sorry -- some of the thorium may have gone to the left. In other words at that point that's where you're getting the separation. That's where the uranium is being separated from the commercial product.

Now one of the questions we have is was that separation of such a nature where some substantial amount of thorium may have gone off to the left with the monosodium phosphate production. Let's say --

**MR. ELLIOTT:** And does that go back into that other box we just talked about?

**DR. NETON:** That goes back into the plant.

**DR. MAURO:** That goes back into the plant because --

**DR. NETON:** That goes back to Building 4.

**DR. MAURO:** -- yeah, and that's where they're making the product. That's what they do for a living over there commercially.

Now, now you've got this commercial product. And it's a large volume. This is where the volume is. This is what they're making for a living. Well, inside it possibly

there's some thorium and --

**DR. NETON:** But that's no different than the regular process at this point, just that the uranium's been removed. Which brings up Arjun's point.

**DR. MAURO:** That's correct.

**DR. NETON:** This is a uranium stream's been removed. Thorium is in there. It would have been there all along no matter what.

**DR. MAURO:** All along, it would have been there anyway.

**DR. NETON:** So then the question is does thorium concentrate at all in the balance at Plant 4, Building 40. And I say the Fipper* Reports show that it doesn't seem to if the process is the same. But we can ask the workers.

**DR. MAURO:** And the reason that becomes important because you brought Building 44 into the action as a result of the new work. Now you can't say, well, it's just part of the process.

Now the third place, and I bring this up because these are questions that I guess we would like answered. The third place is on

the very bottom of the chart where you see right in the middle of the page on the bottom line the word filter, and it says filtrate to waste.

This is one of the last steps in the process where the uranium itself is being purified so that you get the best quality yellowcake you possibly can in the end of the process. So there's some kind of filtration, re-precipitation step occurring here to try to get a purified uranium. Now is it possible that this is the last place where some thorium may break out?

**DR. NETON:** Well, the filtrate to waste, I assume that this is a liquid waste stream.

**DR. MAURO:** That's right, and if that's the case, we need to know that. Or they may --

**DR. NETON:** That just goes to the sewer.

**DR. MAURO:** -- or they may dry it, package it and dispose of it as solid waste. Perhaps return it to the tailings pile.

**DR. NETON:** Yeah, that's a good question.

**DR. MAURO:** So those are the three places where if we could -- I guess there are two questions here. One, if it stays wet, the

problem goes away. Two, if the quantity of thorium is small and the matrix in which it is in is relatively large, well, then the specific activity of the thorium in that little package is not going to be as bad as it is in the 55 gallon drum. The problem goes away.

**DR. NETON:** One of the issues I think is how frequently they changed out those filters because it's easy to calculate sort of a bounding estimate to how much thorium could be in those filters on a worst-case basis. But they made one drum a month basically or something like that.

**DR. MAURO:** Yeah, it wasn't much.

**MR. TOMES:** I'm just going to come in on this last step, on this filtrate to waste, the final filter. Blockson had in all their documentation the work they had done, they had an action of actually, this filtrate was identified as going to a sewer. And they would sample it. If it was less than 0.5 grams U per liter, they would dump it to a sewer which indicates that they were checking to be sure they got all the uranium out of it.

And there also was a step that I believe Dr. Elzerman, if I'm interpreting correctly, that is probably the most likely place the Thorium-230 would be separated from the uranium at that step right there. Where the Thorium-230 may have formed some complexes that did not precipitate out in that step, and it could have gotten pumped to the sewer.

**DR. MAURO:** And could have gone --

**MR. ELLIOTT:** And going to the sewer implies a wet stream.

**DR. NETON:** Yeah, it would just be dumped down a drain.

**DR. ROESSLER:** But going to the sewer implies no concern for workers.

**DR. MAURO:** Yeah, I think that's a line on putting this to bed by then answering these questions.

**DR. NETON:** If this filtrate was sampled and had more than -- what was it? Half a --

**MR. TOMES:** Half a gram.

**DR. NETON:** -- half a gram per liter, I assume they probably feed it back into the re-precipitation process.

**MR. TOMES:** I don't know, but I would assume

that they would; however, I don't think it would be a significant amount because they would have had additional steps if they were having significant problems.

**MS. MUNN:** It would only be good business to do so.

**DR. NETON:** But it's very, very good to bring these up. You're right.

**DR. WADE:** So the need for the worker outreach meeting. You also mentioned, Jim, that you had looked at the literature but maybe not as rigorously. Is that something that the work group wants pursued or not?

**MS. MUNN:** I think the literature probably has been pretty well beaten to death by now. I would suspect both our contractor and our subcontractor and certainly the agency has --

**MR. ELLIOTT:** We presume the subject matter experts looked at it fairly --

**MS. MUNN:** Well, that's theoretically what they are. Subject experts who already know what's in the literature. My concern is in the discussion here, being a novice to this type of production, it still appears to me that I'm hearing the same kinds of discussions

that I thought I was hearing at the worker meeting at Blockson.

So there's concern with respect to whether that source of information has been adequately mined. I haven't seen it. I haven't seen the minutes. And there were several people who spoke specifically to the types of conditions under which the waste streams were handled. Not extensively, but they spoke to them.

