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

Y-12

The verbatim transcript of the Working Group Meeting of the Advisory Board on Radiation and Worker Health held at the Cincinnati Marriott Airport, Hebron, Kentucky, on May 18, 2006.

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P R O C E E D I N G S

(9:40 a.m.)

WELCOME AND OPENING COMMENTS
DR. LEWIS WADE, DFO

DR. WADE: This is Lew Wade and this is a working group -- a meeting of the working group of the Advisory Board. This is the working group chaired by Mark that's staffed ably by Mike, Robert and Wanda that look at a variety of issues including individual dose reconstru-- site profile reviews. And they've gone from work on the Y-12 site profile to the Y-12 SEC petition. And that's the topic that we're here to discuss today is the Y-12 SEC petition. And I'd like to identify who's on the phone starting with Board members. Mike, I know you're with us.

MR. GIBSON: Yes.

DR. WADE: Are there any other Board members on the phone?

(No response)

DR. WADE: Okay. Again, we need to keep our eye on producing a quorum, but I don't think that should be an issue at all. Robert will

not be joining us today. He's, you know, having some health issues. Robert is also conflicted on Y-12 so if he were to be here he could listen but not actively participate. It might be worthwhile identifying who's on the -- the -- who's around the table here, who's on the phone, and then I'll ask the principals to go through and identify if they have particular conflicts relative to this site and then we can begin our deliberations. Around the table this is Lew Wade, the designated federal official for the Board.

MR. GRIFFON: Mark Griffin with the Advisory Board, chairing this work group.

DR. MAKHIJANI: Arjun Makhijani, SC&A, no conflict.

MR. RUTHERFORD: LaVon Rutherford, NIOSH.

DR. NETON: Jim Neton, NIOSH.

MS. MUNN: Wanda Munn, Advisory Board. No conflict in Y-12.

MS. HOWELL: Emily Howell, HHS.

MR. FITZGERALD: Joe Fitzgerald, SC&A.

MR. MCFEE: Matt McFee, ORAU team.

MR. WOLFF: Albert Wolff, ORAU team.

MR. ADLER: Tim Adler, ORAU team.

MR. KERR: George Kerr, ORAU team.
DR. WADE: Now, if I could ask if you're on the phone who -- who wishes to identify themself to identify themself. You don't have to but certainly if you intend to participate in the call I'd like you to identify yourself now.
MS. BRACKETT: Liz Brackett from the ORAU team and I have a conflict with Y-12.
DR. WADE: Okay.
MR. KOTSCH: Jeff Kotsch with Labor. I'll be in and out.
DR. WADE: Welcome. Anyone else on the phone who wishes to identify themselves as a participant?
MR. CHEW: This is Mel Chew, Dr. Wade. And I do not have a conflict with Y-12.
DR. WADE: Welcome.
MR. RICH: This is Bryce Rich. I do not have a conflict.
DR. WADE: Welcome.
MR. GIBSON: Lew, this is Mike. I have no conflict.
DR. WADE: Okay. Why don't we start now and ask Jim as the -- the -- the leader of the NIOSH contingent to identify his team, and if

there are people around the table with conflicts we need to hear that.

DR. NETON: Right. Yeah. This is Jim Neton. I don't have a conflict with Y-12 and I'll ask the -- well, LaVon Rutherford is here as SEC team leader from NIOSH.

MR. RUTHERFORD: And I have no conflict.

DR. NETON: And I'll ask the four ORAU folks starting with Matt McFee on the left to identify if they're conflicted or not.

MR. MCFEE: I am not conflicted with Y-12.

MR. WOLFF: Al Wolff and not conflicted with Y-12.

MR. ADLER: I am conflicted with Y-12.

MR. KERR: George Kerr. I'm not conflicted.

DR. NETON: Just for the record, Al Wolff is the document owner of the Y-12 document. Tim Adler is the subject expert on the document as is George Kerr.

DR. WADE: The document owner for the SEC petition evaluation --

DR. NETON: No, no, no. No. For the report.

DR. WADE: For the report? Okay.

DR. NETON: I'm sorry. Yeah.

DR. WADE: Arjun, your -- your folks?

DR. MAKHIJANI: This is Arjun Makhijani. I have no conflicts on Y-12.

DR. BEHLING: Hans Behling. I'm not conflicted.

MR. FITZGERALD: And Joe Fitxgerald. I'm not conflicted with Y-12.

DR. WADE: Okay. I think that's all of the -- the preliminary business so I'll turn it over to -- to the chair to conduct the deliberations.

INTRODUCTION BY MR. GRIFFON, CHAIR

MR. GRIFFON: All right. I think what -- the best way to proceed, I sent a -- a mini-agenda out. I think most of you got that. Everybody probably has that except for me. I pulled it out of the conference -- oh, here we are. I just took it out of the conference call notes. There was a conference call on May 9th, between NIOSH and SC&A and this was an informal conference call. It wasn't a work group call. Mainly it was to go through the -- the -- some of the technical issues in preparation really for this work group meeting and for the upcoming Board meeting. And these were really the -- the remaining issues that were discussed

at that meeting and we're going to carry through that agenda here. I think that makes more sense. So just to go down the list, and I'll probably call on Jim and -- and SC&A as we usually do it. I think one thing that -- that we all recognize is that we received quite a few documents, many of them short as you said, Jim, but still quite a few documents last night so there may be, you know -- I don't think any of us have had much time to digest those if any time to even look at them. But at least you can present them here and we'll -- we'll go from there I guess.

DR. MAKHIJANI: Some of us -- actually I think you just sent them to John and --

MR. GRIFFON: Yeah.

DR. MAKHIJANI: -- because I didn't --

DR. NETON: I sent them to the team. Maybe --

DR. MAKHIJANI: I didn't receive them. I know they came from --

DR. NETON: Well, I have copies here so -- and -- and they are short and I apologize for a late delivery but as -- as we talked about it's --

DR. MAKHIJANI: I don't think --

MR. GRIFFON: You did the best you could.

DR. MAKHIJANI: I think -- well, I'm not blaming John.

DR. NETON: Okay. Well, I have copies. I recognized that they might not get distributed.

ISSUE 1: EXTERNAL DOSE DATA VALIDATION AND COWORKER MODEL

MR. GRIFFON: So just to start off, Issue 1 from the conference call. And this is the external dose validation along with the co-worker model and I guess two pieces that we want to discuss there but -- but I guess the primary -- primary remaining issue was the sort of pre-'56 external dose, the questions on the data reliability there. I think Jim is handing out some documents that were emailed --

DR. NETON: Right.

MR. GRIFFON: -- yesterday, yeah, so maybe you can --

DR. NETON: I only made nine copies so share among --

MS. MUNN: You can -- I have --

DR. NETON: Okay. Wanda -- Wanda printed hers out. That's good. Okay. Did you turn it over to me, Mark? I was kind of busy distributing.

MR. GRIFFON: Yep.

DR. NETON: Sorry.

MR. GRIFFON: You're all right.

DR. NETON: What I -- What I just handed out and -- and I apologize. I don't have quite enough copies but -- is -- is a summary. And again this is a last, late breaking issues in -- - in -- late breaking summaries of issues that we put together in the last day or two. But I -- I've tried to summarize where -- where we are with this 19-- external doses prior to 19-- essentially 1957. I think the -- the issue has -- has -- has arisen that, you know, SC&A and the Advisory Board working group have -- have questioned our ability to reconstruct external doses in the '48 to '56 time frame. A lot of it centers around -- there's two pieces here. One is the validation of the data that we have. And then the second piece is is the extrapolation model that we're proposing to use sufficiently bounding, given those data. So I'll just go through these briefly. The -- The first one you have in front of you is a one-page document that we were asked to go back and look at some -- for some additional validation of what's in the CER database

compared to, you know, health physics reports and whatever -- whatever we could get a hand on. If you recall in the external area I think we were only able to come up with one validation using Delta View. So this is a -- a brief summary that Bill Tankersley put together that compares the results that were included in a 1957 memo that talked about external doses for 1956. And what it shows here is dose ranges and the number of doses -- number of workers with doses in those ranges in the memo. And you can see the second column refers to skin doses and -- in the memo and the fourth column talks about penetrating doses. And when we compare the skin dose in the memo to the skin doses in the database and penetrating doses in the memo and penetrating doses in the database, one can see that there's a fairly good concordance between the two numbers. Where there are discrepancies there are more data available in the CER database, more -- more people in those ranges than -- than in the memo. But we feel that's a -- a -- a pretty good comparison at that point. And then we -- the second set was the average doses, millirem

per week by department-specific comparison between a memo that was issued in '58 for doses that were 19-- for 1957. And again pretty I would say reasonable agreement between the two, the database and what was included in the memo. They aren't -- They aren't perfect and I'd like to talk a little bit down the line as to why those numbers might not be perfect and to show you what we discovered in the -- in the intervening weeks from Board meeting 'til now. So you might hold your questions on why there are any discrepancies until I can get into some of the meat of the issues. The second -- The second page has a -- a copy -- by the way, some of the information I've handed out does include Privacy Act information so please treat it as such. If you're not comfortable taking it home and disposing of it just give them all back to me and I'll -- I'll take care of it. And -- And we certainly shouldn't be reading anybody's names and badge numbers off of these things because we are creating a public record here. Okay. The second memo is a July -- the second page shows a July 1st, 1957 memo in -- in which they attempted to reconstruct what the

cumulative exposures were for workers in -- in a foundry operation from 1952 to 1956. So anyone who was on the books in '57, they tried to figure out what their total exposure to date was from working from '52 to '56 or whatever years they happened to be working in -- in those -- in those years. And on the next page what you'll see is a -- a checklist -- I think there are 65 workers listed here -- of the years that the worker was actually involved in operations and -- and had badge results, and a column that shows what the -- what the site believed in this memo to be the total exposure through 1956, and what the average annual exposure was. You can kind of ignore that. They're trying to get a handle for what the average exposures, but what we're more interested here is the total exposures through 1956. I should point out I believe that this is shallow dose reported, S-millirem to user nomenclature.

MR. GRIFFON: I'm assuming that was in the memo somewhere or -- because that's what I was trying to figure out, which time to compare it to.

DR. NETON: Where -- Where did I -- where did I come to that conclusion and I'm --

MR. GRIFFON: Yeah.

DR. NETON: As listed averages --

MR. GRIFFON: I imagine you're right. Just -- Just by the numbers I imagine you're right.

DR. NETON: All right.

MR. GRIFFON: By the numbers I thought you were --

DR. NETON: Yeah. They -- They -- They -- They certainly should be S-millirem. If you look at the --

MR. GRIFFON: Right.

DR. NETON: -- at the cumulative exposures here they're fairly large and it's a uranium foundry.

MR. GRIFFON: Yeah.

DR. NETON: And in my estimation it would be extremely difficult to get those kind of external exposures but --

MR. GRIFFON: Right.

DR. NETON: -- but it was a good question, Mark. Again I apologize. Some of this is just so late breaking that I'm -- I'm sort of going through this on the fly a little bit myself.

The -- The -- The Excel spreadsheet table behind that documents the comparison of the -- of the doses that were in the cumulative doses through ’56 in the memo versus what was added up for the doses that we had in the database. And of course, if you recall the database was quarterly doses that, you know, were added up to get a year and then we added up those years through ’56 of what we had. This is not perfect agreement. I think in about 90 percent or almost 90 percent of the cases the agreement is pretty good, down in the single digit categories. But you’ll find that there are 40 percent discrepancies for a large number -- not a large number -- I think six or so of the cases. And if you’ll -- if you’ll look at it closer -- I’ve had a chance to look at it where you haven’t -- the 40 percent discrepancies are for people who were monitored only in 1952 for the most part so there -- there are some issues there with what occurred maybe in 1952. What I’ve done though is on the -- after the spreadsheet I’ve just generated a plot of the comparison of the CER database against the health physics reports, and, you know, of

course if -- if it's a pretty good straight line which is what you'd hope, I did discount one data that was a 70 percent discrepant data that Bill Tankersley is working on that he believes was an -- was an incident where a person intentionally got irradiated doing -- using some X-ray process. So I'll -- I'll put that caveat on it. But with that exception this is all the raw data that we had. So there are 64 points plotted here. And, you know, again it's not perfect but this certainly shows that we've got a -- a fairly one to one correspondence between what's in the database and what -- what is in the record.

DR. MAKHIJANI: This doesn't include the ones with the 40 percent --

DR. NETON: This does.

DR. MAKHIJANI: It does?

MR. GRIFFON: It doesn't include the 70 percent.

DR. NETON: It doesn't include the -- the one 70 percent outlier I didn't put on here. I probably should have indicated that but -- but the 40 percenters were on there. Again it's -- it's not perfect but again it shows, you know,

for 50-year-old data that we've got a pretty good handle at least on the magnitude within a reasonable approximation of what these exposures were. So that's where we are with additional comparisons. You know, not a lot of new stuff but, you know, again we -- we've --

MR. GRIFFON: Yeah.

DR. NETON: -- managed to glean a couple more supporting pieces of data. I'd like to shift our attention then, if there's no questions on that, to the so-called back extrapolation model and how this might be used given the quality of the data that we may or may not have to bound exposures to workers prior to 1956. Okay, so the next page --

MR. GRIFFON: Did we say we didn't have questions on that?

DR. NETON: Oh, I'm sorry. I'm -- I'm --

MR. GRIFFON: If you could stop there just for a second.

DR. NETON: Go ahead. I'm sorry.

MR. GRIFFON: I mean if the graph is interesting, what you can do with the graph is interesting.

DR. NETON: Yeah.

MR. GRIFFON: The -- I'm trying to look and see, I mean on the fly here but it seems like most of the differences in your difference column are in the positive side meaning that the --

DR. NETON: Right.

MR. GRIFFON: -- hard copy was higher than the --

DR. NETON: Yes.

MR. GRIFFON: -- so if they tend to be --

DR. NETON: Internal but within about 10/15 percent.

MR. GRIFFON: But in most of them you're saying during that '52 year. And is that related to that memo where the doses apparently were --

DR. NETON: No, that was a 1954.

MR. GRIFFON: That was a different thing? Okay. That was interesting though --

DR. NETON: Well --

MR. GRIFFON: -- as well -- I'm sure you're going to bring that up.

DR. NETON: Yeah. Well, I can get into that a little bit now. At the end of this -- I won't -- I won't go over these in detail but the last ten or twelve pages that I've included in this

handout are internal company correspondences primarily by the health physics folks, Matt Hap West and others. In a 1956 -- '51 -- '58 time frame which sort of document what was going on in the early years. And maybe I'll take the opportunity since you brought it up to -- to explain a little bit at this point. This is an interesting story. There's always a story behind the story in a 60-year-old document. Prior to February 28th, 1955 -- this is interesting. I had -- I had not realized this having been in health physics for a -- more than a quarter of a century -- that prior to 1955 the skin dose and the deep dose limits were identical. In other words, they were both 15 rem.

MS. MUNN: Yeah, I noticed that.

DR. NETON: And -- And so what that meant -- and -- and George -- George Kerr has mentioned this several -- in several discussions but it just sort of dawned on me, you know, the implications of this is that given that the skin dose and the shallow -- the skin dose and the shallow -- the skin dose and the deep dose limits were equivalent, there was no incentive

on their part necessarily to track them independently.

MS. MUNN: Unh-unh.

DR. NETON: In other words, you'll look. There's a memo in here that talks about the beta gamma column. So they would put dose information in the beta gamma column and it didn't really matter whether it was beta or gamma because they were still comparing it against the 15 rem dose limit which applied to both working systems. So what you'll see in these other memos is an attempt on management's part, and particularly health physic's management's part over the years to tease those pieces of information apart and put them in the right locations. Because if -- after '55 then you started getting into the later years into this 5 x N - 18 requirement which, you know, limited dose to a certain cumulative exposures. And so they really felt a need to start to get a better handle. So what I'm -- the bottom line of that is that you would not necessarily expect these memos to agree with the CER database perfectly because the CER database was updated periodically in response to these new

requirements to -- to more accurately reflect what the workers were exposed to than some of these sort of contemporaneous memos that were generated on the pro-- snapshots of programs at the time. So if one took a 1954 memo, you may indeed see a discrepancy between skin dose and deep dose because they may have been added into the same column and then later on in the CER database per these memos they may have been teased apart. In fact there's a memo in here where like 50 or 60 workers -- they said these workers were exposed primarily to deep dose. Move their beta gamma column over into the deep dose. So there have been some shuffling of the information over the years and that's essentially what -- and George can back me up if -- if there's anything I'm missing here but that's sort of what -- what's happened prior to February 28th, 1955 when the skin dose limit actually went up. I mean I think it went up to 30 rem. I -- I don't recall exactly but -- so the -- the skin dose when it went up. So then there was an incentive on their part to track these -- those calculations separately. So even given that though, you know, this graph --

and I understand what Mark is saying. You -- especially when a graph -- you show especially when it's on a large scale -- but it does show that it's a, you know -- we -- we have a pretty good snapshot of what the range of doses were for these workers in those time frames. That's -- I think that's what we're trying to say. Now, let me -- let me expand the story a little more here. On top of the fact that prior to '55 the beta gamma columns were -- the beta and gamma were -- were some tracked -- not tracked separately, in 1950 and 1951 -- prior to 1960 all badges were exchanged on a weekly basis. So you've got 52 potential reads a week and there's a 30 millirem detection limit about, depends on the year, but 30 to 50 millirems so you've got a lot of missed dose. In 1950 and '51 it was the policy and it's in this Hap West memo that's listed here. Okay. It was the policy that any badge that was not positive was recorded as zero. So this explains why '50 and '51 are zeros for deep dose because it's pretty hard to get that kind of deep dose in a uranium worker. In fact, to flesh out the story a little bit more, most of the doses in '50--

almost all the -- all the -- all the doses in '50/'51 do not include the cyclotron workers. It's another -- another part of the puzzle. So you got '50 and '51 showing essentially all zeros because the workers who were monitored, their doses on a weekly basis were less than say 30 millirem a badge exchange cycle which would give them a maximum missed dose of say 100 -- 50 to 100 millirem if they were monitored every week during that year. So we know that in '50 -- '50 and '51. '52 and '53 the practice changed.