I want to make sure that we're not asking questions that have already been answered in previous worker meetings. Without those minutes, and my apologies for not having requested those earlier --

**MR. TOMES:** I believe there was a couple brief comments made at the previous worker meetings concerning waste streams. It was not the focus of the questions necessarily, but there was a couple, I know I asked a couple questions. It was very brief, and the people did not know the answer to it. So there was really nothing discussed. But it was clearly not, we did not focus on those issues. We were focused on the general process. And I

believe it would be beneficial to focus on these issues at the meeting because we did not focus on them at all. I mean, it was just it was a couple comments here and there and people did not identify that they knew anything about that. But perhaps if we asked more specific questions, a couple of the workers who actually worked in that building may know.

**DR. ROESSLER:** How hard would it be to get the minutes? It seems like we should have them.

**DR. WADE:** This is the first action item.

**DR. ROESSLER:** Pardon?

**DR. WADE:** This is the first action item. It seems that those minutes should be shared with our work group.

**MR. TOMES:** They're on the website.

**DR. ROESSLER:** They are on the website?

**MR. TOMES:** Uh-huh.

**DR. ROESSLER:** Oh, under the Blockson?

**MR. TOMES:** Yes.

**DR. NETON:** I'd like to get back to what Lew mentioned about the literature, and maybe that's a misunderstanding what I meant by a

review of the literature. What I was talking about was not necessarily reviewing the literature on the radiochemistry of thorium, but to review the literature on the raffinates that were produced in the Department of Energy process to determine, to put a sort of sanity check on this. What are the upper limits that one observes when one is not trying to purposely concentrate thorium?

I mean, just as sort of a byproduct of concentrating uranium, that one can put an upper cap on what the concentration of Thorium-230 in these raffinates might have been. It wouldn't be the end result, but it would add to this sort of weight of the evidence argument that John Mauro was talking about that, yeah, we don't see any place where it concentrates, intentionally try to concentrate thorium.

Let's look at some similar processes and see what the raffinates contain as far as thorium, and indeed, have we not bounded the amount by dumping it all in the drum and putting 330 nanocuries per gram into the workers' breathing zone. I thought that that

would just add some extra weight of the evidence to the argument.

**DR. ROESSLER:** Give an example of where they were doing something where they were not trying to concentrate uranium at least for my --

**DR. NETON:** Well, the raffinate at Fernald, the Thorium-230 cold door silos, Silo 3, had an average concentration of about 60 nanocuries per gram of Thorium-230. That is some of the highest uranium-bearing ores that was ever produced, the Belgian Congo ores, and it came up. I'm not suggesting it was exactly the same, but I'm saying that this is sort of what you end up with in a process where you take tons of ore products and start refining it.

**DR. MAURO:** So I think it's you're saying you saw 60 nanocuries per gram of Fernald raffinate and at the Blockson can, it's 80?

**DR. NETON:** Three hundred and thirty.

**DR. MAURO:** Three hundred and thirty.

**DR. NETON:** Assuming you have 100 percent recovery. Now that may or may not be true, but if it's 50 you can scale it down by half.

If it's a pure uranium product, it would be, because it was in equilibrium with uranium. Uranium has about 330 nanocuries per gram. So you'd have 330 nanocuries of Thorium-230.

That's a fairly high amount, a third of a microcurie of uranium per gram in the breathing zone of the workers is quite a bit. Again, I'm hard pressed to see anywhere in this process where it might be higher.

**DR. MAURO:** I think that's an important element to this whole argument.

**DR. NETON:** I think that it might be. We won't do a definitive search, but just sort of a sanity check, an upper bounding look. Clearly, if we found a bunch of places it's much higher than that, and I do have to state with a caveat that they weren't purposely trying to concentrate Thorium-230. There are some processes, for example, at Mallinckrodt where they were trying to make Thorium-230 to send it to Mound for production purposes.

**MR. ELLIOTT:** For the worker outreach meeting I think from this discussion and from the reviews that we've had from the subject matter experts on both sides, I think we are

able to formulate good questions. And I think Jim and Tom can put those things together and share them with the working group.

And we should carry them to the field with us for this meeting with these workers and have them on one page and make sure that we attend to business there and focus on those questions when we get to that part in the presentation.

**MS. MUNN:** That I think would be highly appropriate. And as a matter of fact since we have a very short agenda here today, and this topic is the key topic. So far as I know it's really the only outstanding topic. Am I correct?

**DR. MAURO:** There's one other topic that I would consider to be a non-SEC issue that we would benefit from some discussion today even though it's a non-SEC. And this has to do with the Type M, Type S discussion we had before.

**MS. MUNN:** Yes.

**DR. MAURO:** The reason I say it's a non-SEC because, you know, for obvious reasons. Whether or not it would even benefit from some

discussion of that today also is certainly up to the working group.

**MS. MUNN:** I think that would be a fine thing to do. What I'm going to suggest is a little unusual. So far as I know we haven't done this in the past, but because we're here, because we're all clear on what we want to do but not clear on the specifics of what the question needs to be, I would like to suggest that we take about a 45-minute break and have our NIOSH folks and our SC&A folks sit down and write out, define for us, what those three big questions are going to be that we'll ask of the workers. If we can do that, then we can get the questions together. We can have a short break for lunch. We can come back. The entire group can look at the questions and agree or disagree, add to or correct, and we can have a brief discussion on the Type M issue. Is that satisfactory with everyone here? Does that make sense?

(no response)

**MS. MUNN:** It doesn't appear to me that composing the three questions is feasible in our entire group and having the people on the

phone waiting to see what we're going to come up with. That discussion probably is not productive for all of us. But those folks who are the experts need to be the ones who are telling us what we need to know to resolve this. Are you all amenable with that?

**DR. ROESSLER:** Uh-huh.

**MS. MUNN:** If that's the case, then I would suggest that the larger group now adjourn temporarily. That will give you until 12 noon to put together the questions. Will we need more than a half hour after that for lunch as well?