MR. GRIFFON: So then there's ones in that Delta View -- I mean I'm sorry.

DR. NETON: That's fine.

MR. GRIFFON: The ones in the Delta View database were cyclotron workers and they wouldn't have been recorded that database that we've seen? That's why that data wasn't necessarily in there?

DR. NETON: Some of them were not in that. Were some in there during the cyclotrons?

MR. KERR: No. If you -- if there's a --

DR. NETON: It -- It -- It's spotty though.

MR. GRIFFON: But they were all zeros. Okay.

MR. KERR: I would like to check. The amazing thing is to me that there's a lot of things with what we found out with -- we have just recently been able to verify the cyclotron. And before we had no handle on who was really working at the cyclotron because we would through departments but we didn't know names or badge numbers. The reason we found enough numbers there we can really tell who the cyclotron crews were over really a fairly wide period of time. Once you have that then you can go back and easily check and see what their dose is.

MR. GRIFFON: Right.

DR. NETON: Right.

MR. KERR: And we now find that there's a lot of information on cyclotron workers. It's in the X-10 database.

DR. NETON: Yeah, so this --

MR. KERR: And probably more information on cyclotron workers in the X-10 database than there is in the Y-12 because most of the workers at the cyclotron were actually X-10 people.

DR. NETON: Right. I don't want to jump into

too much the cyclotron issue because that -- they're separate issues of cyclotrons but -- but the bottom line I think -- I'm sorry. Wanda, you were going to say something?

MS. MUNN: I was just trying to say your soft voice is -- is not getting --

DR. NETON: Oh.

MS. MUNN: -- to the recorder I don't think. You're --

DR. NETON: We'll move the mike over.

MR. GRIFFON: You need to move the mike down to the end of the table maybe or something.

DR. NETON: But -- So the -- the cyclotron is a separate issue. I'd like to sort of tease that out for the moment if we could --

MR. GRIFFON: Right. Sorry.

DR. NETON: -- and say that, okay, the uranium -- essentially the people who were mostly working with uranium at this point in the CER -- are captured in the CER database as -- as zero values because when they measured them they just made them zero when they read them if they were less than the detection limit. You know, it's pretty hard I think, unlikely to get more than 40 -- 30 millirem in a week working

in a uranium foundry. That's at least my opinion at this point. In '51 and '52 though -- '50/'51, that's what they did. In '52 and '53 then it became management policy to record the detection limit if it were zero, if it were not measurable. So then you see --

DR. MAKHIJANI: '53 or '52?

DR. NETON: '52 and '53. In '52 and '50-- this is documented in one of the attachments that I -- it's a Hap West interview that was conducted with Donna Cragle I think in the '80s.

MR. GRIFFON: So then they recorded the LOD --

DR. NETON: So then they started recording the LOD -- LOD at times --

MR. GRIFFON: -- if it was less than measurable?

DR. NETON: -- if it was less than measurable. So what you see is -- is a lot of doses centered around 400 millirem all of a sudden. Well, 30 times 13 is 390 so you're -- you're starting to see a jump, a quantum jump in the exposures and it looks like there's a lot of dose there. So these are essentially, in '52 and '53, missed dose. To a large extent the values that we see are influenced by missed

doses and so -- and onward from there actually. It was the policy after ’53 to keep doing that. So you got the data in the CER database are influenced tremendously after ’51 by missed dose values. Keep that -- Keep that in mind. In fact it -- it’s amazing how high some of those could be. Now, there were high exposures to extremities and external from -- from working in foundries. I’ll grant you that. But some of the extra -- specific-- especially since cyclotron workers were not in there, you know, some of the high doses you see recorded for internal, deep penetrating seem -- seem somewhat high to us but again they’re assigning potentially 390 millirem a quarter based on just missed dose. And in fact if you read the report 32 that was put out by ORAU that sort of developed this co-worker or the back extrapolation model you’ll see they have detailed tables of distributions by year from ’52 through whenever and the distributions in the ’53/’54/’55 time frame when they were monitoring selected workers who were we believe would be the highest exposed workers, don’t fit any real distribution. That’s why -- in fact

that's what -- that's what was the genesis of this back extrapolation model because you'll see if you look at those little histograms there you'll see nothing and then all of a sudden, bloop, a large block of workers at almost 400 millirem per quarter and then nothing and then a few more out here that people may have had real high -- you know, real exposures. So there are -- the data are not amenable to developing distributions prior to 1956 and that -- that's well stated in the report 32. So I'm like a yarn -- yarn teller here but if you look on the next page, this is a -- page 26 out of report 32. And what I'd like to just focus on here is -- is the back extrapolation graph. So how -- how is NIOSH really treating workers who have no monitoring data prior to 1956? Everybody have that page? Hans, you don't have it?

DR. BEHLING: Yeah, I do.

DR. NETON: Is this -- This is it right here.

DR. MAKHIJANI: I have a question before you go on.

DR. NETON: Yeah, sure.

DR. MAKHIJANI: On the first page of that, the

only real discrepancy in that first table there in the -- before the 556 and the 703 --

DR. NETON: Uh-huh.

DR. MAKHIJANI: And given the numbers of workers involved it seems like a -- if it were a dose discrepancies were not that large. It would seem that 150 worker discrepancies -- and they don't appear anywhere else in the table so where did the 150 workers appear from in the CER database?

DR. NETON: What's their -- What's their job categories? I mean we didn't analyze --

MR. GRIFFON: No, Arjun. For the number of people.

DR. MAKHIJANI: Right. They're not --

MR. GRIFFON: There was 150 workers in the --

DR. MAKHIJANI: -- in the old -- did the old memo miss workers that were later caught or -- that just --

DR. NETON: It -- It may be -- well, this is 1956 so this is after the skin and shallow.

DR. MAKHIJANI: Uh-huh.

DR. NETON: I really don't have an answer for that at this point, Arjun, you know.

DR. MAKHIJANI: All right. I have another

question, just a quick one here. On this chart here, the -- the one that you showed to us, it's not -- it doesn't look like a slope of one but that should be a slope of one. I think the slope was a little less than one.

DR. NETON: That's an interesting observation.

DR. MAKHIJANI: As I'm reading it because it's --

DR. NETON: Well, and I think that -- that -- that does go along with the fact that most of the biases are in the negative in the --

DR. MAKHIJANI: Yeah.

DR. NETON: -- in that direction. Yeah, I agree with that.

DR. MAKHIJANI: So the best fit would actually --

DR. NETON: Right.

DR. MAKHIJANI: So while the points look like they fall along the line pretty well it looks like there's a systematic bias --

DR. NETON: Yeah.

DR. MAKHIJANI: -- because their slope is less than one. So it would be useful to see the regression.

DR. NETON: Good point. Very good point.

MR. GRIFFON: You raised a good point which might be useful in adjusting.

DR. MAKHIJANI: Yeah, it might be because there is a systematic error you might be able to make some corrections.

DR. NETON: That's a very good point. I appreciate that. Okay. I'll just make a note of that before I forget.

MR. GRIFFON: That's sort of what I was exerting with the differences being all on one side.

DR. NETON: I agree with that.

MR. GRIFFON: Right.

DR. NETON: And again, some of those differences may be because of the shifting of the skin dose into the --

MR. GRIFFON: Right.

DR. NETON: -- deep dose category as I indicated, you know.

MR. GRIFFON: Uh-huh.

DR. NETON: There certainly are some -- some issues with the data. I mean you certainly agree with that. To the extent that they prevent us from doing dose reconstructions I think is the subject of -- of where we're

heading here. Now, on this graph on page 26 you -- you'll see a scatter plot here and it's somewhat deceptive because it's a log -- I think it's a log scale. Yeah, it's a log scale. And -- But -- But this is right out of this report 32 and what ORAU has done is fit a function for the data from starting in '57, last -- last quarter of '56 through '60-- whatever time frame that is, '66, and picked, you know, this is the famous 147 workers that were selected who had -- were fully monitored from '57 through '60-something and in fact had -- had monitoring data in each of the quarters. And in fact, in our opinion probably represented the higher end of the work force because of they were fully monitored and had positive results and -- and such. Now, the data -- the regression line fit through there included missed dose for all those workers so -- - so when they had a quarter with a positive value ORAU went back and added in the -- I don't think it was a full 30 millirem. It was probably the LOD over two which is what we would normally do. Add those into their doses to account for any missed dose because we only

had quarterly data so -- so that line that you see through the black dots from '50-- into '56 through '65 time frame is -- is a regression line through their doses including missed dose because we only had quarterly data.

DR. BEHLING: Let me ask you a question on that, your -- your assignment of missed doses based on LOD value as opposed to using the measured doses for those periods when they were in fact monitored. And think we had that discussion before when you said for instance, let's assume that if the -- a person was monitored on a weekly basis and you realize that in a counted quarter there should be thirteen entries but instead you only find six and you said you would probably take thirteen over six and multiply it times the --

DR. NETON: Correct.

DR. BEHLING: -- doses received during that six-week period as an adjustment factor.

DR. NETON: Correct.

DR. BEHLING: And this was not being LOD adjustment. This was being basically assuming that if the doses received during the times when the individual was monitored would in

essence be identical to the balance of the time when he was not monitored.

DR. NETON: Well, we're saying the same thing. I mean if I have one -- one result in the quarter --

DR. BEHLING: Yes.

DR. NETON: -- and it's 100 millirem --

DR. BEHLING: Yes.

DR. NETON: -- then I'm going to assume that the other 12 weeks --

DR. BEHLING: Also would have 100?

DR. NETON: No.

DR. BEHLING: No?

DR. NETON: Were LOD.

DR. BEHLING: LOD?

DR. NETON: Because you couldn't be higher than that.

DR. BEHLING: Well, that's assuming that the person was monitored and the monitoring --

DR. NETON: Okay. Well --

DR. BEHLING: -- resulted in the zero dose. But suppose he was not monitored? That's the question.

DR. NETON: Okay. If he wasn't monitored we're -- we're still going with our opinion that they

were -- the people who were the highest monitored -- were highest exposed were monitored and so if he wasn't monitored then he was not in that category.

DR. MAURO: This is a -- a change though from what we discussed last time.

MR. KERR: He could have been sick. He could have been on vacation, you know.

You don't know why it's not showing up. He was assigned some regardless. If there was a zero there for that time --

DR. BEHLING: Yeah.

MR. KERR: -- he was assigned an LOD because we don't know what the situation was. But there's -- I mean these people had vacation, they were sick.

DR. NETON: Yeah. I think, you know --

DR. BEHLING: No, I think this is where we -- the difference is is as a conservative measure I would have potentially said well, maybe not every person was monitored for each of the cycles in the calendar quarter and there is some point, and I think you -- you may have had that discussion on the conference call -- when I look for instance during the second quarter

of 1958 when I think one of your tables, table 8-3 or something had identified somewhere around 690-some odd people who were monitored but for that one week, the 25th week of 1958, the health physics record showed that there were only something like 378 or something like that monitored. And it gave me the feeling that perhaps the people who were monitored during that week weren't always monitored throughout the quarter even though their job may have been the same.

MR. KERR: From 147 people selected for the fact that they were continuously monitored over the period.

DR. NETON: Right.

MR. KERR: There were just some zeros in the record here, there and yonder. We filled in and didn't --

DR. NETON: Right.

MR. KERR: -- and tried to measure as conservatively as possible.

DR. NETON: This -- These people were -- were hand-picked for a reason that they had exposures that were well monitored over an entire period. It is not like we went and just

ran and we selected workers for 40-- from '57 through -- and I think we -- we ought to focus on those people's records because that's the -- I think and ORAU -- SC&A has actually done a review of those and I thought that they -- they did agree that those workers appeared to be more highly exposed workers.

DR. MAURO: I think the confusion may have been that it was our understanding that some of those 147 did not have -- were not monitored every week in every quarter.

DR. NETON: Well, we have no way of knowing that really. And in fact after '60 it wasn't weekly any more. It went to --

DR. MAURO: Right.

DR. NETON: Quarter.

DR. MAURO: -- quarter.

DR. BEHLING: In which case it makes no difference.

DR. NETON: After '60 it's -- it's a moot -- it's not -- it's not an issue so you're talking between '57 and '60.

DR. MAURO: Right. And, you know, the -- the only thing is there are two different things in here. And one is that, okay, if we have a

worker in 1957 who's part of the 147 and you've got six weeks worth of actual measured monitored data, then the rest of it --

DR. NETON: We wouldn't have weekly data though. We only have quarterly data.

DR. MAURO: And all -- all of those are quarterly?

DR. NETON: Every -- Every dose as a result we have is quarterly.

DR. MAURO: For the 147?

DR. NETON: For anyone.

DR. BEHLING: So you're blindly assuming that -- that the -- if there were missed doses it's due to the fact that they were -- the recorded dose that came out as zeros as opposed to --

DR. NETON: Correct.

DR. BEHLING: -- I think it was not monitored?

DR. NETON: Correct. Now, you know, one would argue why would they -- if the person is showing positive results, you know, why would they -- we have no indication to believe that they were rotating people through as I know Hans, has been one of your thoughts all along. That they would rotate people through and Mr. Worker X would get his 100 millirem badge this

week and we take it away and give it to the next guy because he might be -- That's not the way at least the memo trails that I have read -- they look to us like they were purposely picking people that were working in the trenches doing the work and -- and monitoring the -- the high end of the -- of the --

MR. RUTHERFORD: And wouldn't that -- I mean if they did that in those early years, '57 to '60, artificially drive the maximum doses down? Because if you're spreading the TLD around the -- the total cumulative dose for that individual is going to be driven down which we clearly didn't see that when you looked at the later data for the same operations to the earlier data. So I -- I -- I'm -- I don't see that effect.

DR. NETON: Well, in fact you could see on this graph the spread of the data for the 147 doesn't look tremendously different to me prior to 1960 and these are the same monitored workforce --

MR. GRIFFON: Right.

DR. NETON: -- who were monitored quarterly versus weekly. It's the same people. I -- I

don't see that there's a -- a drop in that at all. In fact it looks very similar. It does go up per the -- the regression line. But I think this is a point where we're just going to have to say we may disagree on whether missed doses are appropriate to add to those workers or not. And the bottom line is what effect if might have on the overall back extrapolation because I think -- I think the line that's fit from '60 onward is pretty much consistent with the line before 1960.

DR. BEHLING: That's it. I only base it on circumstantial evidences. I have no real data.

DR. NETON: Yeah.

DR. BEHLING: But as I said one data point that came up was the 1958 25th week where for that second counted quarter I think one of George's tables identifies somewhere around 700 people were monitored in that quarter but yet for the 25th week there was some accounting that was done at the request of health physicists to -- to say how many people were -- were there exposures to in that group. And I only counted 370 which is about 50 percent of the people monitored in that counted quarter.

DR. NETON: '58 sounds suspiciously in the --

DR. BEHLING: Well --

DR. NETON: -- criticality time frame.

DR. BEHLING: Yes. It was within that time frame.

MR. RUTHERFORD: The 25th week is that week, yeah.

DR. BEHLING: Yes, it was --

DR. NETON: Yeah, well, this may be somewhat of an anomaly then. I don't know whether -- whether --

DR. BEHLING: The only thing I can say, it's true. You don't want to match one by one. As you mentioned there are people coming in and out of the system. They may retire. They may come into the workforce in any counted quarter and so the numbers should never match one to one. But a factor of two seemed a bit too much to -- as a discrepancy for me to assume. But to the way a person is monitored, he's monitored always and -- and that's the only reason I bring it up.

DR. NETON: Okay.

MR. KERR: I -- I -- I've got to submit that the way we have -- we have amendments here that

I'd like to let you look at.

THE COURT REPORTER: Dr. Kerr, could you come close to the table, please?

MR. KERR: Sorry. Hans, when we have a time away from the table today I have some memos with me that I'd like to show you and let you look at. And I think we can really clear up this -- some of these questions you have about who's ro-- the rotational monitoring --

DR. BEHLING: Uh-huh.

MR. KERR: -- and so forth so let's don't take up time here.

DR. BEHLING: Yeah.

MR. KERR: But let's look at those aside and see if we can resolve some of these questions you have.

DR. BEHLING: Okay.

MR. GRIFFON: Also, if you have the references on those memos or if they're on the O-drive somewhere that would be --

DR. NETON: Yeah.

MR. GRIFFON: -- I think we'd all be interested in that.

DR. NETON: And I think some of them are maybe attached --

MR. GRIFFON: Some of them might be in your package? Yeah.

DR. NETON: George -- George might not realize it but I've attached a number of these memos to your handout.

DR. MAURO: Could I just step back a little bit? When we had our conference call it was my sense that in regard to this -- the issues we're talking about here, the concern was some discrepancies in the early extent of dosimetry data that we sort of identified in the minutes. And the problem was those discrepancies created the situation which might have made it difficult for you to validate your extrapolation model. And that one -- that was the only real issue. The -- Once -- Once there was a confidence on your part that you understood what the discrepancies were then as I understood, then you were back to the place where we are in a position where we can validate our model using your earlier data. And then we leave the SEC realm and we move into the site profile realm. Is -- Is that where we are right now?

DR. NETON: That's where I'm trying to head but

I -- I can't get past Hans's issue here with this whether we put 100 millirem or -- and I think that's a tractable problem. I think to answer Hans's issue I mean you -- you could go and go back and redo this entire analysis and give them that dose for every week and -- and see how it changes this back extrapolation model.

MR. GRIFFON: That would still make the site profile.

DR. NETON: Yeah, that -- that -- that's just a difference in opinion as to how one interprets the '57 through '64 data so --

DR. MAURO: No, the reas-- no, that's what I --

DR. NETON: Bear with me here.

DR. MAURO: So I want to -- I guess I'd like to get a little more crisp in terms of I guess in light of the analyses that I --

DR. NETON: Right.

DR. MAURO: -- that -- and the tables you've shown us --

DR. NETON: Right.