**DR. NETON:** It depends on how long it takes the smaller group to write the questions.

**MS. MUNN:** Let's adjourn temporarily. We will, let's come back here at 12:45. Agreed?

**DR. NETON:** Okay.

**MS. MUNN:** And those of you who are going to put the questions together, please do so. For the folks on the telephone, I think you can take a break until 12:45.

**DR. NETON:** Are we going to break the connection here?

**DR. WADE:** Yeah, we'll break the connection.

We'll dial back in at 12:40.

(Whereupon, the working group recessed from 11:13 a.m. until 12:45 p.m.)

**THREE QUESTIONS FOR WORKERS' MEETING**

**MS. MUNN:** Welcome back, let's call ourselves back into session. I understand that we had a productive meeting with respect to pulling together the three questions that we specifically want to make sure get addressed during the next workers' meeting. Who would like to read those questions to us so that we can have any discussion that might evolve from that?

**MR. TOMES:** I can do that.

**MS. MUNN:** Thank you, Tom.

**MR. TOMES:** We have three questions with some details on each question a little bit here. The first one is what were the steps involved in the monosodium phosphate production process which occurred in Building 40 to partially neutralize the phosphoric acid before they pumped to Building 55? And I've got a couple other questions I'd like to, you know, related to that, you know, more focused responses that we can get from the workers.

For example, what happened to the solids filtered out before the liquid was pumped to Building 55 as a potential source. And we want to know if there was any drying done in Building 40 of this filtered out waste.

**MS. MUNN:** My guess is we'll be very fortunate if we have workers who can get down to that level of specificity, but nevertheless, it's worth asking.

**MR. TOMES:** And also if there was filter change-out frequency for filtering material in Building 40.

And the second question is how was the monosodium phosphate processed after it left Building 55. So we're wanting to know actually what happened, what they did to the processed monosodium phosphate before it came into Building 55, and what they did with it after it left Building 55. Where it went if they know that, and again, if it was filtered or further processed in their regular plants.

And the third question we're proposing to ask is how was the waste from Building 55 handled. Specifically, the liquid waste that was generated from the final step, what was

done with that? Was it processed or pumped out? If they know anything about that particular waste stream.

And we'd also like to know if they know any information about how filtrate waste may have been handled. You know, they recycled some of the filtrate in the building. And at some point it's assumed that that would become not useful to re-use, and they would have discarded it.

And those were our three questions right there.

**MS. MUNN:** I believe I recall having heard some of them talk about some of the waste stream having been pumped outside, but I don't recall the specifics and haven't re-read, and shouldn't make that comment really because I haven't re-read the minutes.

But does anyone have any concern, any further issue with respect to those three questions? Do you feel they cover what we're attempting to get to here?

**DR. ROESSLER:** I was looking at the minutes from that last public outreach while I was having lunch, and I haven't gotten all the way

through them yet, but I think we're going to have a problem with terminology. I don't see anything in the minutes that talks about the monosodium process.

I think they used words, they say liquor, and they have different terminology. And I think we're going to have to have somebody translate these questions into something that the workers will identify with or we're not going to get answers.

**MR. TOMES:** The liquor is common in the literature, too, referred to as liquor in the Building 55.

**MS. MUNN:** Are you going to be at that meeting, Tom?

**MR. TOMES:** Yes, ma'am.

**MS. MUNN:** And John?

**DR. MAURO:** I was not planning to. It would be Bill or Chick Phillips. They know a lot more about it than I do.

**MS. MUNN:** Okay, so then either Bill or Chick will be there.

**DR. MAURO:** Yes.

**MS. MUNN:** Will you folks be able to make that cross-connection between terminology?

**MR. THURBER:** I think if one showed them this diagram and said we're talking about this box here that's called the Blockson monosodium phosphate process. We're talking about this waste stream which says, whatever it says, return process.

**MS. MUNN:** Yeah, I was going to say we need a better copy.

**MR. THURBER:** I didn't have my glasses on; that's all. And we're talking about primarily this waste stream here, you know. Tell us what you know about those. I think that would probably capture it, and capture it in a way that they would be able to understand precisely where we were going.

Jim?

**DR. NETON:** I agree. I think it's a good idea to have this diagram because this is a 1958 vintage diagram that presumably some of the workers might recognize.

**DR. ROESSLER:** You think there'd be also a connection between the diagram and locations in the building that would help them focus in on what the questions are?

**DR. NETON:** My recollection, Building 55 is

pretty small.

**MS. MUNN:** Yeah, it's not --

**DR. NETON:** It's a hundred by two hundred.

**MS. MUNN:** It's not a big building.

**DR. NETON:** So we just need to differentiate between what was in Building 55 and then the balance of the phosphate processing area which I think is Building 40.

**MS. MUNN:** Yeah, 40.

**DR. NETON:** Forty. So I think we could make that distinction for one of them. It's a good plan. I think we need to make sure we have this available to display.

**DR. MELIUS:** We should have this blown up so we can use it as a display thing or something.

**DR. NETON:** Yeah, we'll have a PowerPoint --

**DR. MELIUS:** Just talk about it, I mean otherwise it's going to be --

**DR. NETON:** Agreed.

**DR. MELIUS:** -- difficult to --

**DR. NETON:** Usually we have a PowerPoint presentation at these worker outreach meetings, and we'll make sure that when this is blown up, it can be read.

**MS. MUNN:** Gen, this is what the building

looked like.