DR. MAURO: -- and the description you've explained regarding these columns --

DR. NETON: Right.

DR. MAURO: -- am I hearing that you're getting a little bit more comfortable with understanding what transpired in those early years and the discrepancies that apparently y'all saw?

DR. NETON: I think yes.

DR. MAURO: Is that what I'm hearing?

DR. NETON: I'm trying to -- I'm trying to get there but unfortunately I have to go through and explain what we're doing on individual dose reconstructions to give you a sense of how the data do or do not support that conclusion. I'm going to have to -- you have to bear with me. I don't think it's well understood how we're doing these.

MR. GRIFFON: Let me ask about data, too, on the -- it seems like you've -- and we did ask for this, this question of pre-'56.

DR. NETON: Right.

MR. GRIFFON: But also the -- the overall external data reliability question. You know, obviously the model is relying on '56 through '65, right?

DR. NETON: Uh-huh.

MR. GRIFFON: Heavily on -- on that data.

DR. NETON: Right.
MR. GRIFFON: Have -- Have you found any supporting documents in that area? I know we focused on probably '48 to '57 because it's the SEC period.
DR. NETON: Sure.
MR. GRIFFON: But, you know, really --
DR. NETON: Yeah.
MR. GRIFFON: -- the dose reconstruction would rely on the later data. I just, you know, in -- in glancing at some of these memos and --
DR. NETON: Yeah.
MR. GRIFFON: -- it was 11:00 o'clock last night. I mean there -- there are some interesting twists and turns on how they got from here to there -- for these database data. I mean the -- the West memo --
DR. NETON: Yeah, sure.
MR. GRIFFON: -- where he discussed -- I mean he -- he clearly says that there was no raw data even then when he was trying to --
DR. NETON: Right. But --
MR. GRIFFON: -- understand this stuff so --
DR. NETON: -- if I can explain the comparison I'm getting to an invalidation it might -- it

might at least make my point.

MR. GRIFFON: All right. I'll wait for you to -- to finish.

DR. NETON: Now, whether you guys agree or disagree with that interpretation, but bear with me. Remember, we got a missed dose -- we got the monitored workforce with, you know, thousands of quarters per year and -- and so they were monitored. And it is our contention that they were more highly monitored workers and so in worst case you've got a missed dose issue. I mean they didn't record anything for less than zero so you've got 52 weeks times 30. You've got a 15 -- 1.5 rem missed dose issue to deal with. But I want to point out where we -- what this back extrapolation model shows. We did get -- well, there's one additional data point we got in 1955 that I'll talk about later with an HP report where they -- the average millirem per quarter in 1955 came out 1554 and the CER database came out 1531 so we do have one additional piece of information I just received this morning.

MR. GRIFFON: Okay.

DR. NETON: It's not in here but -- so we do

have some validation there. And again after '55 we're much more confident because remember, February 28, '55 is when they upped the skin dose limit so they had to intentionally track separately deep and shallow. And so they were monitored separately. And the comparison that we did later on with the -- with the Delta View showed that the data matched fairly well. I think it was a later time frame but --

MR. GRIFFON: I think it was '53.

DR. NETON: Was that '53?

MR. GRIFFON: Wasn't that '53?

So anyway we still -- the '56 -- I mean I -- I agree on the '56 through '65 therefore should be more one to one correlation --

DR. NETON: Right.

MR. GRIFFON: -- is what you're saying.

DR. NETON: Right. Yeah.

MR. GRIFFON: So if you were --

DR. NETON: It's very difficult to find those -- those pieces of data unfortunately. But if we can get past the red line through the solid black dots here and whether we use Hans's approach or our approach, let's assume that that line can be constructed somehow. Now

we've got the extrapolated line back into the 1950 era where -- where -- we -- we know we have a lot of workers who -- who were not monitored. So let me just brief-- briefly explain what we would assign. This is -- This is -- it's a little misleading because it says year on the bottom but this would be the dose assigned per quarter to each individual so in other words, if you go back to 1950, you know, you'll see it will be somewhere around 300 millirem per quarter assigned to a worker based on the back extrapolation so you're talking about 1.2 rem or exposure at a uranium facility not counting cyclotron workers. Pretty -- Pretty generous dose assignment I think.

MS. MUNN: Very generous. Very generous.

DR. NETON: Now, one thing I want to point out though is this curve is based on assigning missed -- two things: missed dose is included to generate that curve so it -- we're -- we're already in my opinion accounting and somewhat biasing it high because it's our -- it's been our experience that missed dose -- if you add missed dose in at face value it biases a worker's exposures high. It's almost

impossible to have 13 -- 12 badge reads at the detection limit in a row all read less than detectible and add that dose. So that's point number one. The second point is that this curve in itself was -- it's a little difficult to explain because of the -- the maximum likelihood process that was used here but in the regression analysis for this curve they assumed a geometric standard deviation of the data points here. Instead of using sigma in the regression analysis they used the 95th percentile of sigma to fit the curve. Now, how that corresponds one to one with what came out here is difficult to explain other than if you look at the table on the next page. You'll see the geometric mean of the regression line, say in '47, was 194 E-dose which is what NIOSH would use in the quarterly dose assignment, came out 385. That is a direct result of using the 95th percentile of the geometric standard deviation in fitting the regression model. It -- It's -- It's very complicated to describe what the effects -- I can just show you empirically what the net effect was. But my point is that you have -- you have already used

missed dose to generate the regression line and on top of that you've used the 95th percentile of the sigma value to generate the regression line so you're -- you're already way up there is what I'm trying to point out.

MR. GRIFFON: That -- That's pretty -- you -- you can easily track that through on these spreadsheets that support. I haven't looked at the -- I mean I've looked at those --

DR. NETON: Yeah.

MR. GRIFFON: -- that's laid out there. The calculations are --

DR. NETON: Yeah, the calculations are laid out there. And it -- it's pretty arcane subject matter but yeah, it's there. Okay. So now I can get into this -- this next --

DR. BEHLING: Okay. Can -- Can you just --

DR. NETON: Yeah.

DR. BEHLING: The E-dose is basically the assigned dose without a sigma value?

DR. NETON: No, it has a sigma value as well.

DR. BEHLING: You're saying it's built in.

DR. NETON: Right. Yeah.

DR. BEHLING: But this would be entered in as a deterministic value?

DR. NETON: No, it would have a sigma value associated with it as well which would be the propagated sigma of the geometric standard deviation and the organ dose conversion factor. I went through the -- the tools yesterday to verify this. So what you have is, you know, the do-- the organ dose conversion factor or the triangular distribution. And you -- you couple that with the geometric standard deviation on this E-value and you end up with a propagated log -- it ends up being lognormal because a lognormal drives the distribution. And so you'll end up assigning an E-dose with its associated geometric standard deviation that's propagated through the process. So again it's not just that although, you know, it's a sampling process and as we've been down the line you effectively end up sampling higher than that because if this uncertainty is small compared to the overall uncertainty you'll effectively sample the mean of the distribution. It's getting pretty technical here but --

DR. MAURO: Again, it's -- I'll ask you a simple question and just make sure I understand

what I'm looking at. On the table 5 that we're looking at now -- not -- we're looking at 1947 -- you have this 194 millirem in that quarter. That -- That's a geometric mean obtained from real data?

DR. NETON: Yeah, that's the black dot. That's the geometric mean of the regression line --

DR. MAURO: So there was a certain number of workers that actually were measured in that quarter?

DR. NETON: That is the best estimate of the workers' exposures --

DR. MAURO: Right.

DR. NETON: -- in that quarter.

DR. MAURO: And that was from the data -- but this was from -- measured from badge film?

DR. NETON: Oh, no, no, no, not '47. This is the projected --

DR. MAURO: Okay.

DR. NETON: -- regression line from the --

DR. MAURO: Okay. Then -- and then the -- the past the progre-- from the regression line then what's -- then what's the I guess the E-dose? I'm having trouble understanding what this number is?

DR. NETON: Okay. That would be the regression line if one used the data as it was. Used it, the geometric mean of standard deviation for all the data after '55.

DR. MAURO: Okay. That would be the 194?

DR. NETON: Right.

DR. MAURO: Okay. Then --

DR. NETON: Now, I don't -- I didn't reproduce it here but there's a -- there's a -- in table -- in report 32 there's especially one sentence. It said to be more claimant favorable instead of using the sigma value for either of those years after '56 in the regression calculation they used the 95th percentile as if it were sigma.

DR. MAURO: Okay.

DR. NETON: And then they -- they fit the line using that. And this is what you end up with doing that. And in fact if you look at the equation underneath the -- underneath figure 2 here that -- that -- that equation, E-dose = EXP3.6 - .122 year - 61, that little appendage there plus .5 x 1.147 squared is the correction that they added to increase the E-dose. In other words, if you would get the -- what you

would get -- 140-- 194 without that .51 x 1.47 squared. And that's the additional increase due to account for the -- allowing for the sigma to be equal to the 95th percentile.

DR. MAURO: Now I understand. Now, a follow-up question.

DR. NETON: Sure.

DR. MAURO: Now, in one of the tables that you are providing you actually do have some records of external measurements. For example in 1948 it looks like there were 162 personnel. I have it -- I'm looking at one if the tables you've provided. I'll just tell you what the numbers are. The -- There actually were measurements.

MR. GRIFFON: Yeah, yeah, yeah, yeah.

DR. MAURO: And there were 162 workers monitored in 1948. And the total number of records in 1948 for those workers were 3,599 which is a lot of records. So there were a lot of records. Now, what I'd be interested in knowing, so okay, there's your real records. Now if I took the doses for those all 166 workers and I just said, you know, here's -- here's the dose in that year, 1948, here's the -- the highest dose for the highest person.

Second highest, third highest, you know, just -- - just made a long list So here's -- here's -- - if I just use the data for those -- and there -- by the way there were over 2,000 workers so what we're really saying is in 1948 there were 2,511 workers. You had data in 1948 for 162 of them. And look, I'll show you --

DR. NETON: John, we're getting there. I -- I've got that comparison.

DR. MAURO: Oh, is that where you're heading?

DR. NETON: I'm heading there.

DR. MAURO: I'm sorry.

DR. NETON: I'm heading there. I'm sorry. I'm sorry to have to be so -- but I think it's important to understand what we've done.

DR. MAURO: Okay.

DR. NETON: I hope you agree I mean because otherwise I mean we -- we -- we have no basis of comparison.

DR. MAURO: Okay.

DR. NETON: So we're going to -- we're going to assign this lot, okay, so you can read it. We're going to give them about 1,200 millirem with the distribution say for 1948. I think we all agree that seems to be a fairly generous

assignment of dose. The one other thing I just want to bring out because I don't want to get confused about these scaling factors. If a worker was monitored after '56 we have some additional knowledge that we don't have for people who were never monitored, right? I mean and so the scaling factor was built into the calculation to account for the fact that maybe a worker was at the high end of the exposure after '56. You can see there's a big spread of these black dots. What if he was the worker way to heck up here? So to account for that we'll say, well, if he's got five quarters of data here to show us that he's really at the higher end up in here we're going to scale his doses parallel to that red line and say it certainly goes up and it goes up proportionally and we're not going to under-assign him a dose prior to 1957. That -- That was the whole point of the scaling factors. If by definition though if you have no monitoring data at all before '57 your scaling factor is one because we've already decided that the highest exposed workers were monitored. He is not by definition one of these workers with the high -

- at the high end of the distribution. So that -- that's where we're at. Okay. Now, if you'd just -- there's a report here that George Kerr put together for us. It's called validation of backward extrapolation model. I'm sorry?

DR. MAKHIJANI: Can I ask you a question about that? In the '56 to '60 period some workers were monitored part of the time because some of the record in the evaluation report you indicate that people were taken off monitoring because they didn't have high doses or they were on monitoring -- they were put on monitoring so obviously it's varying so how -- how do you deal in the scaling factor with the partially monitored?

DR. NETON: Right now my understanding -- my understanding of the procedure is that it's five quarters -- I think it's five quarters of monitoring data that you could use. But -- But if it's not there then it would have to be -- there would have to be some judgment made. I mean, you know, we -- we --

DR. MAKHIJANI: Yes. You said that.

DR. NETON: We have clear-cut procedures but clearly the guy has a huge dose in 1958 and his

job title is the same and it goes back. We're going to -- We're going to make some -- some adjustment for that. But proceduralized right now it's five quarters. Okay. Let's move on to the next document that's entitled validation of back extrapolation model. And I'm not crazy about the term validation but maybe evaluation would be a better term. But given the data we have, if you'll look at the figure 1, after 1957 we will assign, you know, we -- we have it. We have the data for the workers so we'll assign it. Prior to 1956 though what you see is a line that is equivalent to that red line on the other document. And the circles are the projected annual doses that we would assign to the workers for those years with unmonitored data. So you can see back around in 1958 you're upwards around 1300 millirem per year. In 1951 you'd be right around a rem. So these are the -- these are the assigned deep doses for these workers who were unmonitored who in our opinion had lower exposures than the monitored workers. And remember this is based on an extrapolation of 147 workers including missed dose assigned to them. So that's --

that's what we assigned and -- and on top of this it's not shown but you would have a geo-- it's not shown but you would have some kind of a geometric standard deviation about each of those points to account for the uncertainty of the backward extrapolation model. So you end up with some pretty high -- high -- you end up with a very high estimate and a geometric standard deviation about those values.

Has everybody got -- it's -- it's this page with the figure 1 and figure 2 on it.

MS. MUNN: Page 3?

DR. NETON: Right.

MS. MUNN: Right.

DR. NETON: The first one is deep dose. The second figure two is beta particles. So in an attempt to go back and look at the data that we have -- remember we have data prior to '57. We've looked at it. We -- We've acknowledged just earlier that there are issues with this data because of recording practices and whatnot. Notwithstanding those issues though, and remembering that after '51 all of the doses include missed dose by definition. Every time a person was monitored with zero they added 30

millirem so we've got -- what we have here is the projected line includes missed dose and now we're -- we're comparing it to values X factor '51 of people's doses that includes missed dose. And we just did a straight comparison of what the back extrapolation model would assign versus what we currently had in the database. And this -- this is the average value that's in the database.

DR. MAURO: So am I correct in interpreting that your extra-- extrapolation model provides a high level of ensurance that you're going to overestimate the mean dose in a given year for a given unmonitored worker?

DR. NETON: It is -- It is our opinion --

DR. MAURO: And I think we've never doubted that that -- that you overestimated -- I don't know. This is -- This is my opinion. You would always -- you would overestimate the mean dose, but it's always been our concern that there may be a population of workers -- sub-population of workers in the earlier years that that back extrapolation is going to be potentially underestimated for those workers. Now, granted, one of the discussions we had is

that that's going to be, you know, the vast majority of these thousands of workers are going to fall below the projected back extrapolation. That's true. And I think that that brings us -- you know, we're really in a site profile issue right now. So that brings us to the question is, are there substantial numbers of workers who are unmonitored in the early years that had a good likelihood of experience and exposures well above the values that were back extrapolated? No doubt that you've overestimated the mean for the population of workers. But the question is is this, you know, is this where you want -- where you want to be?

MS. MUNN: Is there any evidence --

MR. KERR: You can go to these means now and (inaudible) the monitored workers.

MR. RUTHERFORD: But the means are for the monitored workers?

DR. NETON: Yeah.

MR. KERR: The means that are shown down here at the bottom --

MS. MUNN: Right.

MR. KERR: -- are from the monitored workers.

DR. MAURO: Yes.
DR. NETON: Including the missed dose for the monitored workers.
MR. KERR: That's not unmonitored workers. That is the monitored workers.
MR. RUTHERFORD: So the only way you could come up with that is if you do not believe the maximum exposed people were monitored. That's the only way you can make that interpretation.
MS. MUNN: Has there ever been any evidence --
DR. MAURO: We have no evidence whatsoever of that. When you compare -- when you look -- remember early on when we looked at the data from '61 on when everyone was monitored and we identified the maximum exposed people during that period. When we -- we went back in the earlier years those same people were the same maximum exposed people with the same max doses. So I think we've done that comparison already.
DR. NETON: Well, With some caveats. Be careful but --
DR. MAURO: There's a sim-- We're really -- We're really right back I guess to where we started with in the population of workers that were all monitored. When those workers were

selected I am now convinced that two things happened. There was an effort absolutely to monitor the workers that had the high end exposures. There was also an effort to capture workers in a large number of different departments so there was like a little bit of both. A little bit of --

DR. NETON: Cohort worker.

DR. MAURO: But it wasn't all that. In other words, because there's no doubt that -- that the departments that have the higher exposures had a greater number of workers in the pot. So -- So it was a little bit of both. Now the question becomes when you look at the mean of all the numbers what we're really saying is you get the mean of all the numbers which reflects a chunk of people that were the departments that got higher exposures, but some people, a chunk of people that were in the departments that got low exposures. So when you roll the whole thing up what you get it an overall picture that would be a somewhat dilution of the exposures to the people that were in the high end departments. And that's -- But I see that as a site profile issue.

DR. NETON: I agree. I agree with you. But remember that this E-dose is a factor of almost two higher that the projected mean value of the distribution to begin with. We've already built into some conservatism on that level.

DR. MAURO: So that protects you from that.

DR. NETON: Well, we feel -- we feel strongly that that's the case.

DR. MAURO: Protects your position by doing that.

DR. NETON: Yeah.

DR. MAURO: Okay.

DR. NETON: And so --

MR. RUTHERFORD: I think your discussion on '48 and '49 dose will even add. We already built in to some conservatism on that level.

DR. MAURO: Right. So that protects you.

DR. NETON: Well, we feel -- we feel strongly that that's the case.

DR. MAURO: That's your position, I mean by doing that. Yeah, okay.

DR. NETON: And so --

MR. RUTHERFORD: Well, back to your discussion on '48 and '49 those would even add more value to it.