**DR. ROESSLER:** Yeah, I saw, but even so --

**MS. MUNN:** Yeah, it really wasn't a large and complex building.

But if it's possible for us to have those questions in written form and a hard copy of the process that's available for the people preferably prior to the meeting or at least first thing early in the meeting so they have a chance to look at it.

**DR. MAURO:** Any possibility that prior to the meeting whoever the counterpart is who represents the workers, a discussion could be held about what we're trying to accomplish. Maybe they could help us craft the questions in a way that might be more -- I don't know if we have that kind of relationship.

**DR. NETON:** Yeah, I don't know, John. I'm not sure that we do have a contact at Blockson like we have at other plants. We'll check into that though. If we do, it's certainly a good idea.

**DR. MELIUS:** There's an international union contact who happens to be in Cincinnati. I think he's on vacation this week. But he's

been in touch with Vern McDougall*. It's John Morowitz*. He used to work at NIOSH. They've gotten involved recently. So I talked to him a few months ago. He called me up about the process and our process. How we handle things and what was going on there. So John may be able to track down, help you track down ahead of time who would be a good contact and so forth. And I thought when we were in that meeting, I thought there were some of the former union --

**MS. MUNN:** Mark Lewis might know those kinds of people.

**DR. ROESSLER:** Well, in the minutes that I was just looking at one of the key players was Mark Lewis. He said he was formerly with the union. The union was then disbanded. But it occurred to me, I haven't read through all the minutes, but he was sort of organizing the people there.

**DR. MELIUS:** It's a different union though. This, the International Chemical Workers, I think, represented Blockson.

**DR. ROESSLER:** But he seemed to be the one who was organizing the workers and --

**DR. MELIUS:** Yeah, he did. I don't know about his, Mark's, continued involvement because I don't think -- is he still involved? I don't think so. Vern McDougall's the, NIOSH has redone their outreach component, and Vern McDougall, who had worked with Mark on this before, but Vern is now doing it. And Vern was the one that had reached out to John Morowitz.

**DR. NETON:** Right.

**MR. TOMES:** He had told me he had gotten contacts with the union.

**DR. MELIUS:** Okay, but Morowitz is right here in Cincinnati.

**DR. NETON:** We'll work through that and see what we can do with that; it's a good idea. We just need to see if we can accomplish this in the few weeks we have before the September 12th meeting.

**DR. MELIUS:** At the time I talked to him I don't know if he's on Laurie's contact list or not.

**MS. MUNN:** So, Jim, you can identify, attempt to identify that contact and see if we can get those two items in their hands, the

picture of the flowchart and the three specific questions?

**MR. GIBSON (by Telephone):** I want to just go on record here that kind of this is a different perspective but as far as the chairing the worker outreach working group, I'll be attending the meeting just to see how these meetings go, but I don't really recall having these outreach meetings to where workers are somewhat compelled or limited in their responses or in their input.

**MS. MUNN:** They won't be here either.

**MR. GIBSON (by Telephone):** I understand we're asking them for any specific information they may have, but I would have a concern if it's limited to that.

**MS. MUNN:** No, there is no intent to limit it. Au contrare, but the earlier, the two earlier meetings at Blockson were really wide open and very informative. People talked about whatever they wanted to talk about and that will continue to be the case I'm sure. It's just that without specific issues to be addressed, it's difficult for people themselves to focus in what is now a major

issue. This is an attempt to make sure that in the process of their telling their stories, hopefully, someone has some answers to these questions, too.

**MR. GIBSON (by Telephone):** Specific but not limited to.

**MS. MUNN:** Correct.

**DR. NETON:** The focus of this meeting was originally going to be to discuss the revision to the site profile which we took a lot of their comments and incorporated and made significant revisions to the profile and so sort of roll that out for them and get feedback on the general content of the site profile. But like Wanda said, while we're there it certainly behooves us to at least try to focus on these issues that will help us resolve the SEC part of it.

**MS. MUNN:** When we held the earlier meetings, I don't think we really knew exactly what we wanted to know. We just wanted as much information as we could get. And we still want as much information as we can get, but we specifically want answers to these questions because that's what's keeping this

work group from coming to a conclusion. And we do want to get this off the table as early as possible.

**DR. ROESSLER:** Speaking of getting it off the table, what do you see would be the sequence of events after the outreach meeting? Will we need to have a work group come back together again to then finally resolve what still seems to be a question?

**MS. MUNN:** It would be my hope that we could do that possibly at the October meeting. I'm not certain. A part of it depends on how much shakes out of the worker meetings. It also depends on what that timeframe is for other people for other items on our agenda. We have a pretty heavy agenda in October.

**DR. WADE:** So when you're going to be able to review the minutes of that meeting. The meeting's on September 12th. When would you normally expect to have the minutes available, the transcript available?

**DR. NETON:** I don't think it's going to be a transcript. I think it will be minutes. We should have that available for our own use within a week or so after that. There may be

some time delay for the redacted version to appear, but we could use it internally. I would think that we should be able -- and I want to speak to Tom because he's the one, the technical lead on this -- put together a white paper or a position paper outlining much of what we discussed earlier and incorporating what we learn at the meeting and just outline our position, where we are at that point. And then provide it to the working group for further discussion. That should be able to happen I would think towards the mid to end of September. Well, probably the end of September if the working group meeting's on the 12th.

**DR. WADE:** And the Board is meeting on October 4th, 5th and 6th in Blockson country.

**MS. MUNN:** In Blockson country, yes.

**DR. NETON:** It sounds late to have that produced, but I do think this is one of the only issues that we have on the table. And I don't envision this report being more than under ten pages probably. I mean, it's just going to outline sort of the weight of the evidence we have on where we believe this

thorium may or may not have concentrated. How firmly we can state that.

**MS. MUNN:** As I see it this is the single outstanding item which this group needs to make a recommendation to the full Board.

**DR. NETON:** I believe that's true.

**MS. MUNN:** And if we can, in fact, do that prior to the October meeting, it would be most helpful for everyone if we can -- think we can do that, Tom?

**MR. TOMES:** Okay.

**DR. MELIUS:** That may be, but I will go on record that I would be opposed to any final action on this unless we've given adequate time for the petitioners to review the information and have it accessible to them. And frankly, the track record of getting things through Privacy Act review and so forth has not been good. So I really think we're, it would be a mistake to try to think that we can complete this at the October meeting.

Again, it may depend on what the findings are or something like that. I mean, whatever, probably can't be by September 12th, but to me I don't see where that's going to

work out. And I think we have to be, have a process that's fair, open and transparent. And we've not been doing that recently with a number of these sites, and I think enough is enough and let's be realistic about what we can accomplish within the timeframe.

**MS. MUNN:** What can you recommend, Jim? What would your recommendation be?

**DR. MELIUS:** Well, my recommendation is I think we're going to end up doing another work group meeting, and maybe that can be done at the October meeting in conjunction with that. But I don't think we're going to be ready, and we'll have fully shared all the information in time for a decision by the Board at the October meeting.

**MS. MUNN:** Well, I'm not suggesting necessarily a decision by the Board. I just want to be able to lay before the Board any very thorough list of outstanding items that we have. And in my mind I see this one as being the current issue, and a single current issue. If you have a recommendation for how to proceed, we're open to hear it.

**DR. MELIUS:** I'm fine with what you just

said. We should update the Board, and we do it at every meeting, but --

**MS. MUNN:** Well, I'm concerned about your concern relative to adequate notification of the SEC and worker groups. How would you like us to proceed in that regard?

**DR. MELIUS:** I don't think that's going to be possible to do in time to resolve this issue by the Board, a final conclusion presented to the Board at the October meeting.

**MS. MUNN:** So I'm asking for your proposal. What then do you propose?

**DR. MELIUS:** That it not be done until a meeting after the October meeting.

**DR. WADE:** Well, I think we would serve the public well if at the October meeting we could daylight everything that we have. Let them know what the issues are, what the work group has done, what's available. Make sure that all of that is before the public to the degree it can put before the public with the expectation being that the Board will need to chew on that awhile. And also, there might be time for the petitioners and others to react to that with the vote likely coming at the

January meeting.

**MS. MUNN:** Is it possible that we could do that, take care of the final vote during our December call? We have a December call scheduled. Is there any problem with doing it at that time?

**DR. WADE:** It's possible. I think when the Board is going to vote on an SEC petition that has history and issues, I think sometimes it's best to do that when the Board is face-to-face and can really thrash through things, and so I would, from my perspective, if it's the difference between December and January, I'd rather see it face-to-face in January.

**MS. MUNN:** Jim?

**DR. MELIUS:** January in Chicago sounds wonderful.

**MS. MUNN:** That's, we're going to Chicago but not repeatedly, I hope. There are a couple of hundred other sites that we need to be concerned with.

**DR. WADE:** Well, if you think about facing the people at Blockson in October with a complete discussion and disclosure of issues, and where we stand, and documents that are or

soon will be available, I think we serve what Jim is telling us what we need to serve. And that is the interests of the petitioners and claimants. Give them an opportunity to hear and to comment there or subsequent to that with an expectation with a Board vote in January. I think that's doing the public's business well it seems to me.

**MS. MUNN:** Agreed?

(no audible responses)

**MS. MUNN:** I'm seeing a nod of the head. I don't know whether it's to me or not, but I see a nod of the head.

**DR. WADE:** And Jim also makes -- a lesson we need to learn, it's like my mother always used to say, your eyes are bigger than your stomach. We take on more than we're able to do, and if this meeting is going to happen on September 12th, having a redacted version before the petitioners in time is going to be tough. And that's just life. I mean, we can try, but we've tried and failed before. And I think we need to learn from our past failures.

**MS. MUNN:** So we will make as much of a presentation as is possible without the actual

redacted --

**DR. WADE:** I would love to have the redacted version available when you meet in October, but I'm not going to bet the farm on it. I think we should push for it.

**DR. NETON:** I still think it would be good if we could get our position paper formulated by the end of September.

**MS. MUNN:** It would be very nice.

**DR. NETON:** Because then it could be taken up for discussion as a working group whenever you felt like it. But I agree with Jim. The redacted version is important to have.

**DR. WADE:** The work group can meet an hour before one evening. They could do it on the phone before. I mean, there are options available to you for that to have an intimate discussion of the work group. We could schedule this the third day or the second day and meet the evening of the first day. There are all kinds of options to that, but we're not going to have our business done with everything wrapped up on October 5th.

**DR. ROESSLER:** I think I missed something. Where are we meeting in October?

**DR. WADE:** Chicago.

**MS. MUNN:** Naperville.

**DR. ROESSLER:** I don't know how I missed that.

**DR. NETON:** Are we going to Naperville though?

**MS. MUNN:** Yes, we're going to Naperville at the request of the work groups and the senators.

**DR. MELIUS:** Where in Chicago?

**MS. MUNN:** Naperville.

**DR. WADE:** I think the same hotel, I think. I think that's a very reasonable plan of attack.

**MS. MUNN:** We have an understanding where we are, right? Then my notes tell me I have only one other item. John asked to discuss the solubility issues.