DR. NETON: Well, ’48 and ’49 is way, way below as well. And that was based on some of the PIC data as well as the film badge data that George wrote a report on that we had talked about in the past. I just feel that, you know, you -- you have a curve that is based on -- I don't know, on what -- our curve, our back extrapolation curve is based on including missed dose for the highest exposed worker -- for the what we believe to be the highest exposed worker. We went back including that missed dose. And we used the 95th percentile of the -- of the same, jack it up by either a factor of two. And now we’re comparing this to the monitored workers and they fall pretty well below that. And those monitored workers include, after ’52, missed dose itself. So we’re comparing a -- a huge missed dose overestimate to a missed dose overestimate of the actual workers and we’re above that. I -- I find that to be a pretty convincing scenario in my mind that we’re not under-assigning doses to uranium workers in this facility. And in particular in light of the fact if we’re saying that these cyclotron workers are not in here.

Now, if the cyclotron workers were in here I'd feel a little less comfortable --

DR. MAURO: Right.

DR. NETON: -- because we know that those were some very high exposures. I mean clearly very high. So you're talking about a uranium foundry, a facility. It's hard to imagine getting doses much higher than this in the workplace. Is there -- Is there a segment of population that was unmonitored? I -- I have trouble believing that that's true. Could it have happened? I can't say with 100 percent certainty that it didn't.

DR. BEHLING: To some extent I'm somewhat biased because I reviewed the Paducah TBD.

DR. NETON: Right.

DR. BEHLING: And they run a parallel path. Their conversion from partial monitoring to full monitoring occurred in exactly the time -- time frame that occurred here. And -- And I looked at that data and they, too, expressed the opinion that the most or the highly exposed population was monitored prior to the conversion to whole monitoring. And then they actually had a couple documents that showed the

distribution of doses among people prior to that conversion and after and -- and they have distribution that says zero to one rem a year --

DR. NETON: Yeah, I remember talking about that.

DR. BEHLING: -- to one to two rem and I believe the numbers go at a time when they monitored only 500-and-some odd workers they have 15 people in the one to two rem, the highest distribution. And then they converted to all monitoring workers that went from 500-some odd people to over 1,600, more than tripling the -- the original people monitored. And of course, the assumption now would have been that the people who weren't monitored, the additional 1,100 people would have fallen all into the low exposure category. And instead when you look at the people that went -- that were prior to that, 15 people who fell into the one to two rem among the 500, and then they went to 1,600 people monitored, they went from 15 to 75. And you sort of say well, they don't -- it doesn't seem to -- to jive.

DR. NETON: I'd be careful, though,

interpreting that. I mean are we looking at missed dose issues here again?

DR. BEHLING: Yeah, I don't --

DR. NETON: Missed dose plays a huge part in these early dose reconstructions. You know, you've got 52 badges with a 30 millirem detection limit. Depends on whether you add the 50 in like they did in '53 or they did not, or was it, you know --

DR. BEHLING: I think there were quarterly doses and I don't think the issue of missed dose was part of that equation.

DR. NETON: Well, I don't know. I'd like to see it.

DR. BEHLING: Yeah. And -- And -- And it just struck me and so in that way I'm somewhat biased --

DR. NETON: Sure.

DR. BEHLING: -- in saying, okay, here we have Paducah and it's on a parallel path between partial monitoring of a workforce to full, and we have a distribution that in crude terms defined worker exposure between zero and one rem a year, one and two rem. And we went from 15 people in the one to two rem representing a

total worker population monitored of 560. And then you add 1,100 new workers and -- and they should have all been in -- in the lower portion.

DR. NETON: Right.

DR. BEHLING: And instead you went from 15 to 75, a five-fold increase. And that's what?

DR. NETON: Right. And that was at Paducah?

DR. BEHLING: That's correct.

MS. MUNN: But Hans, in the Paducah case you have evidence --

DR. BEHLING: Right. We have --

MS. MUNN: -- that there was a problem.

DR. BEHLING: Right.

MS. MUNN: In this case there is no evidence.

DR. BEHLING: No, I -- I understand that.

MS. MUNN: It's just --

DR. BEHLING: What I'm saying is that you could be -- I'm fully aware -- I think we're all assuming that the average dose is an inflated dose, that people are mostly going to get a generous assignment of the dose they probably didn't deserve. But as -- as John is saying, we're looking at it and it's just like the environmental protection. The reasonably

maximum exposed, he probably is a rare bird there's no question. But John's concern is that are there some potential people out there, a very few and who's to say if any of them even have a claim, that on a basis of your generous assignment would still be underestimated. That's the only issue.

DR. NETON: I -- I -- I understand. I understand what you're saying.

MR. KERR: As we handed out something or Jim did at an earlier meeting which re-looked into 1961 group of workers, and we looked at -- split that 1961 into two groups; ones who had been monitored before 1961, ones who hadn't. If you read that memo I don't think you'll find any evidence that there was a lot of workers before 1961 who were highly exposed that weren't being monitored. And if you haven't seen that I would advise you to get a copy and look at it.

MR. GRIFFON: We still have -- there is some caveats. I mean the salvage worker question is -- is one thing, right, the early amount.

MR. RUTHERFORD: Yeah. I think you addressed that separately though.

DR. NETON: Yeah, a salvage worker in my mind is -- is more of an internal dose issue than an external. I don't -- I don't have any believe to be that -- they were -- they were working with uranium.

MR. GRIFFON: Right. Yeah.

DR. NETON: And so, you know, I just don't see that there's a big difference.

DR. MAURO: We still haven't done this common sense thing that I've been --

DR. NETON: Okay.

DR. MAURO: I keep asking for and I don't know -- I don't know how much value it is. But in my mind it has value. Let me just -- Let me just point that out to you what it is.

DR. NETON: Sure.

DR. MAURO: And then, you know, sort of get it off my back. Okay. All I'm saying here is -- is at this very nice table, I look at it and I got it to say oh, okay, in 1948 there were 2,511 workers, okay --

DR. NETON: Uh-huh.

DR. MAURO: -- in Y-12. And we know that 162 of them were monitored, okay? And these are the number of records we have. I guess these

are weekly records.

DR. NETON: Yes.

DR. MAURO: Okay. Now, are they good? Good.

MR. GRIFFON: Rank them highest to --

DR. MAURO: All right. So just do me a favor. Just take them high to low, all right? Forget about the distribution.

You may see -- you may see some high, three or four high numbers and you may see all zeros. Or if this is the -- whatever -- whatever it is, it is.

DR. NETON: Okay.

DR. MAURO: This is what the data say. Then along comes your extrapolation model.

MR. RUTHERFORD: See where it fits.

DR. MAURO: Where does it drop in?

MR. RUTHERFORD: I agree. I see what you're saying.

DR. MAURO: I mean I look at that and if I see a drop up in the 95th percentile of this distribution I say I don't -- I don't need to know any more. I'm -- I'm --

DR. NETON: Well, the average value here is around 200.

DR. MAURO: Right. Yeah, right.

DR. NETON: Okay. So --
DR. BEHLING: But he's wanting to check for any outliers to see how many outliers there may be?
DR. MAURO: Where does it sit? Do we have a whole bunch of people that were hired?
DR. NETON: Well, that may be but -- well, but -- well, but John because now --
DR. MAURO: Okay.
DR. NETON: -- now let's say we find one -- one person who was monitored that exceeds 1,500 millirem.
DR. MAURO: Right.
DR. NETON: What are you going to do about that? Are you going to state that?
DR. MAURO: I just want to know it. I guess, no, here's where the judges --
DR. NETON: If he's monitored, see, now we -- we maintain that the highest exposed people are monitored.
DR. MAURO: Right.
DR. NETON: Right. So my point is that just because there may be a few people over what we're assigning does not mean, you know, this --
DR. MAURO: No. Remember -- Remember then we

go back to the conversation we had with Hans before. But we all agree that there were some departments where there may be a large number of people that -- that received substantial exposure but only a portion of them were actually selected for monitoring. There were -- in other words, all the workers that had the potential for exposure in a given department were not monitored. So -- So -- So --

DR. NETON: But those workers were included in the distribution. I mean and the percentage would be included, you're right. Right.

DR. MAURO: But what I'm saying is that those -- so here we have a worker that was not monitored, came out of a chem department where there was a high exposure but he wasn't monitored. Now -- but that department if you look at it, it was biased high by its very nature.

DR. NETON: Because it had a high exposure.

DR. MAURO: Do you see? You understand what I'm saying. Now, to me I say that problem goes away if you do this ranking. And I see that you're coming in at the high end. The extrapolation is bringing you in at the high --

and I'm not saying we're in the high end, but, you know, it shows that when you go back and extrapolate there are going to be very few people that will be high end. Now, we all know there's always going to be one or two are going to be higher than you in theory. The thing is where are we coming in? See that's what I call the common sense approach to looking at the data. And that would -- that would convince me. But I'll also say that what we're talking about now is a site profile issue because what I'm hearing is, unless I'm hearing differently, the data -- the question is being put to bed?

MR. GRIFFON: No.

DR. MAURO: No? Okay. Well, I -- that's what we should be --

MR. GRIFFON: It hasn't been. I mean that's what I'm saying. The first 60 -- 50 -- the first 56 right now, you know, hasn't.

DR. MAURO: Well, then that's what we should be talking about.

MR. GRIFFON: That's where we're at. I think the modeling is less an issue to me than the question of what we're -- what we're modeling with.

MR. RUTHERFORD: Yes.
DR. NETON: We're looking more to '57 to '60 --
MR. GRIFFON: Yeah, yeah.
DR. NETON: -- because '61 on everybody was monitored and so we should have data that we can do an -- easily a comparison with that.
MR. GRIFFON: Well, no, no, no.
DR. NETON: Okay.
MR. GRIFFON: '65 and I'm not saying, you know, I think these can help, physics reports for summary data. I don't know if they exist, Jim. I -- I agree with you there but, you know, it's just a -- a couple spot checks from that time period.
DR. NETON: Okay. I'm -- I'm -- I'm encouraged. I mean if that's where we're at I don't -- I don't --
MR. GRIFFON: I'm not trying to make a moving target out of this but really we are focusing on '57 for that time period of the SEC but really you're relying on the other and --
DR. NETON: Right.
MR. GRIFFON: -- quite frankly if we dig into the '57 through '65 period and see all these manipulations and maneuvers I'd be a little

more concerned.

DR. NETON: Yeah. I've learned -- I've learned my lesson. I'll never presume.

MR. GRIFFON: You've explained and -- and with good reasons and memos and good -- it seems like good -- you have a good trail --

DR. NETON: There's a -- There's a -- There's an explanation to what's been going on and I'm --

MR. GRIFFON: Right. But if that still exists afterwards -- you seem to think that that doesn't exist now and if we look and -- and we see problems still --

DR. NETON: I can't predict that there is not some new standard that occurred but --

MR. GRIFFON: Right. Right.

DR. NETON: So I'm encouraged. I mean if that's where we're at, that's fine. I mean we can -- we can go back and -- and look at the --

MR. GRIFFON: I mean I think that --

DR. NETON: -- the data that we have in '57 through '65.

MR. GRIFFON: I think that's been my bigger concern throughout is the --

DR. NETON: I might have misunderstood that.

MR. GRIFFON: -- the data that we're using rather than the model itself, the data that the models rely on.

DR. NETON: Well, I think it was important though to establish that the model itself was bound.

MR. GRIFFON: Right. I agree.

DR. NETON: I think -- I think that's an important thing to demonstrate.

MR. RUTHERFORD: Well, I think once -- I think even if you end up tweaking it it's a site profile issue. It's not an SEC issue.

DR. NETON: That's been my belief for awhile.

MR. RUTHERFORD: Right.

MR. GRIFFON: Right.

DR. NETON: Right. Okay.

MR. GRIFFON: Well, but -- but the data, you know, we had to get there by looking at the data.

DR. NETON: Sure, absolutely. No problem.

MR. GRIFFON: George.

MR. KERR: The data that -- that John really wants is in a report on the '48/'49 --

MR. GRIFFON: It is.

MR. KERR: -- data.

MR. GRIFFON: Yeah.

MR. KERR: Because we give the maximum value that is recorded each month. It's not the 95th percentile. We give the 75th percentile but then we also give the maximum. So those -- that data is available.

DR. NETON: There -- There -- Here's some of the data. '48 maximum -- July '48 was about 300 millirem.

MR. GRIFFON: Where -- Where is this report?

MR. KERR: This is a report -- '47. Well, it's on --

DR. MAURO: This is -- Okay, this is in 02/'47.

DR. NETON: It's been out since September of 2005.

MR. GRIFFON: 02/'47, okay. Okay. So this is out there.

DR. NETON: It's been out there for awhile. And -- And it does -- it does have monthly statistics. And I'll tell you right now just at first when you look at this thing it looks like we're --

DR. MAURO: Well --

DR. NETON: I won't make any comment. Looks --

Looks pretty good to me.
MR. GRIFFON: Looks okay.
DR. NETON: Yeah. I don't -- I don't see that there is a --
MR. GRIFFON: Are those numbers in 02/'47 derived from health physics reports or from where? Where are they --
MR. KERR: From that '48/'49 --
DR. NETON: Well, it's that '48/'49 data that as the film badge data that we talked about when, you know, Arjun was at one point saying, well, we said it wasn't valid two or three years ago or somebody did and then --
MR. GRIFFON: Right. So addressed that.
DR. NETON: The intent of that document was to go back and look at that to see if it could be used to do any kind of comparisons such as we're making. Actually I think the original intent to be honest may have been could we use these data to reconstruct doses.
DR. MAURO: Unh-unh.
DR. NETON: And I think we're not doing that now. We're just saying that in looking at the data there's enough information there that we can use to say that this 1,500 millirem that

we're projecting to assign is pretty darn good. And it's pretty bounding and and it's -- it's -- it's a plausible number.

DR. MAURO: I have to apologize. When I asked that question before, do we still have a date of that issue, I was thinking of about what George was saying.

DR. NETON: Yeah. Yeah.

DR. MAURO: What was the answer? I mean where are we on that?

DR. NETON: I agree and, you know, Mark says and it makes sense that we need to go back and look at after '57 and show that we don't have any disconnects there.

DR. MAURO: Got it.

DR. NETON: To the extent that we can.

MR. GRIFFON: But the model itself I think we're -- I mean we're -- we're I mean I think we're getting comfortable with it. And even if there's still some -- some smaller questions on it I think it's really a site profile issue.

DR. NETON: Yeah.

MR. GRIFFON: I don't know if everybody agrees but --

MS. MUNN: I just want to draw a box around

that. We're okay with the '52 through '57?
MR. GRIFFON: No, no. I mean we just got this stuff last night. It seems good as Jim presented it. It seems like they've got --
MS. MUNN: Well, okay.
MR. GRIFFON: What? What?
DR. NETON: No, no. I'm fine. That's fine.
MR. GRIFFON: I mean --
DR. NETON: No, no. I just -- I just -- I'm not --
MR. GRIFFON: You're looking at me funny.
DR. NETON: Well, I was going to say it seems sort of like I put some spin on it.
MR. GRIFFON: Well, there's a -- there's a -- no, no, no. I'm not -- I'm not suggesting that but there is another problem. I mean you look at this at 11:00 o'clock at night. We don't have identified databases so I'm at a loss how to even compare, you know.
DR. NETON: My whole point --
MR. GRIFFON: This is an ongoing issue.
DR. NETON: My whole point is there are (inaudible) prior to '56 --
MR. GRIFFON: Yeah.
DR. NETON: -- and they're -- they're

understood and recognized. And given that though, and given that it's all missed dose it looks like we're up here, you know, well above where -- where we believe the workers were receiving dose.

MS. MUNN: It looks well above any probability.

DR. NETON: I think it's a very reasonable, plausible approach.

MR. GRIFFON: I think Arjun's been waiting to say something.

DR. MAKHIJANI: The back extrapolation and the modeling seemed okay I think, especially with the scaling factor and so forth so I think a lot -- the -- the crucial assumption is one of the things we've been debating and that was part of Harry's statistical analysis and in the review that we did last month, in appendix 3 of the review. And that revolves around interpretation of this table 45-B in your appendix of the evaluation report on page 33.

DR. NETON: Okay.

DR. MAKHIJANI: And, you know, if -- if you'll -- if you'll look at that table it's -- it's clear that in many of the departments if you define high exposure potential as high exposed

-- high mean exposure, what everybody was monitoring, and rank it that way as one approximate way of understanding which departments have the highest exposure -- relatively high exposure potential compared to others. And you look at that table and it goes from 30 millirem average to 107 which is more than a factor of three. And then you look at the percentage of people who were monitored between ’56 and ’60. Do they correlate -- do the percentage of people increase? Were there consistent -- is there some consistent pattern in the monitoring even among the departments that are clustered at the high end, which is saying the 70 to 100-plus millirem dose. You don’t find one. The --

DR. NETON: Well, I -- I don't have that table in front of me but the first table my -- that I saw in that comparison made no sense to me technically from a -- from a statistical perspective.

DR. MAKHIJANI: Which table?

DR. NETON: Well, are you talking about those tables that were generated, those graphs to show --

DR. MAURO: Figures 1, 2 and 3?
DR. NETON: Yeah.
DR. MAURO: I pulled those out. Yeah. Yeah.
DR. MAKHIJANI: Right. Because number 3 -- number 3 seemed to support our case. Number 1 didn't seem to be with merit because I saw no reason to believe the premise.
DR. NETON: Well, the workers who were low -- the average exposure in workers prior to '56 should be the same after '60. I think --
DR. MAKHIJANI: No, it's not '56. It's -- It's -- It's not -- It's not a question of comparing the average exposure. It's a question of we simply did a correlation. Were -- Were those departments that had high exposures in the '61 to '65 period --
DR. NETON: Right.
DR. MAKHIJANI: -- also tending to have the relatively high exposures in the earlier period?
DR. NETON: Is this figure -- Is this figure 1?
DR. MAKHIJANI: This is figure 1.
DR. NETON: Okay.
DR. MAKHIJANI: It's not the horizontal and

vertical axes are not on the same sphere.

DR. NETON: I understand.

DR. MAKHIJANI: And you're not required to have a slope of one. You're only required to have a relatively strong positive correlation between high values and high values regardless of what those high values actually are.