**REVIEW OF ACTION ITEMS**

**DR. WADE:** Should we review the action items now on this?

**MS. MUNN:** Please do.

**DR. WADE:** First is that NIOSH is going to undertake a literature search surrounding the issue of the concentration of Thorium-230 in

raffinate streams around the complex to get a sense of, you know, what a plausible upper bound might be and whether what we're proposing, what NIOSH is proposing, makes sense relative to that data background. And again, obviously, as soon as that can be done and shared with the work group the better.

NIOSH is going to check on a Blockson contact to help make the wording of the questions understandable that you bring before the outreach meeting. And John Morowitz is a potential point of contact for that.

And then we have the outreach meeting itself that will take place on September 12th, where with no limits to other options, as Mike Gibson mentioned, there will be a focused request based upon the questions that have been prepared. And I think it would be well to share those questions with the work group in writing before the meeting just so everybody has them.

By my counting noses Mike Gibson's going to be at the outreach meeting representing the work group.

**MR. GIBSON (by Telephone):** Gen, will you be

at the meeting?

**DR. WADE:** Gen will be at the meeting. SC&A will be represented, and NIOSH will be represented. And we'll move to share the minutes of that meeting, un-redacted, to the work group as quickly as possible and get them redacted as quickly as possible. The possibility of a work group meeting sometime before or during the October Board meeting, but I'll put on the agenda for the October meeting a full vetting of technical issues surrounding Blockson.

And I'll do it at a time before the last public comment period so that people could make public comment on what we've said and what we're proposing on Blockson during that meeting. And the most likely scenario is voting on Blockson in January at a location to be determined.

**MS. MUNN:** My request would be that we schedule our working group meeting at the October session for Wednesday evening, immediately after the first day. Tuesday is going to be well taken up with procedures and subcommittee.

**DR. WADE:** So Wednesday is the first day --

**MS. MUNN:** Wednesday is the first day of the meeting.

**DR. WADE:** So usually we'll have a public comment period right after the meeting. So after that public comment period, 15 minutes rest break, and then the work group meets.

**MS. MUNN:** And then the work group meets for hopefully no more than an hour.

**DR. MELIUS:** How about breakfast the next morning? I'm probably not going to be there Wednesday. I'm sorry. I have another NIOSH engagement that day, and I don't know by the time I fly out to Chicago that evening, I'll make it in time.

**MS. MUNN:** I will expect you to be chipper.

**DR. MELIUS:** In the morning I will --

**MS. MUNN:** And you gain an hour.

**DR. MELIUS:** The last time I flew to Chicago I was delayed. I had to give Dr. Howard a ride.

**MS. MUNN:** So you would prefer Thursday breakfast.

**DR. WADE:** Thursday for breakfast. I'll set the starting time of the meeting accordingly.

**MS. MUNN:** Good, that would be much appreciated.

**DR. ROESSLER:** How about eight?

**MS. MUNN:** That's not bad.

**DR. WADE:** Eight for breakfast. Nine-fifteen the Board meeting, eight o'clock breakfast.

**DR. ROESSLER:** The way you work us around, Wanda, we can finish in an hour.

**MS. MUNN:** That just depends on what comes back from the group in Blockson. All right, I think we know what we're doing. Fairly sure.

**DR. NETON:** One thing Lew that you may have left off which maybe you did intentionally was to have this position paper out possibly by the end of September, the position paper on the raffinate issue. We were going to try to have that out before the October Board meeting.

**DR. MELIUS:** Twenty-four hours later SC&A will have their --

**DR. NETON:** That's true, SC&A does need time to -- we'll try to get it out as soon as possible.

**DR. MELIUS:** I think to be fair to everybody

it's just I'd rather have everybody do a good job and not try to meet an artificial --

**DR. NETON:** Agreed.

**DR. MELIUS:** -- deadline.

**MS. MUNN:** Well, in view of the fact that we have a significant amount of time following the October meeting before we are going to make the decision, there should be adequate time for an additional paper back if that's necessary from SC&A. And if we're going to require an additional exchange of some sort in this work group, we can always convene a telephone meeting if that's going to be necessary so that we can be well prepared for the December phone call as a final wrap up and final presentation in January to the full Board. Agreed?

(no audible response)

**SOLUBILITY ISSUES**

**MS. MUNN:** Final topic, John?

**DR. MAURO:** The only other non -- I won't call it that, but the other issue that would appear to us as being a non-SEC issue has to do what are the, in the latest version of the site profile, the approach that's been adopted

by NIOSH for doing dose reconstruction is to assume that the workers that are handling the uranium in the 55 gallon drum, the nature of the airborne uranium oxide, the yellowcake, is Type M.

And in the report reference is made in the report, the site profile report, the latest version, reference is made to some citations that established the basis for assuming that it's appropriate to assume that this is absorption Type M. We're not disputing that it is or is not Type M. But when we looked into the literature behind it, it was equivocal. That is we really, we're not, it did not make a case that, in fact, it is Type M.

And the reason we consider that to be important is depending on the cancer type as we all know, depending on whether you assume it's Type M or Type S could make a big difference in the dose reconstruction. So on that basis we raised the question that it appears that a little bit more evidence for why Type M is, in fact, the appropriate assumption in this particular case. Because

as you may know, in other places, AWE sites, when we were in this situation working with yellowcake or an oxide of uranium, the way in which the protocol followed was the dose reconstructor was instructed to assume the worst type, whether it's S or M, depending on the organ of concern.

In this particular exposure matrix the instructions are to use Type M only. And we raise the question based on looking at the literature behind it, it doesn't appear that the evidence is overwhelming that that's, in fact, the case. And I guess that's as far as we've interpreted it.

**MR. TOMES:** The one reference that it is incorrect. The DOE standard, it's changed since the last, you know, and I looked up the comments, and in fact, the new version does call it Y instead of W in their terminology. But that was not really the foundation and basis for why we think it's M.

I've got three references just to try to get a handle on the compound that's actually produced. I've got my first one here is a Fernald document because Fernald was

actually in the later years of their, of Blockson's operation was actually receiving materials. And I got a document from them that called this a uranile phosphate.

And I also have some documentation from the research chemist at Blockson who wrote the publications that we, that you and I both reviewed. They indicate the cause is sodium diuranate. And I also have some documentation from one of the AE officials who was actually present and assisting Blockson. They called it a sodium uranile phosphate chemical.

So there seems -- and it was a phosphate factory so there was some type of phosphate, uranium phosphate compound being produced there. And there's no indication that there was any of the, highly insoluble uranium compounds present in that material such as U-02, high-fired material, just yellowcake which is a general term applied to all those types of materials. It's a general terminology.

And the term U-308 was just used in the TBD because that is what the DOE required

the mass to be reported as, U-308, regardless of what the compound was. And so we do have one option in the TBD for Type S material, and that is in the, we have actually two options for internal dose in the TBD that use the one that's most bounding because we have an option there in Building 55 workers.

In our review of other literature and some of the data from Blockson outside of Building 55, we wanted to be sure that we were not underestimating those workers who may not have been in Building 55. And so we have a default intake for calcining operations.

It was assumed to be the highest, and that is obviously some higher-fired material. And it's unprocessed, but before it's been oxidized and everything. So we're assuming that either one could have happened on that stuff. So there's a Type S or a Type M, and you simply just choose the option for a worker who would give you maximum dose.

**DR. MAURO:** So let me see if I understand it. So you're saying in that portion of the operation where you're working with the uranium ore that has undergone calcining,

which could create an oxide of uranium which is Type S, the dose reconstructor would at that point use the limiting chemical form?

**MR. TOMES:** That's right.

**DR. MAURO:** However, in that portion of the operation in Building 55 where they were working with the uranium oxide of some form, whatever the form it was which sounds like it wasn't necessarily the U-308 that we all know and love, but it had its own chemistry. There's lots of evidence that that, in fact, was Type M. I guess the only suggestion I would have is that the site profile would do well to tell that story.

**MR. TOMES:** It's better to be more specific.

**DR. MAURO:** Yeah, otherwise, yeah, that was our only concern because we didn't see that with the story you just told in the site profile.

**DR. NETON:** Tom did a good job. The whole history of yellowcake is all kinds of misnomers go around the DOE complex on what really constitutes yellowcake. Yellowcake could be any of ten different chemical forms even among themselves. And U-308 compounds we

just learned the new ICRP document on interpretation of bioassay data has reversed their opinion and is now calling U-308, M. Yeah, it's going back to M. It's not released yet. It's not official. We have a draft copy of it. They're going back to M. And you correctly pointed out that it's related to temperature formation and this particular material, even if it were U-308, was not created at a high temperature. When they say high fired, they mean like in a blast furnace, in a bomb, not an atomic bomb, but those bombs where they actually made the uranium in the compounds. This was just dried overnight.

**DR. MAURO:** Yeah, once you move out of the calcining then you hit it and the chemistry starts, that's behind you now. So the fact that the original ore may have been calcined and had the effect of creating a Type S, then but once you go into chemistry you're saying, and you're moving through the monosodium phosphate, the precipitation, then the calcining really doesn't have a role anymore. I mean, you've left that realm. And the chemical form that's coming out now in this

process, you're saying there's evidence that that's, that stuff is, in fact, Type M.

**DR. NETON:** Yes.

**DR. MAURO:** As I said, I believe that, just that your citations don't go toward that.

**DR. NETON:** Good point.

Interestingly the (unintelligible) out of Wes Bolch's group at the University of Florida actually did some solubility characterizations very recently. It just came out in Aerosol Science and Technology, 2006, and they even felt that the raw materials themselves were actually more like Type M for the uranium compound. They did some pretty interesting in situ in vitro solubility studies, and it was almost M, a little bit S-looking, but it was almost more characteristic of resembling a Type M material. It's a very interesting piece of work.

**DR. ROESSLER:** What was that in?

**DR. NETON:** Aerosol Science and Technology, 2006, "Characterization of Radioactive Aerosol in Florida Phosphate Processing Facilities". So they sampled the various processing applications in phosphates, and they didn't

see any evidence of S. And this is the raw rock. This is not the fluffy, flocculent material that came out of the --

**DR. MAURO:** But before calcining.

**DR. NETON:** No, this is after calcining. But the only thing that was slightly different in Blockson was Tom mentioned they increased their calcining temperature to make sure that the organic materials were fully oxidized because that would hinder the chemical recovery of uranium.

**DR. MAURO:** Now as far as this issue now I realize that this meeting, I guess, is mainly concerned with the SEC aspects of this question. The degree to which we could put this issue to bed by let's say providing this material or whatever is necessary on the O drive, we can take a look at, that would go toward more what I would call the site profile aspect of it, and we can take a look at that and act on that also if that's what the Board or work group would like us to do beside review the white paper or do you want to keep this separate?