DR. NETON: But my question on that graph was what if the department had 1,000 people in it and they monitored one. You're going to dilute it and have a low exposure that after '61 it makes no sense to me, that comparison.

DR. MAKHIJANI: That -- That's exact-- That's part of the point -- well, there's another graph, of course, that we did.

DR. NETON: Well, figure 2 I'll grant you. But figure 1 makes no -- no technical sense to me why that comparison is a valid --

DR. MAKHIJANI: Well, it -- it -- it allows you to determine whether there is a correlation between the -- the departments that indicate high -- the doses that were indicated as relatively high in the department --

DR. NETON: Only if the departments all have the same number of workers. If you have

different number of workers by department you're going to dilute the dose way down. It makes no sense to me what you're doing.

DR. MAKHIJANI: No, but if -- if -- if your premise is correct that in the '56 to '60 period that all of the monitored workers have the highest exposure potential clearly the average in those departments -- first of all the average in those departments for the '56 to '60 period should be higher than the average in the '61 to '65 period and that is clearly not the case. I will give you -- I will read you an example. The -- The --

DR. NETON: I don't have it in front of me.

DR. MAKHIJANI: Look. Department 2162, 50 workers, average 17.1, 36 percent monitored. The average post when everybody was monitored, 47.6.

DR. NETON: But --

DR. MAKHIJANI: Wait. I'll give you one with a lot of workers. Department 2776, 8.9 percent of the quarters were monitored. The mean dose was 20.6 when they partial monitored but the mean dose when there was universal monitoring was 90.7. That -- That -- That contradicts

the case that the people in the earlier periods, that's why that correlation is important is indicates that in some departments that had high exposure potential you had a lot of monitoring and in others you didn't. So, you know, your premise actually was indicated to not be correct.

DR. NETON: But I would argue that the doses that you're quoting there are well below the detectible doses of the badge exchanges. So you're really in a statistical wheeze, Arjun. There is no way that you can validly compare doses that are 100 millirem when you've got a badge that -- that reads 30 millirem and is exchanged weekly. It makes no sense.

DR. MAKHIJANI: Well, quarterly dose is only 20.

DR. NETON: But my point is that you -- you've got built in there a lot of statistical issues with detectability of the radiation itself. You're comparing -- if you put air bars on those comparisons I guarantee you they're going to be like this. (Indicating.) They make no statistical sense at all to me. I could do this. I could go back and show that. But what

I'm saying is you're looking below the detectability of the measurement systems themselves and trying to make comparisons at zero.

DR. MAKHIJANI: Those were the data that you're using and including in your 147 workers.

DR. NETON: No, they were --

DR. MAKHIJANI: You are using -- you are using data from workers who were monitored in the '56 -- that's the piece -- that's the only piece that really concerns me in this --

DR. NETON: Right.

DR. MAKHIJANI: -- is this piece.

DR. NETON: Right.

DR. MAKHIJANI: Is your -- There's -- To me as I look at this information both in regard to proportion of people who are monitored in the various departments and -- and the average doses that are indicated here is that there's a very mixed bag as regards who was being monitored in the '56 to '60 period.

DR. NETON: I don't think that that analysis says that at all. I think you've -- you've got statistical issues with what you've been comparing. We compared the highest exposed

workers who had really high doses and the highest exposed workers continued to be the highest exposed workers across the -- the graph. So you're -- you're up there in the level of doses that are meaningful statistically. You're comparing doses of workers who could have received, who knows? Again like I said, 30 millirem per badge exchange, 50 weeks, you've got a potential dose per worker of 1.5 rem, and you're comparing 20 millirem averages. It's -- It's not a valid comparison I don't think. I think if you put air bars on there you can't come to any -- any valid comparison there. I mean it's a good statistical analysis but I think that they did not understand the limitations of the measurement devises that were used when they did the analysis. That's my opinion.

DR. MAKHIJANI: Why, when 90. -- let -- let's just take -- if -- if that -- and I'm quite open to not seeing this right. And I looked at this as much as you have obviously.

DR. NETON: Yeah.

DR. MAKHIJANI: Let's if we can -- if we can just understand this one department, 2776.

1,137 workers; number of monitored quarters with 8.9 percent. The mean dose in the '56 to '60 period per quarter is 20.6 millirem. Same department with the universal monitoring was 90.7 millirem. All right. Now, in the second period it clearly had an above detectable dose --

DR. NETON: But the average --

DR. MAKHIJANI: -- of 90.7.

DR. NETON: But it's built up of a bunch of numbers that -- that aren't above the statistical --

DR. MAKHIJANI: But a lot of people had to have --

MR. GRIFFON: Maybe they just built up because the LOD was assigned --

DR. NETON: Exactly. What I'm saying --

MR. GRIFFON: -- Zeros assigned --

DR. MAKHIJANI: A lot of people had to have doses above 30 millirem in order to make up this average as 90. If the limit of detection is 30 --

DR. NETON: Right.

DR. MAKHIJANI: -- it couldn't be that 70 percent of the people were assigned 30 and

you're coming up with an average of 90 because then you've got some very, very high exposed people.

DR. NETON: But the point is, Arjun, you're assigning missed dose to all those workers that are now monitored. That's my point. You're giving all those workers who didn't receive --

DR. MAKHIJANI: That's just 30 millirem per badge exchange per quarter.

DR. NETON: Times 13 is 400 millirem.

MR. GRIFFON: Six months or?

DR. NETON: These are per quarter doses.

DR. BEHLING: These are quarterly doses.

DR. MAKHIJANI: These are quarterly doses.

DR. NETON: Right. But what I'm saying though is the 90 millirem quarterly dose includes a lot of missed dose.

DR. MAKHIJANI: But only 30 millirem.

DR. NETON: For more workers though. You've added a lot more workers --

DR. MAKHIJANI: But not the early ones.

DR. NETON: -- (Inaudible) positive --

DR. MAKHIJANI: -- relevant in the average. The -- The -- If you -- If you have an average of 90 millirem you have to have a very

significant number of workers --

DR. NETON: No.

DR. MAKHIJANI: -- who have above --

DR. NETON: No.

DR. MAKHIJANI: Please hear me out. Now, if you have an average of 90 millirem in a group of workers and the limit of detection is 30 then you're going to have a large number of workers who have had doses above the limit of detection. And then you can't come up with an average of 90 unless you have real -- a few real outliers --

DR. NETON: Okay. Let me -- Let me --

DR. MAKHIJANI: -- which I'm excluding.

DR. NETON: Let me see if I understood what the comparison was. Prior to '56/'57, eight percent of the workers are monitored or something like that. So I have badge results for those and I'm assigning them missed dose or whatever to come up with my average but I'm dividing that value by the entire work population --

DR. MAKHIJANI: No, no.

MR. GRIFFON: No, no. No. Workers.

DR. NETON: I divide it by the monitored

workers?

DR. MAKHIJANI: Yes.

DR. NETON: Well, then that makes the comparison --

DR. MAKHIJANI: This is the mean dose -- this is the mean dose for -- for monitored workers. It would make no sense to divide it by average.

DR. BEHLING: They should go down. In principle they should go down.

DR. NETON: But not if you're measuring 1,100 workers and assigning them all missed dose.

DR. BEHLING: No.

MR. GRIFFON: Let me make a -- can I make a --

DR. NETON: I know. They monitored everybody after --

MR. GRIFFON: Can I make a suggestion here? Hold on. Hold on. Let's -- it might be a good time for a ten-minute break?

DR. MAKHIJANI: Okay.

MR. GRIFFON: And during the break maybe Jim can look at -- do you have this tape on file?

DR. MAKHIJANI: No, I don't have it.

MR. GRIFFON: Maybe let's take ten and let Jim look at this table during the break with Arjun and we'll come back and --

(Whereupon, a recess was held from 11:05 a.m. to 11:20 a.m.)

MR. PRESLEY: Hey, Mark.

MR. GRIFFON: Yeah.

MR. PRESLEY: I'm on the line. It's Bob.

MR. GRIFFON: Hi, Bob.

MS. MUNN: Good. How are you feeling?

MR. GRIFFON: Yeah, how are you doing?

MR. PRESLEY: Much better.

MS. MUNN: Good.

MR. GRIFFON: That's good.

MS. MUNN: Great.

MR. PRESLEY: I'm on for about 30/45 minutes.

MS. MUNN: Are you behaving yourself?

MR. PRESLEY: Yes, ma'am. I'm sitting here laying back with my feet up in a chair.

MS. MUNN: Good.

MR. PRESLEY: Like to never found a telephone up here to use.

DR. WADE: I appreciate that. Bob, this is Lew. You understand that you're conflicted on Y-12. You're certainly welcome to stay on the line and listen to the discussion.

MR. PRESLEY: I would love to.

DR. WADE: Thank you.

MR. GRIFFON: Okay. Jim, I think I want to just, you know, let's -- let's try to wrap this issue and discussion up and see what we have remaining.

DR. NETON: I just have one -- one comment. In the interim during the break we were able to pull out a piece of documentation on the particular department number that Arjun was talking about, department 2776. And it looks for a two-year period here starting in '58 they were removed from the program completely, from monitoring. So that may --

MR. GRIFFON: Two year? Two year?

DR. NETON: I think it's starting in '58.

DR. MAKHIJANI: April of '58.

DR. NETON: April of '58 through '60. They were taken off the monitoring program completely because they didn't feel the workers had sufficiently high exposures. Anyway, that -- that's something we can probably talk about when we -- when we look through that particular example that Arjun raised.

MR. GRIFFON: Yeah, okay. And during the break we did have some discussion on these particular tables. We -- We needed an opportunity to let

Jim see which tables SC&A was looking at and vice versa so -- but I did want to try to at least get a path forward here. And I think my sense is that number one is a remaining question on data -- data reliability, '57 through '65 if NIOSH can find, you know -- support that case a little better I think that would be useful. I think the work group and SC&A still have to digest the information you provided for that '52 through '57 period as far as data validation goes but it looks like you have a fair -- fair amount of data there. I mean, you know, that looks like a good, strong case for that data although many twists and turns with some of these memos that I was reading. But at least there's some information there. But I can -- SC&A and the work group need a chance to look at that a little more. And then on the model part I think nothing remains as far as NIOSH analysis but I think SC&A wants to -- to further look at the tables in the evaluation report and I would say compare it to -- to the previous reports that George has provided on looking at the maximum exposed workers pre and post-'61 is the -- is

how the analysis is laid out.

DR. NETON: Right.

MR. GRIFFON: And I mean I think many of us feel that -- that what from the model standpoint, what to -- if anything it being a site profile issue more than an SEC issue. But I think we want to cross the T, dot the I on that issue. And I think we're -- we're close to that but, you know.

DR. NETON: Well, I still, you know -- we've -- we've been at this juncture for awhile and I guess I still point out that if it's coming down to the situation where SC&A and the Advisory -- the working group is not comfortable assigning the geometric mean of the back extrapolated distribution then it's a matter of how much that is tweaked to cover the maximum exposed worker I think. And if that's the situation we're at then to me that -- that doesn't bear on the SEC process and, you know --

MR. GRIFFON: And I think the final resolution is -- is are we -- are we convinced at least in -- in large part the highest exposed workers were monitored. And some of these -- this

table raises some questions I think that we need to at least explore a little further. I mean I think we've been pretty convinced. You've pointed out some pretty good arguments that that is the case.

DR. NETON: Right.

MR. GRIFFON: I think we need to just close that and then we're -- I'm -- I'm speaking for myself anyway, if that's closed then -- the -- the regression analysis, that piece of it, it looks okay.

DR. NETON: Okay.

MR. GRIFFON: All right.

DR. NETON: I agree with that.

MR. GRIFFON: So --

DR. NETON: All right.

MR. GRIFFON: I agree with that.

MS. MUNN: Yeah, I want -- I have two questions that I'd like to ask you. If we come to the conclusion that some of the issues reveal that there are not necessarily applicable to the SEC but are site profile issues, are we simply postponing dealing with this? Does it come back to us?

MR. GRIFFON: Well, we still -- we have a lot

of site profile matrix issues from -- from --
MS. MUNN: I understand.
MR. GRIFFON: Right. So we -- we would be -- it's not -- I mean I guess it's -- it's just a timing thing. We're trying to make as quick of a determination on the SEC petition as we can. So if we feel that they have enough information to maximum plausible doses then we don't need to go any further for this SEC closeout process. That's my opinion, Jim. Is that -- so we are -- we are putting it aside for the meantime only because we wanted to --
MS. MUNN: But --
MR. GRIFFON: Yeah.
MS. MUNN: It comes back.
MR. GRIFFON: It -- It could come back. But it could -- it could be that John and -- and Arjun and -- and the SC&A folks and -- and the work group say, you know, the regression amounts looks good the way it is and we can close it up completely. I don't know. But I think -- I think we want to at least get to the point where we can say, you know, this -- this really -- we're not completely sure but we're pretty -- we're sure it's not an SEC issue.

Let's put it over here as a potential site profile issue and, you know.

MS. MUNN: Okay. One other point of clarification. Now, are there going to be additional -- in your mind are there going to be additional years following the '65 time frame where we're going to feel any -- to be reviewing the data in the same manner that we've done to this point?

MR. GRIFFON: The data reliability questions?

MS. MUNN: Yes.

MR. GRIFFON: I mean I think since the model -- the co-worker models used that period -- up to '65, correct? So I would say, you know, that's the primary period of interest would be the SEC period but also to work the modeling period.

DR. NETON: Co-worker model after '61 is really the distribu-- well, after '57 is the distributions, the -- the normal distributions by year --

MR. GRIFFON: By year.

DR. NETON: -- of themselves. No extrapolation is --

MR. GRIFFON: Right.

DR. NETON: It's a traditional co-worker model

much as you see at other sites.

MR. GRIFFON: Right.

DR. NETON: Because at that point we have confidence that they do fit lognormal distributions and something can be done with them.

MR. GRIFFON: And that's after what year?

DR. NETON: After '57 -- '56. Starting in '57 we have AAFC and the frequency charts that Hans has with him from report 32, the data appear to fit very nicely what you'd call normal -- traditional lognormal distributions. And so then you would be assigned either the geometric mean or the 95th percentile depending upon --

MR. GRIFFON: The co-worker back extrapolation relies on what period of monitoring data?

DR. NETON: '50-- last quarter '56 through '65.

MR. GRIFFON: Okay. So that -- I think that's --

DR. NETON: That's what --

MR. GRIFFON: That's the interest. That's the primary interest.

DR. NETON: Right. But -- But again I would point out that the back extrapolation model is based on this 147 workers. I think really

that's where the emphasis needs to be placed. Out of those 147 workers representative of the maximum exposed workers in that time period. And if they are then the model --

MR. GRIFFON: Well, then is -- But if that's the modeling side then the data reliability side is --

DR. NETON: Different issues.

MR. GRIFFON: -- data reliability.

DR. NETON: Now, the department issue that Arjun has raised again, maybe those 147 workers need to be looked at in that light. Do you know what I'm saying?

MR. GRIFFON: Yeah.

DR. NETON: Because we -- we relied on a very select subset of workers to develop that model and -- and they're the crux of the model. If -- If -- If we can convince folks that the model used people who were in the maximally exposed categories then I think we're okay.

MR. GRIFFON: That part goes away, right. I agree.

DR. NETON: So --

MR. GRIFFON: Then it becomes mainly a data reliability issue.

DR. NETON: Right.
MR. GRIFFON: Which is I think where we're -- where we're -- we're real close to that.
DR. NETON: yeah. And it's data reliability '57 --
MR. GRIFFON: '57 to '65. And give us -- give the Board -- the work group and -- and SC&A an opportunity to look at your '52 through '57 stuff that you've provided.
DR. NETON: Yeah. And again, that's getting close, but again one needs to look at the context of the projected curve versus, you know, what we can glean from that data.
DR. MAKHIJANI: Jim, do you have the departmental breakdown of the 147 workers? That might make this job a lot simpler.
DR. NETON: I agree.
DR. MAKHIJANI: Compare that to the --
MR. KERR: We have work descriptions. Those you already have.
MR. GRIFFON: Yeah, we've -- we've been given that.
DR. MAKHIJANI: But do we have the -- we have --
DR. NETON: You have the worker num-- worker

ID's and those department numbers are listed in the database so you should --

DR. MAKHIJANI: Oh, so I could go back and --

DR. NETON: I don't know. I think --

MR. KERR: You asked -- You asked previously for job descriptions.

DR. MAKHIJANI: Yeah.

MR. KERR: But what you asked for -- and you got a breakdown in terms of job descriptions.

DR. MAKHIJANI: Right.

MR. KERR: And you realize most of them are uranium workers.

DR. MAKHIJANI: Right.

MR. KERR: They're machine shop worker, workers and special workers. Makes up almost the whole 147.

DR. MAKHIJANI: Right.

MS. MUNN: Are you saying now we want to plot them another way?

DR. MAKHIJANI: In this context because, well, this issue didn't arise earlier because we didn't have the evaluation report. But the analysis that we've done subsequent to that publication was off the evaluation report where the doses are broken out by department number.

MS. MUNN: Right.
DR. MAKHIJANI: And so the question about were the highest people mon-- the potential exposure people monitored arose in the departmental context only because we saw that table and --
MS. MUNN: Sure.
DR. MAKHIJANI: -- realized it. We can have that breakdown or we could simply go to the table and it might become -- I think -- I think LaVon -- LaVon --
DR. NETON: Yeah, I think we can do that.
DR. MAKHIJANI: Okay.
DR. NETON: My -- My -- My real question is -- looking through the O-drive recently I -- I saw -- there's a spreadsheet, a list of the 147 ID numbers I think so maybe --
MR. GRIFFON: I think that's in -- I've seen --
DR. NETON: But -- But it doesn't have --
MR. GRIFFON: -- I know I have --
DR. NETON: -- department codes but that's tractable through the -- the database which --
MR. GRIFFON: Which gets us back to the database. I think -- I think that's the only other thing I would ask for from NIOSH's side is if we can once and for all get the Y-12

access databases iden-- identified data. I mean it -- it -- it would just make this so much easier to -- to --

DR. NETON: Well, we've given you the access database for all the years we're working with, I think through '65 now.

MR. GRIFFON: Through '65, right but no identifiers.

DR. NETON: Well, it's got ID number.

MR. GRIFFON: Doesn't have --

DR. NETON: You can't -- You can't track it to a case number.

MR. GRIFFON: We can't track it to like these names, this list of names that you have, things like that. Just to spot check to get comfort with this data you've just provided in -- in real time. I think it would be much easier.

DR. NETON: Just to insert the identifier in the database?

MR. GRIFFON: Yeah. I mean you, you know, for the people extracted from there.

DR. NETON: Yeah, sure. I think we can do that. It's just the whole database --

MR. GRIFFON: I'm not trying to create work either.

DR. NETON: No, no, no, no.
MR. GRIFFON: I think it probably exists, you know, and --
DR. NETON: Yeah, I think -- I think we can do that.
MR. GRIFFON: I don't want to make work.
DR. NETON: Yeah. The -- The -- It's not a real reluctance on our part to provide the whole database but if it's a sequel database and you have to download these tables to convert them to Access, it's virtually impossible I've been told to make that entire sequel database, which is a relational database, into Access tables that are useable. You almost -- these Access ta-- database -- files almost are the result of queries of this huge database which the data may be all over the place. You know what I'm saying?
MR. GRIFFON: Yeah, yeah, yeah.
DR. NETON: A relational database has, you know, many, many, many tables and key field indices. So what may appear to be very simple -- here's the year-end data, here's the guy's name -- may have actually been pulled from a number of different locations from a sequel

frame which only runs on, you know, several sequels.

MR. GRIFFON: So when Bill Tankersley did those comparisons he probably was using a sequel database directly?

DR. NETON: I don't know. Well, he can pull, you know -- he can ask their -- their computer people to give me -- give me, you know. It's very much like the database. You know, we have all kinds of stuff in there but to get an answer, how many people were working between 19-- you know.

MR. GRIFFON: I understand.

DR. NETON: It takes some programming.

MR. GRIFFON: I mean I'm not trying to create additional work. I was thinking, well, it's probably a product that's --

DR. NETON: But the answer to your original question is can we put identified information in there.

MR. GRIFFON: Okay.

DR. NETON: I don't see why we shouldn't be able to.

MR. GRIFFON: All right. And -- And put a urinalysis in. You know, might as well do both

of them.

DR. NETON: Okay.

MR. GRIFFON: So is there any other -- other -- other things on issue one? Do you still have stuff on issue one?

DR. NETON: No. No.

MR. GRIFFON: No?

DR. NETON: No, I --

MR. GRIFFON: The last little bit, maybe just as a -- from a presentation standpoint, because we really do need to move through the other seven issues. Do you -- can you give us a sense of some of these memos that you sent last night? Particularly there was one on the --

DR. NETON: Yeah.

MR. GRIFFON: -- I thought they indicated that --

DR. NETON: Yeah.

MR. GRIFFON: -- there's some analysis they --

DR. NETON: 1954.

MR. GRIFFON: -- had done and that was transposed and they put the penetrating in the skin and vice versa.

DR. NETON: Yeah. Actually ORAU discovered --

MR. GRIFFON: I'm not sure how they got there

but --

DR. NETON: ORAU discovered it after they took receipt of the electronic data for study --

MR. GRIFFON: Yeah.

DR. NETON: -- that the 1954 penetrating doses appeared to be inordinately high compared to the bracketing years ’52 and ’53 and ’55. And on investigation they -- they worked with Hap West who was -- many of you maybe know was a long-time HP at the site and ran the program for awhile. He’s since deceased. But they determined from several different avenues that the -- the data would transpose for penetrating and shallow in 1954. So they went and redid the database to match what they believed to be the truth for that year. And so the CER database then, which is -- actually the Y-12 database would have been updated and then the CER database would have followed -- was changed.

MR. GRIFFON: I think that how they got there was the part I was -- and skimming this over last night --

DR. NETON: Well, you know, I skimmed -- I didn’t read that report real closely either.

MR. GRIFFON: But I mean it was clear to me early on he said that he was unable to find raw records so they had to I think he said tap his own memory and others that worked in that time period and --

DR. NETON: So there are some, you know --

MR. GRIFFON: All right. We'll leave -- I mean I think we should look at that memo but just as a follow-up on the other -- other question --

DR. NETON: The other memos spoke to beta, you know, the data up here in the beta gamma column. And there's an instruction to the -- and that just sort of validates this IBM keypunch thing that we were talking about that the IBM cards only had a column for beta gamma prior to '55 actually. And they -- they were instructing them to create a new column, one for gamma and one for beta, and there was some instruction and actually a list of workers who they believe the beta -- gamma exposures should be pulled out of the beta column and moved into the gamma field. But it was pretty much based on their work assignment, work location as best --

MR. GRIFFON: And that memo had a list of --

DR. NETON: Workers.

MR. GRIFFON: -- the guys' numbers or I think it --

DR. NETON: It was workers, the Social Security numbers.

MS. MUNN: Worker names and --

DR. NETON: The Social Security numbers, right.

MR. GRIFFON: So those'll be in the (inaudible).

DR. NETON: Right.

MR. GRIFFON: Okay. It might be interesting to look at the --

DR. NETON: Right.

MR. GRIFFON: Well, I think year is by department?

DR. NETON: Right. And then -- then there were other instructions of memos in there about how they wanted to see the data for certain years like, oh, there was a recollection by Hap West of the years as to what monitoring practices were in places and how -- the recording practices in particular. This is where I got the information for '50, '51. They didn't put any -- they put all zeros. Starting in '52 they recorded missed dose and, you know, and it

goes up through the ‘60s. So --

MR. GRIFFON: In spite of --

MR. KERR: In --

MR. GRIFFON: Sorry.

MR. KERR: I was going to say something on -- in one of those memos which is getting -- it was a ’57 memo where they’re getting ready for ’58, where you need to know cumulative exposure --

MR. GRIFFON: Right.

MR. KERR: -- and you need to ensure that it didn’t exceed so much per year and according to worker’s age. They tell you how they got -- how they went back and summed, you know, the doses.

MR. GRIFFON: Uh-huh.

MR. KERR: And if you’ll see the ratio they used it was the number of badges over the number of records.

MR. GRIFFON: Right.

MR. KERR: So if they had a damaged badge or somebody didn’t turn a badge in or something they tried to correct for missed dose in getting those S-rem and P-rem --

MR. GRIFFON: Yeah, I did see that correction.

MR. KERR: You saw --
MR. GRIFFON: The number of badges over the number of records, yeah.
MR. KERR: Yeah. But it was for missed dose, the thought that they were taken into account.
DR. NETON: I think they're interesting reading.
MR. GRIFFON: Yeah.
DR. NETON: And I do think they show that the level of effort they were trying to put into make it correct. But also it does point out that there are issues in that database but --
MR. GRIFFON: Well, right. Just -- And some -- somewhat it clarified some things that were recorded at different time periods so it was useful for that.
MR. KERR: Yeah. One other thing, Mark, and I have just this one comment. If you go back and look at say a '53 memo or a '54 memo, realizing that they made some of these changes at a later date, you may see some other discrepancies between the two values because of the corrections that were made later. And see, there may be some minor -- minor discrepancies may be coming in that way.

DR. NETON: But again --
MR. GRIFFON: One thing I was going to ask you then. I think some of this analysis probably answered this question for you but one of the earlier things we raised I think at the last meeting was the P-millirem question.
DR. NETON: Uh-huh.
MR. GRIFFON: And did -- what -- what's the upshot of that? I mean you -- you have the result of why it is the gamma dose in I think -- I thought you mentioned somewhere in my reading I thought I saw something about that but maybe not.
DR. NETON: Well, '50/'51 clearly there was nothing in any of those columns --
MR. GRIFFON: Right.
DR. NETON: -- so we understand now why that was the case.
MR. GRIFFON: Because it was all put in S?
DR. NETON: It was all put in S. Well, yeah. And also it was -- even if they were going to record it was missed dose wasn't listed and so it was unlikely that anyone would have received greater than 1.5 rem I guess in that period. I don't recall now, you know, --

MR. GRIFFON: I just sort of see a P-millirem versus --

DR. NETON: -- early estimates.

MR. GRIFFON: Yeah. I mean you remember the issue that was brought up?

DR. NETON: Yeah, sure.

MR. GRIFFON: Yeah, yeah.

MR. KERR: There was a problem back early because they assigned sometimes in the -- in the later years they assigned missed dose based on where they thought the person primarily had a gamma exposure problem or a beta exposure problem. But sometimes they wrote down -- put this 50 millirem over here in the gamma and didn't put it in the beta column. So anyhow you got this problem when you sum 'em up because that -- your deep penetrating were the contributing, your S-millirem as well as your P-millirem. If they only put it over here in the P-millirem column and summed up, it was possible you'd get P-millirem doses bigger than the S-millirem doses.

DR. NETON: That's -- That's true.

MR. KERR: And they went back later and tried to correct for this if they saw the P-millirem

was greater than the S-millirem. Then they set employee equal. And the reason they did that, if you go back and look in some of the claimants' files you're going to get down and you're going to see sometimes in the early years where the S-rem and the P-millirem are the same.

MR. GRIFFON: Uh-huh.

MR. KERR: And that was kind of a correction they tried to make because they may not have assigned any, you know --

MR. GRIFFON: Since they weren't sure?

DR. NETON: Yeah. In fact my recollection looking through the database, after '56 I was hard-pressed to find values that didn't sort of add up and make sense. In other words --

MR. GRIFFON: That's correct. After '56 we had --

DR. NETON: If you go in there -- It makes sense from a health physics perspective what's in the various columns.

MR. GRIFFON: And looking at it after '56, yeah.

DR. NETON: They all add up.

MR. GRIFFON: In other words '52 to '55 --

DR. NETON: Yeah, ’52 to ’55, and again, you know --

MR. GRIFFON: The gamma P-rem -- I mean the skin and the -- and the S-rem always -- always met, almost always I think.

DR. NETON: Might, yeah.

MR. GRIFFON: From ’52 to ’55 anyway. I’m going by memory which --

DR. NETON: And in fact it’s never -- there is never a column -- I went through almost every -- every point last week and there’s -- I don't think there’s ever a column where the S-millirem is larger than any of the other columns. In other words, if there’s a gamma dose the S-millirem is always larger or equal to the beta column. I went through it and it made -- it made sense to me that the -- the bracketing dose, and this was partly related to the fact that they recorded beta gamma doses in the same column, so you’ll never see a --

MR. GRIFFON: I mean this is kind of a minor item.

DR. NETON: Yeah. Well, yeah.

MR. GRIFFON: The gamma versus P-millirem if -- if you can just maybe follow up on that.

DR. NETON: Yeah.

DR. BEHLING: We may have at times at some facilities -- I'm not sure if Y-12 necessarily -- where they actually pulled out the gamma component of the shallow dose and reported as a beta dose which means that there can be incidents where the beta dose is clearly less than the deep dose if there's no beta component because they basically pulled out the gamma component and reported it as not shallow dose but beta dose.

DR. NETON: That was incorrect, but yeah. I've seen that out at facilities. You're right. But I don't see that in -- I -- I looked through pretty carefully the database and I didn't see any case where the shallow dose was exceeded by the gamma dose. It always was -- was larger than the gamma dose.

MR. GRIFFON: That makes sense.

DR. MAKHIJANI: For Y-12 I think that is --

DR. NETON: For Y-12 -- see, originally I was thinking, well, that's -- that's certainly bounding. If you use all shallow doses because that's the largest dose in any of the columns, then you've got a bounding analysis there. But

I don't think you need to go there. But I wanted to satisfy myself that if there was this recording practice of putting beta and gamma in the same column is there an instance where -- where the gamma dose is larger and the beta dose is not? So -- But I can't explain any more than that.

MR. GRIFFON: Anything else on issue one?

(No response)

MR. GRIFFON: So we've got those -- some action items on that then.

DR. NETON: Right.

ISSUE 2: THORIUM BUILDINGS

MR. GRIFFON: Issue two.

DR. NETON: Okay. Thorium buildings.

MR. GRIFFON: Thorium buildings.

DR. NETON: Okay. This --

MR. GRIFFON: Let's go into it and maybe, I don't know if people want to -- how about taking lunch at 1:00 or is that okay?

DR. NETON: That's fine by me.

MR. GRIFFON: Is that okay with everyone? Then maybe we'll miss any potential crowd in the --

DR. NETON: I thought it was pretty busy today actually.

MR. GRIFFON: Yeah. Okay.
DR. NETON: Okay. Thorium --
DR. WADE: There's coffee here by the way.
MR. GRIFFON: Okay.
DR. NETON: Okay. It'll keep me -- keep me going 'til 1:00 o'clock. I'm not really a big coffee drinker but these meetings, I just feel like I -- I need -- I need the extra energy.
MR. GRIFFON: Do you want a couple minutes to get a cup of coffee?
DR. NETON: I can make it okay.
MR. GRIFFON: As long as you're okay. I'm going to get one while you're talking.
DR. NETON: Okay. Well, once I'm done I'll get one. In the thorium area of course the -- the issue is have we -- have we bracketed all the buildings that had thorium in them in our, you know, class that we're adding to the SEC. Or more correctly have we -- have we bracketed the buildings that had thorium exposure potential in the SEC period. You know, we -- we have to be careful that because a building had thorium listed as being in its contents that, you know, it was really an exposure hazard, yes or no. To address that question we sent some people

back to the records area to look at the thorium -- the so-called thorium ledgers. These are ledgers that -- that kept track of material balance of the nuclides that -- that were of interest and thorium is one of those. And ORAU has gone back and looked at these ledgers and identified now all potential buildings that -- or I have to be careful. Not necessarily buildings. Sometimes material balance areas of where thorium was actually -- to which thorium was actually distributed during the SEC period. This is fairly late-breaking news so I'm going to have to rely on Mel Chew. Is Mel on the phone?

MR. CHEW: Yes, I am Jim.

DR. NETON: Okay, Mel. Mel, could you flesh out for us where we are with the ledgers and the thorium buildings, please?

MR. CHEW: Glad to.

DR. NETON: Unfortunately I don't have any handout for --

MR. CHEW: Thanks to Jack Beck and Company I faxed you this morning two lists here. One is a list of buildings that we -- from the ledgers that we have identified where thorium is in the

1950s which is the SEC period. And then a second list that includes the additional buildings from the 1960s. And let's focus in on the area where the SEC period is here. The table -- there's a chart that I think you have in your hand there, Jim, that talks about -- goes out to the account numbers and you're absolutely correct. The account numbers really relate to locations where material balances were segregated for control and accountability material, accountability of the thorium. It is very notable that the accountability is down to a gram level in quantity. Let me just try to give a summary without going through the long story. And we can go through I mean a detailed analysis. In the 1950s we have identified eight buildings in the 1950 time frame -- '50s time frame which is the SEC period of which there are -- I mean we have added some additional buildings because small samples that have went -- have been identified into analytical areas, even down to the like 11 grams, 16 grams and 454 grams. So we have identified these particular eight buildings that we have indicated that thorium was

present. Okay. So --

MR. GRIFFON: Mel, are these -- you're -- you're saying the '50s but you mean '48 through '57 or --

MR. CHEW: Well, I think that even in the '48 through '50 I think there was the first indication of any thorium was like one and a half kg's in the '49 period, Mark, that showed up in the X-10 electromatic research area 9204-3.

MR. GRIFFON: But I mean --

MR. CHEW: -- four kilograms was listed as a total quantity. There's an account called control and control sort of is the -- by our analysis is where the total quantity of thorium is within Y-12 and then they break it out into the particular areas where they are located. So control is sort of like this is the total quantity we know of is at Y-12. So I hope I answered your question. We do have indication where in 1949 there were some in the R&D area and also in the electromatic research area of which we think the -- our control is like -- like 57 kilograms in total here. But encompassing that -- and -- and so that goes

through 1950s all the way through ’57 is the table that I submitted to -- to Jim on this particular time. The -- The quantities in -- are in kilograms and we can clearly identify -- we have listed all of the buildings through that entire period from ’49 to the 1950s, probably including ’59, that would be, you know, those buildings that would have contained the -- has -- has quantities of thorium present. So we’re going to revise -- I think, Jim, this is your call -- I think we’re going to revise the -- this particular list in the SEC evaluation report to reflect the -- these particular buildings that we did not originally include, including some of the analytical laboratories which contained small quantities. I’m going to stop here. Jim, do you want to pick it up from here?

DR. NETON: Right. I'm not sure we’ve actually made that decision at this point although it’s certainly an option.

MR. CHEW: Right. This is your call. That's right. I’m --

DR. NETON: And -- And, you know, this is fairly new information. I just -- I just -- I

got this last night and didn't have time to look at it but --

MR. GRIFFON: Can we -- can you make copies --

DR. NETON: Yeah, we'll --

MR. GRIFFON: -- during the break or --

DR. NETON: Yeah, we'll get copies.

MR. CHEW: The bottom line, Mark, is that -- is the -- the base using the official ledgers that is in the (inaudible), you have identified all the specific locations in the time period we're talking about and what quantities of thorium has been at the -- at those particular locations here. And we have also not only accounted for the accountability number which is the identification of the MVA, but also a little bit about the location description like research laboratory, extraction and muffling, analytical lab, electromatic researching and ORNL reactor technology division. So I think what I'd like to say is that we think we have all of the thorium accounted for in the Y-12 area for those particular buildings and locations during the 1950s, '49.

DR. NETON: And I'd like to give credit to -- to the folks who -- who worked -- worked

through these ledgers. It was easy to find the -- the first few up through '55. I think '56 and '57 took some doing. They weren't in the same location. But we were able to find a ledger for every single year which was good work.

MR. GRIFFON: We appreciate that.

DR. NETON: Now, Mel, when you say there's eight buildings you've identified then I assume then there's overlap with these -- the five that we've listed in the SEC period already.

MR. CHEW: That is correct.

MR. GRIFFON: And what are the three additional that aren't on the list?