**MS. MUNN:** There's no reason to keep it

separate. These are all issues that have to be resolved at one point or another. And if this can be resolved in any truly comprehensive way so that we can wrap this issue up with a ribbon and not have it arise again at a later time, it would be beneficial to do so. What the best route for doing that is, is questionable to me.

I'm not certain whether it's appropriate to provide a page update for the site profile or whether it's an issue to be negotiated in the NIOSH/SC&A realm. My instinct would be to include it in the permanent record which would mean ostensibly an update to the site profile. But if that is too far outside of our normal process, what does that involve?

**DR. NETON:** Well, typically with the site profile issues we have sort of a give and take going back and forth on the issue. I would prefer that we would do it prior to closing out, revising the site profile. I mean, this is very much the way we worked Blockson Chemical, I mean, Bethlehem Steel. We took all the issues, and we sort of hashed them out

among ourselves and came to a consensus opinion on all of them, and then we revise it.

**MS. MUNN:** Can Tom give us a white paper of response to inquiry to SC&A? Something in writing that we can place in the record.

**DR. NETON:** I think he could. The only caveat is that I think that the thorium issue takes top priority.

**MS. MUNN:** Oh, I agree.

**DR. NETON:** We'll get that done, and this would be a second tier issue.

**MS. MUNN:** Second tier thing.

**DR. NETON:** And if it can all be accomplished at the same time, that's well and good, but right now we will commit to having this Thorium-230 issue summarized and then as soon as we can get to the solubility we will. And it may be at the same time, but I can't, I don't know that we can guarantee that.

**MS. MUNN:** It would not seem that it would be an extensive effort to just put together a couple of paragraphs and the citations.

**DR. NETON:** Well, we like to do it right because we know the scrutiny under which this thing would be evaluated.

**MS. MUNN:** And you're correct. So we'll do that if we can at the same time. If we can't, as soon after there as possible.

Are there any other questions, issues?

**DR. MELIUS:** Yeah, I have one question, initially, for John Mauro.

It wasn't clear to me in reading your original review which goes back to January, you may not remember it, and then your subsequent to a more focused review, to what extent you looked at the issue of how robust the dataset was for the uranium.

**DR. MAURO:** You know, I would have to go back. My recollection is that we hadn't set an issue. The degree to which we accepted on face value the measurements, you're correct. I'd have to go take a look and see how far did we go.

**DR. MELIUS:** In your report you looked at it, but then actually got into the issue of the solubility and so forth. It sort of hinges –- and comment on that, and you didn't really comment that I could find. I just looked again on that issue. I think, NIOSH, you commented on that. I mean, you pulled up

their individual records and looked at that and so forth. You don't need to do anything now. I mean, I don't want to hold up, but I would just like to --

**DR. NETON:** My recollection is those where EML HASL measurements which were vetted before the chemical processing.

**DR. MAURO:** I think I remember now. There was a certain, like a 121 measurements. We only found -- I might be crossing wires, but I think we only saw 60-something of the measurements. In other words we didn't see them all at the time we did our review. And we looked at the individual measurements and saw the range of values and what was done.

And then we looked at your report where you had more values. But the range that we found in the data captured the same range. Then subsequently you folks did provide us with a full set, and we did look at the full set. So I think that -- it's coming back -- we did take a pretty good look at that.

**DR. MELIUS:** And then my subsidiary question would be given the expansion of the area covered by the review, does that change your

view of the, you know, I was going to say how robust that dataset is in terms of characterizing exposures. Because that I don't think you commented on. While, again, it may be fine, I just wanted to raise the issue now rather than later.

**DR. MAURO:** So in other words in light of the new scope, 40 years is captured, does that change the inflection of all this?

**DR. MELIUS:** Right.

**MS. MUNN:** John, can you respond to that?

**DR. MELIUS:** If you commented on it before, I mean, 110 dose reconstructions have been done, most of those for people outside the scope of the SEC.

**DR. NETON:** Right, but we did take, to use a word, surrogate data at that point, and we took the highest 50 milligram per cubic meter dust loading from the calcining operation, and --

**DR. MAURO:** That's something that we don't have to wait on. In other words we can go back, this is not like we're waiting on this new information from you folks. We can go back and look at it from that perspective now.

**DR. MELIUS:** I didn't see closure on that.

**DR. WADE:** So, John, you'll provide to the working group, you'll extract from your report the pertinent issue and provide it as quickly as possible.

**DR. MAURO:** And as I understand it is look at the dataset of the uranium bioassay dataset from this new context where there'll be 40 years involved the workers in Building 40.

**DR. NETON:** That's true, but we didn't use the uranium bioassay set to reconstruct doses in Building 40. We went out and obtained Fipper*-type data and took the highest air concentrations we could find. I think you reviewed it actually.

**DR. MAURO:** I know.

**DR. NETON:** I mean, the bioassay in Building 55 is separate.

**DR. MELIUS:** My question is mostly for John. And since I couldn't see a record of what they reviewed, I didn't see closure on in our two reports on those two issues and didn't understand exactly what they did, the documentation, only see part of the dataset, not that they had done the whole thing. And I

just --

**DR. MAURO:** I will go back, read that section of the report. My guess is I may very well give you a call to make sure I understand the scope of your concern and then I will look at it within that perspective. So I might get back to you on that.

**MS. MUNN:** Anything else?

(no response)

**MS. MUNN:** If not, we are adjourned until 8:00 a.m., October the 4th, in Naperville.

(Whereupon, the working group adjourned at 1:35 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 August 28, 2007; 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 6th day of October, 2007.

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**STEVEN RAY GREEN, CCR**

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