MR. RUTHERFORD: Three additional.

MR. CHEW: Let's see. I don't have that in front of me here. Sorry about that. But I think 9203 had 11 grams of material. I'm just going to take a guess which one. I should have had that little bit of overlap here. But I can iden-- I can identify --

MR. RUTHERFORD: Mel, this is Bomber -- this is Bomber. I've got it. 9203 is an additional building.

MR. CHEW: Okay. Thanks.

MR. RUTHERFORD: 92-3 is an additional building.

MR. CHEW: All right.

MR. RUTHERFORD: And 9995 is the third additional building.

MR. CHEW: Yeah. I already got that, Bomber. And -- And I kind of -- I can give -- we have the maximum quantities --

MR. GRIFFON: Yeah.

MR. CHEW: -- in any given year that I just had to flip to for myself just for this discussion if necessary here. For example, like Bomber just mentioned, 9995 they had 436 grams. The 9203 that Bomber mentioned was 11 -- 11 grams for example, and I showed it for 1954.

MR. GRIFFON: Are those both labs? They must be labs.

MS. MUNN: 11 grams, had to be.

MR. RUTHERFORD: The 11 gram was definitely a lab. I know that.

MR. GRIFFON: 9995 I know was a lab.

DR. NETON: It's an assay lab -- assay lab.

MR. RUTHERFORD: 9201-3 was an ORNL reactor technical division and that -- they picked up significant quantities in '57. But they --

they actually had quantities back in 1952.

MR. GRIFFON: What do you mean significant quantities?

MR. RUTHERFORD: Well, I mean I would --

DR. NETON: 9201-3, in '57 they picked up 7,800 kilograms of material.

MR. GRIFFON: Alpha 3 -- Alpha 3's clearly not a research lab. I mean it's not a lab.

DR. NETON: Right. Yeah, these other two, again, I'll reserve judgment. We have to rethink this but when you -- again, as I preface my remarks, if you -- if you have 11 grams of material in an analytical laboratory you're clearly calibration type standards. Now, how finely we want to split this is -- in terms of what the potential exposure is I don't know. I mean we need to -- we need to rethink this and --

MR. GRIFFON: Let me ask if that listing -- I mean I'm glad, you know, it got to the ledgers but were there other buildings, Arjun, that you found in these other previous memos that you saw that were mentioned? Maybe we can figure out if there's a discrepancy --

DR. MAKHIJANI: Can I look at the break?

MR. GRIFFON: Okay. Okay. We'll get back after lunch. Maybe we'll be at a place to take a break at noon.

DR. MAKHIJANI: (Inaudible)

MR. GRIFFON: The other -- The other question I had outside of the buildings in looking at some of the case data it's -- it's apparent to me that there is mainly a reliance on department information and this -- this is probably more of a deal out question but it gets back to the how do you determine question, you know. And if you're -- how do you find out if someone was in one of these five or seven or how many other buildings? And the onus comes onto DOL so maybe we need to bring Pete Turcic back in the mix.

DR. NETON: I think you're right.

MR. GRIFFON: But if you just have department information then I know from doing some work out there that the departments are not necessarily one to one linkage with buildings. So then you, you know, do they conservatively assume and some of these are big process buildings so then you get into a large number of claimants being put into this group which

may or may not belong in that group, you know. So...

DR. MAKHIJANI: Mark -- Mark, I have --

MR. GRIFFON: Anyway but you -- you don't have -- you can't shed any light on --

DR. WADE: We will ask Pete or someone representing DOL to come to the meeting prepared to answer those questions.

MR. GRIFFON: You don't know if anyone's done any department building sort of analysis. I don't think that's been done. Some of the work has been --

MR. RUTHERFORD: I -- I -- I would bet that Bill Tankersley and some of the -- done some of the studies, has done some of that -- that work.

MR. PRESLEY: Hey, Mark?

MR. GRIFFON: Yeah.

MR. PRESLEY: Can I talk?

DR. WADE: It's up to the group. Are you going to share information based upon your expertise at the site, Bob?

MR. PRESLEY: Yes.

DR. WADE: And not opinion? It's okay with me if -- is it okay with you, Mark and Wanda?

MS. MUNN: Yes.

DR. WADE: Okay. If you -- If you want to share --

MR. GRIFFON: I -- I don't want to violate our own ruling. That's the only thing.

MS. HOWELL: As long as he's speaking as a site expert only.

MR. GRIFFON: Right.

DR. WADE: If you speak as a site expert only and offer only facts as you know them, that would be acceptable, Robert.

MR. PRESLEY: Okay. What you're talking about, the departmental charges and buildings?

MR. GRIFFON: Yeah.

MR. PRESLEY: Just like the fabrication department. You've got -- it doesn't -- somewhere in that time frame there was somewhere between 16 and 21 different shops. And those different shops could have had the same department number.

MR. GRIFFON: Right.

MR. PRESLEY: The same thing with your chemical workers, everything else. So you cannot really go by department number as to what building that is in.

MR. GRIFFON: And then from what I understand, Bob, they -- they, even within like say a maintenance department, these guys were telling me they -- they often bid out on jobs in various areas --

MR. PRESLEY: That could be.

MR. GRIFFON: -- within a year so they could be shifting around.

MR. PRESLEY: And that's not only just in Y-12. They could have gone to ORNL or 225 because we did maintenance. You had Y-12 maintenance people working in all three plant sites.

DR. WADE: We will ask you all to --

MR. GRIFFON: -- ask you all about --

DR. MAKHIJANI: Well, I have --

MR. GRIFFON: Oh, you found your other --

DR. MAKHIJANI: I found my list. We -- Now, we -- you've looked at our evaluation report review of April 24th. We do have time frames on these so, you know, if you eliminated these as not belonging in the right time frame. But there were in 9204-4 -- no, sorry -- 9201-5 and there was some thorium -- there was a storage building, 9720-5. And there's a thorium 230 associated building, 9215.

MR. GRIFFON: And 9215 may have been a later period.

DR. MAKHIJANI: Yeah, I'm not sure about the period. We could not nail down the periods. Obviously all -- all of these --

MR. CHEW: Arjun, I think Bomber has that list I sent him. We have identified those particular buildings that you have just mentioned in the 1960s. I just caught some of them. You mentioned 9201-5, 9215. What was the other one you had mentioned? I'm sorry. I apologize.

DR. MAKHIJANI: 9720-5.

MR. CHEW: 9720-5.

MR. GRIFFON: Storage area I think you said it was.

MR. CHEW: Storage area.

MR. GRIFFON: (Inaudible)

MR. CHEW: Okay. We don’t -- We didn’t have that on the list from the 1960s but it wouldn’t surprise me if 92-- a storage area would, you know, where the material would originally come into because we know large quantities came into the -- into Y-12 and was waiting to be processed here.

DR. MAKHIJANI: Yeah, I think that may be the one building where I don't remember the document but it seems to me that maybe thorium was received there.

MR. CHEW: Oh, that makes sense. We have a one called account number control. There was no building listed but we couldn't find that and -- and I'm just going to take a guess that may relate to that. But we could track that number, account number down, that MBA number down to make you sure that we are tracking 192 -- 9720-5. The other two you mentioned we clearly have identified --

DR. MAKHIJANI: Okay.

MR. CHEW: -- the thorium being present in the 1960s and not in the 1950s.

DR. MAKHIJANI: Okay. So that would resolve that.

MR. CHEW: Pretty much, Arjun. Appreciate it.

DR. MAKHIJANI: And 9204-4 I guess may be the last one on my list.

MR. CHEW: Yeah, 9204-4 is also listed in the 1960s.

MR. GRIFFON: In the 60s.

MR. CHEW: Okay. You have those in front of

you, right Bob?

MR. PRESLEY: Yeah.

MR. CHEW: Good.

DR. MAKHIJANI: Okay. So then that would --

MR. GRIFFON: So we'll check that one --

MR. RICH: In the 1960s were buildings identified by extensive air samplings?

MR. GRIFFON: Bryce Rich.

MR. RICH: The main production areas, the thorium production areas.

MR. GRIFFON: Right.

MR. RICH: There are nine of them, nine buildings. But as has been indicated, three of those overlap, 9202, 9206 and 9203. That's the 1950s.

DR. NETON: Yeah, with the exception of this 9201-3 it seems like, you know, we covered the areas in the SEC --

MR. GRIFFON: Yeah.

DR. NETON: -- class that actually did something, you know, process-wise with thorium and --

MR. GRIFFON: You have a senior laboratory.

DR. NETON: Yeah, laboratories. And, you know, I'm -- I'm still right with this point not

certain where we're going to land on that issue. I mean but the 9201-3 is something NIOSH needs to take into consideration.

MR. GRIFFON: Yeah. Sure. And maybe free up this 9720-5.

DR. WADE: Yeah, I got it down.

MR. GRIFFON: And that's -- that's it.

DR. WADE: I think -- I think --

MR. GRIFFON: Other than that I think --

MR. RICH: 9201-3 was one of the old beta calutron buildings.

DR. MAKHIJANI: The last issue here doesn't relate to a building but to the S3 pond. Now, we -- we looked at the document that NIOSH pointed us to and we noted, you know, between our two reports, and we noted that the burial ground data included S3 pond discards before 1974 so we weren't able to parse whether the S3 pond was used in the SEC period or not. And I don't know if you have been able to. I think that's the last issue we have.

MR. RUTHERFORD: Well, I'll jump in a little bit here. We do have indication that there was some material that was discarded in 1952. We're still tracking identities. This table is

not very clear on that and -- and so if we can leave that S3 pond issue or burial ground issue as something that we're still looking into.

MR. GRIFFON: As for exposures of the people that would have been handling the waste, is that --

MR. RUTHERFORD: Yes.

MR. CHEW: I'd like to on that note, I'd like to distribute first a memo from Union Carbide I have in my hand from radiation safety because the question came up several times about the -- considering the thorium contaminated in the uranium salvage operations that had potentially went into the pond. And it's called the maximum thorium concentration in process salvaging. It does some assessment of work they felt the thorium -- additional thorium exposure may be as a potential exposure pathway and so we do have information that that was studied. I will make sure that's going to be in your hand.

DR. NETON: Yeah, let's make sure we get that distributed, Mel.

MR. CHEW: Okay.

DR. NETON: Great.

MR. GRIFFON: Other issues on the thorium topic? I mean is there -- what about the -- have we closed out the issues of the other (inaudible) that were used to outside of these buildings or -- or could we have covered it all in these buildings? Is that --

DR. NETON: Well, I think the material balance ledgers certainly --

MR. GRIFFON: Right.

DR. NETON -- if the thorium didn't get shipped there unless we believe the ledgers to be inaccurate I think we've covered the waterfront under thorium --

MR. GRIFFON: I think so, too.

DR. NETON: -- activities.

MR. GRIFFON: Me, too.

DR. MAKHIJANI: I would agree with that especially in light of what was said by Department of Labor at the Denver meeting.

MR. GRIFFON: Yeah.

DR. MAKHIJANI: Since we're not dealing with the uranium workers for the thorium, that's gone away so I think --

DR. NETON: Yeah, I believe so.

MR. GRIFFON: Right.

MR. GRIFFON: It makes it a lot easier for all of us.

DR. MAKHIJANI: So we covered the buildings then.

DR. NETON: Yeah.

MR. GRIFFON: As long as we cover, yeah, who worked in those buildings.

DR. NETON: Yeah.

MR. GRIFFON: That's the department building issue, yeah.

DR. NETON: Yeah.

DR. MAURO: I have just got --

MR. GRIFFON: John.

DR. MAURO: Just again for clarification, what we have is a circumstance where at some point waivers define the class in a way that the boundaries are very clear that who falls into the class and who doesn't and it has something to do with, what I'm hearing, with the buildings and perhaps to types of activities and locations within buildings. And a class will be defined in those terms. I'm trying to create a model in my head to -- to separate out where we might still have some residual SEC issues. Would that be --

DR. NETON: I think you heard -- I think you heard Pete Turcic pretty clearly say on the record that, you know, if -- if there was no way to parse those areas out at all that they would -- they would -- they would consider working in the building period as evidence of thorium exposure potential.

MR. GRIFFON: Of thorium exposure, right.

DR. MAURO: Then that puts to bed the only concern I have.

MR. GRIFFON: I think he did -- he might have parsed it a little bit saying that, you know, if there was any indication job-title-wise or whatever that they would --

DR. NETON: Right.

MR. GRIFFON: -- like an administrative person that was likely not in the process.

DR. NETON: Well, even then, yeah.

MR. GRIFFON: Even then, yeah.

DR. NETON: Say for instance if there was a cafeteria in the basement of the building that you entered and never went into the workplace --

MR. GRIFFON: Right.

DR. NETON: -- I think they might make that --

MR. GRIFFON: But otherwise we can assume it's very clear?

MR. RUTHERFORD: If you look at the lab, assay lab, if we -- if we ended up putting the assay lab -- if we decided that that would include that. You know, you wouldn't necessarily look at a newspaper person if there's only 11 grams in the building and their doing, you know, so --

DR. NETON: You've got -- I mean the definition was couched in the sense that, you know, you had to have -- should have been monitored or were monitored for exposure to thorium so that's a --

MR. GRIFFON: But see, they took the thorium part out of that definition.

DR. NETON: He -- He did in the sense that if you can't tell it's not going to be an issue. This takes care of Arjun's concern about co-located workers.

DR. MAURO: You have a pretty good sense then of what that boundary should have been monitored should be. In other words, you're in a – you're going to be in a position where you're going to help Pete say where that line

is drawn.

DR. NETON: And I think Pete's already said that. If there's any potential for thorium exposure at all, pretty much the way I --

DR. MAURO: Then it's clean.

DR. NETON: Yeah, I don't want to interpret.

DR. MAURO: Then it's clean. If it's not clean then it's a walkaway.

MR. GRIFFON: And the only part that I'm saying isn't quite clean is -- is that how do you determine if they ever were in the building?

DR. NETON: That's another issue.

MR. GRIFFON: It's not for us to -- it's a DOL question.

DR. NETON: Uh-huh.

MS. MUNN: And the thorium balance record makes it a lot easier.

ISSUE 3: RECYCLED URANIUM (RU)

MR. GRIFFON: I think we're on to issue three if -- Recycled uranium.

DR. NETON: Wanda, could you start passing them around?

MS. MUNN: Uh-huh.

DR. NETON: I have some -- a handout here that was put together with ORAU. Bryce Rich

particularly was involved in -- in piecing this together. This -- I'll briefly cut to the chase on this. ORAU has raised a concern that I think fundamentally SC&A is not necessarily opposed to the defaults that we're using for the recycled uranium for process workers with the -- with the materials. They did raise a concern that in the cleanup of the recycled material that arrived you generate waste streams, ancillary waste streams that by definition have at some -- to some degree enriched the uranium -- I mean the contaminants relative to the uranium. And so we put together a -- a write-up on this. Bryce Rich has done -- done a good job on this. Some of it goes through the issues of -- of what are we doing and why our -- our conservative values are -- are -- are high already for the workers who are handling the material. We picked the highest -- the highest contaminant level to deal with the workers. I think that at the end we talk about the waste streams that were generated and it is true that the waste stream values are higher and I think we actually have measurements for those values. But it is our

opinion, at least my opinion at this point that the waste streams are wet process waste streams. They were handled wet and dispensed to the -- the disposal areas as such and so the potential for inhalation exposure to this enriched sort of -- bad choice of words -- this enhanced amount of transuranic material was -- was very low and in fact our -- our default assumption using the highest concentration that came in the door is -- is probably a reasonable amount to assign to the workers. With that I'll ask if Bryce has anything to add and comment if that's a fair assessment of where -- where we are or where he believes he wrote -- what he believes he wrote up anyway.

MR. RICH: I -- In more of perhaps background, Y-12 was unique in the area of recycled uranium from the standpoint that they -- most of the contaminants came in with very high enriched uranium recycle materials out of -- out of (inaudible) and SRS. Plutonium 238 became the dominating plutonium isotope. They also handled a lot of other LEU and DU because of operational requirement, all of which had recycled uranium. As Jim indicated we -- we --

we defaulted at the maximum level to add to the uranium intake value since those were so extensive. In -- In the area of the enrichment there was -- there was some, maybe 30 percent of the -- the recycled uranium -- I should back up and say that the -- the -- the very -- VHEU and the HEU that came in was -- was pretty much all chemically extracted again primarily not to remove the uranium contaminants or the recycled uranium contaminants but primarily to remove the other contaminating non-radiological metals such as copper and nickel and the like. About 30 percent of the recycled uranium contaminants did go out in the raffinates. But put in perspective on the history of the plant, something like a tenth of a gram of -- less than a tenth of a gram of plutonium went out and relatively small quantities of neptunium, technetium and -- and the like. Another unique factor was that there was some thorium 228 that came in as a contaminant as a result of the production in irradiating very high enriched uranium fuels. We think we've adequately covered the -- the additional exposure that

could have occurred as a result of the recycled uranium contaminants including the -- the raffinate waste processing. It'll -- It'll -- It'll be perhaps as you look at the description I guess I'll have to admit that because of the complexity we -- we perhaps all a little more descriptive treatment, a little more of a -- a -- a narrative in the -- in the technical basis document which we tried to keep concise but perhaps too concise.

DR. MAURO: The only comment I -- I have is by way of clarification. I did read this write up on the way over and I got the sense that the answer is fairly simple. Notwithstanding the wet processing side of it is that the default method that's currently in the Y-12 TBD had adopted a set of assumptions which bound any of the scenarios that we were trying to struggle with. And if that's the case --

DR. NETON: I think you're right. If you look at table 5-6 is where you're getting that?

MR. GRIFFON: It's -- Yeah.

DR. NETON: If you look at the raffinate value of the footnote the maximum plutonium in the raffinate according to this table is 30 per

gram of sludge. That's pretty low. I mean you -- you would have to inhale a fairly large amount of sludge to -- to get any kind of exposure. As a matter of fact --

MR. RICH: As a matter of fact, that is right. The -- However -- And -- And the -- may not -- and I think it was clear in the write-up that was provided that we did not apply the maximum value to the few people that were involved actually in transferring, you know, the handling the transfer and the disposal in the S3 ponds. Those maximum models to the entire work class nor to the individuals themselves because they did other jobs, too.

DR. NETON: Oh, yeah.

MR. RICH: And -- And -- And so as a consequence, you know, if you want to go -- if you want -- and -- and a further default to accommodate that one rather small -- it only took 50 hours a week -- 50 hours a year to do that job.

DR. NETON: Say how many?

MR. RICH: Pardon me?

DR. MAKHIJANI: Fifty hours --

MS. MUNN: Fifty hours a year.

MR. RICH: Fifty hours a year. And this is -- this is very well documented in the Y-12 recycled uranium mass balance report. And so we didn't devote -- devote the entire -- at that level which would -- which would go in about a factor of five increase. And -- And that increase by the way, because we defaulted high, factor of ten in all of the other defaults above the -- above the average values we felt like that would -- that would certainly cover that -- that relatively short term operation at the increased level for the raffinates. Take a look at it and see what --

MR. GRIFFON: A factor of ten?

DR. MAKHIJANI: Bryce, can you explain the thing because I had a question about that factor of ten that you reduced the maximum value by in your example.

MR. RICH: Yeah, the range of, you know, the analytical range, result range through the plant for all of the -- the contaminant levels, the -- the maximum range to which we defaulted was in the -- in the range of a factor of ten or higher than the average.

DR. MAKHIJANI: And what's the basis for that

factor of ten?

MR. RICH: What's the basis? Because it was just the upper range of the distribution.

MS. MUNN: The maximum value.

MR. RICH: Yes, the maximum value.

MS. MUNN: To represent --

MR. RICH: And the reason for that -- the reason for that is that it -- it -- it's almost impossible to identify any individual as being associated with a process that represented --

MR. GRIFFON: Process --

MR. RICH: -- any -- any -- any given distribution.

MR. GRIFFON: Is it --

MR. RICH: And as a consequence you're almost forced to default to the maximum since -- since this is a -- a missed dose they didn't do plutonium or neptunium analysis but at the levels we're talking about and the extent they didn't do an amount of bioassay at the -- at the levels for that purpose. They -- They controlled on the basis that the incoming limits placed on recycled uranium contaminants was agreed to to increase the overall hazard level by no more than ten percent. This did

not include concentrating mechanisms primarily of which was the liquid extraction process. And with that in mind it -- we feel that we've adequately defaulted on the high side and as -- and the application of the default will provide a claimant-favorable result.

MR. GRIFFON: Bryce, you mentioned the DOE Y-12 recycled uranium report.

MR. RICH: Yes.

MR. GRIFFON: I'm -- I'm going by memory here but it seems to me there were other operations listed in there as at least moderate in -- they had executive summary sort of table where they --

MR. RICH: Yes.

MR. GRIFFON: -- indicated the relative potential for neptunium and plutonium exposures.

MR. RICH: Yes, they figured out a matrix that --

MR. GRIFFON: And there are other operations other than the sludge handling that --

MR. RICH: Oh, yes. They had 36 fundamental or major operations associated with the processing of recycled uranium materials. There were over

100-plus different types of operations but they -- they all grouped within 36 categories and they analyzed and -- and then provided that data within those 36 categories. But three of which were the -- the recycled uranium -- no, the -- the waste product streams not only to the S3 pond but WETF waste processing that occurred after I think '86 or so. And then of course, there's some -- some burial of the -- the material also.

MR. GRIFFON: You believe all those -- your sense is that all those operations fit within this range in table 5-6 that you've presented?

MR. RICH: They fit within the -- the -- the fundamental default range that I indicated with the exception of the --

MR. GRIFFON: Of the raffinate.

MR. RICH: -- of the raffinates. And the raffinates being again in that matrix they -- they -- they made an effort to estimate the amount of time associated.

MR. GRIFFON: Yeah.

MR. RICH: And -- And also the probability of airborne activity and -- and that -- that all taken into account we felt we were defaulting

accurately.

MR. GRIFFON: And when you said you talk about this maximum, is that -- that's -- is that in table 5.6 or --

MR. RICH: No, they're in there, several tables.

MR. GRIFFON: Yeah.

MR. RICH: I think it's table .6 but then there's also a table in the appendix B under B-3 of the 4 pages. And a good share of the default or good share of the materials comes from that source also.

MR. GRIFFON: How about within your TBD though, within the TBD's I have these excerpts here I think.

MR. RICH: Yes.

MR. GRIFFON: Table 5.6, 5.7, 5.8 --

MR. RICH: Right.

MR. GRIFFON: -- that maximum you were discussing, is that -- and then you said you might divide by ten in some instances because the maximum --

MR. RICH: Yeah, I -- I think we -- well, that -- that's true. If -- If you were to -- the -- the -- the best estimates -- but -- but there

are other criteria for doing best estimates so I think that'll come out of the -- the -- that part of the TBD. That's actually dose reconstruction determination so if that's clear.

MR. GRIFFON: I think so, yeah.

DR. MAKHIJANI: Well, I'm still a little puzzled about what actually happens. Is you -- you have the maximum value and there's a distribution that doesn't seem to include the maximum value because the maximum value belongs to a very limited set of processing, three out of whatever, 37.

MR. RICH: I took -- took the maximum distribution for the entire sets --

DR. MAKHIJANI: Right.

MR. RICH: -- all of them.

DR. MAKHIJANI: So the range -- the range that you've shown in table 5-6, .11 to 4.5 for instance for plutonium, does not include that -- the raffinate value.

MR. RICH: I -- That's what I said.

DR. MAKHIJANI: Right.

MR. RICH: It will not include raffinate.

DR. MAKHIJANI: Bear with me. I haven't gotten

to the question yet. The -- The -- When you do a dose reconstruction you -- you use that range, .11 to 4.5 as a --

MR. RICH: You use -- You use the maximum, a maximum derived from that range.

DR. MAKHIJANI: A maximum. So you use 4.5 or --

MR. RICH: Yes.

DR. MAKHIJANI: So you use 4.5 from that range?

MR. RICH: Yes.

DR. MAKHIJANI: Where did the 62 come in?

MR. RICH: The 62 is recognized as a -- as a -- a -- a range for a given raffinate stream that was -- that was handled by -- as a wet process stream that was discharged directly to the S5 pits or later to the WETF processing system. And -- And in the S5 pits -- S3 pits -- ponds they mixed again with -- with other uranium, mostly LEU and DU from other processes, a lot of uranium. And so as a consequence any exposure at that point -- then the -- the -- the parts per billion compared to uranium would -- would go down again. See, in the raffinate stream the uranium was so cleanly removed that it was only parts per million of -- per gram of

material such that the use of the 62 parts per billion -- parts per -- yeah, parts per billion plutonium, is -- is really meaningless because there's precious little uranium in it.

DR. MAKHIJANI: Right.

MR. RICH: And so there are two reasons for not using that -- that -- that level in the raffinate stream directly as a default because it's -- it's not meaningful in terms of the fact there's precious little uranium there in the first place plus the fact that, you know, there was a total of a tenth of a gram, total, put into the ponds and -- and the fact that there's 62 parts per billion is -- is not a -- not a consistent default based on the -- the overall default philosophy that has been developed. Plus the fact that that it was such a small time-wise and exposure potential process.

MR. GRIFFON: I guess the one -- again, I'm going by memory, but the one operation, I thought it was casting or furnace operations where -- and from -- from what I recall sometimes the slag would concentrate in the plutonium or neptunium.

MR. RICH: Yeah, I mentioned that, you know, in the --

MR. GRIFFON: And that's still covered within this range, is it -- I guess that's my question. If this range covers all those types of operations I think --

MR. RICH: Yes. Yes -- Yes, I think so.

MR. GRIFFON: You know --

MR. RICH: And -- And by the way, you know, when you -- when you reduce uranium it's converted to UF tetrachloride and then reduced with a magnesium bomb. And -- And there's a certain amount of slag that comes up which has impurities. It's -- Casting of uranium is a purifying process in itself. But because of the fact that they -- unique to Y-12 they processed all of the ACU directly, immediately and then -- then cast that to uranium directly so that the slag was -- was less than what you would normally get in some other process where the material had sat around and was less pure.

DR. MAKHIJANI: Okay. So basically we're not using the 62 ppb for anything?

MR. RICH: We really are not. And for -- And for the reasons that I've explained.

DR. MAKHIJANI: Okay. I'm just trying to understand what's happening.

MR. RICH: Sure. Sure.

DR. MAKHIJANI: And then sometimes we take the 4.5 ppb and apply that and sometimes we reduce it by a factor of ten? No?

MR. RICH: That -- That -- That was -- That was given as a -- a -- an option if you wanted to get closer to the average. That's an option.

DR. MAKHIJANI: That's -- That's in the sample dose reconstruction.

MR. GRIFFON: Did they reduce it though?

DR. MAKHIJANI: I believe so. At least that was Joyce's conclusion when she looked at the number.

MR. GRIFFON: Okay. I need to look through -- We'll bring that up later when we look at that example.

DR. MAKHIJANI: Okay. Why don't we -- I think it's -- it's number seven or eight.

DR. NETON: I'm not clear why we would have done that actually.

DR. MAKHIJANI: That's what she concluded. I just got it this morning from her.

DR. NETON: That's fine. That's fine.
MR. RICH: The -- The -- The reduction -- we -- we did list the -- the fact that the average was a -- a certain factor below the maximum that we used as the primary default.
MR. GRIFFON: Right.
MR. RICH: And -- And if you wanted to reconstruct the dose on the basis of average values why that was provided as a -- a guide.
MR. GRIFFON: And -- But there's no sort of operational guidance to that is there? I mean --
MR. RICH: Not -- Not -- Not in the TBD.
MR. GRIFFON: Not in the TBD?
DR. NETON: I think it's in the TBD. I'm looking at the dose reconstruction and it must have referenced why they did that if that's the case.
MR. GRIFFON: But I mean how would the DR know which --
DR. NETON: See, I'm looking at -- this may have been a machinist -- a machinist operator who's working with the already cleaned up uranium maybe. See, and, you know, when the -- when they would come in there -- they'd have

the trained (inaudible) issue. Once they go through this cleanup phase and recast it there still may be something there and --

MR. GRIFFON: Yeah.

DR. NETON: -- and I'm just guessing at this point but there may be some justification for reducing that in a -- in a metals (inaudible) effort but I -- I'm going to look through that.

MR. GRIFFON: It's still more of a DR question anyway.

DR. NETON: It seems to me that, yeah, it did not --

MR. GRIFFON: It's not an SEC issue, right.

DR. NETON: If the upper range is valid then yeah.

MR. RICH: Another point of effect on that is that Y-12 and the handling of highly enriched uranium was unique to Y-12 and -- and resulted in operations where a -- a good share of the -- the top of exposure could -- would occur. But you will notice in looking at other processes that a -- you know, it's -- the -- the value of the material is so great that the -- the -- the cleanup efforts were more effective and as a consequence the concentrations of the recycled

uranium contaminants was less coming in on the ACU than it was in other enrichment materials.

MR. GRIFFON: Which makes sense, yeah.

MS. MUNN: Yes.

MR. GRIFFON: It seems to make sense.

MS. MUNN: Yeah.

MR. GRIFFON: Anything else on this topic?

MS. MUNN: Don't think so but there is the action item to potentially beef up this section in the TBD.

MR. GRIFFON: Yeah, right.

DR. NETON: We're -- We're certainly going to do that.

MR. GRIFFON: But probably not an SEC issue.

MS. MUNN: No, not --

DR. NETON: No, no, no.

MR. GRIFFON: That's right.

MS. MUNN: Not for us today.

ISSUE 4: POLONIUM-208

ISSUE 5: EXOTIC RADIONUCLIDES

MR. GRIFFON: Issue four is the polonium. I think we got -- do you want to go through that and then --

DR. NETON: Yeah.

MR. GRIFFON: -- we can break for lunch? I think that'll be probably a good spot.

DR. NETON: I've kind of lumped these two issues together in my mind.

MR. GRIFFON: The exotics and the polonium?

DR. NETON: Yeah, they're --

MR. GRIFFON: Yeah.

DR. NETON: -- cyclotron-related issues --

MR. GRIFFON: Yeah.

DR. NETON: -- although they are different.

MR. GRIFFON: Issues four and five. Even better.

DR. NETON: All right. Well, I'll pass these around.

MR. GRIFFON: Do you need more coffee, Jim?

DR. NETON: No. I got a good night's sleep last night. I'll try the better night's sleep first.

MR. GRIFFON: I'm going to try the coffee first.

DR. NETON: Okay. What I -- What I handed out here is sort of a -- a compendium of issues related to cyclotrons so we can skip the first section on external dose information until we get to that issue. That's more relevant to the exotic radionuclides. And then cut to the back of this handout which includes some -- some

incident and -- and health physics reports from the era of the polonium operations.

And let me just preface this -- these remarks by saying that we last time at the Board meeting and the working group and the conference call that, you know, we were aware of the incidents that were countable in this Delta View database. In fact we got a -- a very good sense that a number of hits on our queries of the database that -- that spoke to incidents, investigations, all that sort of -- sort of thing. And we were fairly confident that we would come back here full of -- full of incident reports to show and demonstrate that -- that these things were followed up. Well, the fact is that we queried the database; we got -- depends on which query you use but the most refined query we had which was incident investigation in the SEC period showed up somewhere (inaudible) to 80 titles that looked to be of interest. And remember these are all over there on this 400,000-plus page Delta View database. We've pulled those reports, looked at them, and in fact we can't at this point provide any compendium of incidents for

internal dose investigations for cyclotrons or for the polonium operations. That fact is a big shock to us. It is what it is. I mean I can't make up incident reports when they don't exist. It also does not necessarily mean that there were a large number of incidents that went unrecorded but the fact is we just can't put our hands around the issues at this time. What I do have though is some -- some of the health physics reports that we actually had in, you know, at the last Board meeting -- available at the last Board meeting that talked about follow-ups of issues. This first one on a polonium-beryllium spill I think we can kind of not ignore but we don't want to talk a lot about it. Really it's just a intent to show the flavor of -- of follow-up when there were incidents. This was a polonium-beryllium source which really has nothing to do with polonium 28 but, you know, they did a detailed follow-up with fecal sampling and -- and exposures and tracked the guy out for months of sampling and that sort of thing. I think I turned my attention to the accelerator section --

MR. GRIFFON: Jim, that first report, is it -- I'm sure it has a date somewhere in there.

DR. NETON: It's July -- It was a health physics report between July through December 1951, yeah.

MR. GRIFFON: Oh, it's -- it's on the top. Yeah.

DR. NETON: In that same time frame, in July through December '51 we also have an accelerator section that was written in a -- in an HP report where they tended to be fairly detailed about what was going on with the cyclotron. There's a general section on -- on, you know, the progress of where they are, how they were making gallium at the time. More significantly, when you get to page 39 you'll see a section labeled exposure analysis. And here they -- they -- they go to some great length about exposure monitoring for cyclotron operators and it's a pretty big deal. These -- They were very high dose exposures, that sort of thing. At the very bottom you'll see a thing called airborne contamination. Here they summarize a report saying that there were 61 air samples obtained during this six-month

period at the cyclotron and they divided these into four groups, and they provide these in -- in results in table 8 which I believe is on page 41. Now, the airborne contaminate that we're talking about here, the best I can decipher from this is related to contamination from polonium 208. That was the main isotope of interest when they started the cyclotron in 1951. In fact they made a lot of, of the stuff. The nature of the production of polonium 208 was that it was not amenable to being irradiated within a clad geometry. Absorption of the protons in the cladage (inaudible) so these -- the -- the (inaudible) I think which was the target, was irradiated there. That created a pretty large contaminant problem. If you look at table 8 you'll see that there -- as high as 15,000 DPM per cubic meter of cyclotron during the operational area -- in the operational area and down from there. So again we have 60-something samples that were taken in this -- in this period. We know what the level of work. I mean we're not flamboyant here. We knew that there were general airborne contaminants of polonium. We have, of course,

no access to bioassay samples for polonium 208 that we could find. So at this point the polonium reconstruction, we have this report. And remember polonium reconstruction only bracketed 1951 and part of '52. I think it was September of '52 when it stopped.

MR. GRIFFON: Uh-huh.

DR. NETON: So the next report is on a similar line, January to July of '52 you'll see on table 7, airborne contamination during shut down and then on page 24 of that report, airborne contaminants are in the normal operation levels. These levels are -- are much lower but they're still very high compared to the limit which they site here as 70 DPM per cubic meter. Now, there are statements in here that say we require everyone to wear respiratory protection above 70 DPM per cubic meter which begs the question then, well, people were breathing up to 70 DPM per cubic meter and then there's also the issue of -- of the representativeness of the air samples and that sort of thing. We're left in a bit of a -- a pickle here right now with this polonium issue. I -- I don't know where we're going

with this but certainly we weren't able to produce what we -- we really firmly believed that we had, you know, 70/80 of these incident reports. In fact, I think ORAU went back and did a wider search, opening the title search, and pulled out 800 documents and looked through all those. And -- And the well is dry. You heard George speak earlier today that the data may actually reside now at X-10 because this was really an X-10 type operation. Now, you know, I think though that the time is running short and frankly maybe going to run out on us on this issue. So I honestly am here to say I don't know where we're at with this other than we have air sampling data that we could use for bracketing polonium. How robust that is and how that allows us to reconstruct doses for the workers right now is still a question mark in my mind.

MR. CHEW: Jim, this is Mel.

DR. NETON: Yeah.

MR. CHEW: I think I faxed you, too, this morning -- remember, we went out to the ORNL library to look for X-10 information to see if we could find inference to either incidences or

the way they operate. And I think I sent you a -- or faxed to you this morning -- we looked at the progress report, April 1, 1951 to June 30th, 1951 is the cover page. And the second page it says 86-inch cyclotron. And considerable attention has been given to both personal protection from alpha activity associated with cyclotron components.

DR. NETON: Right.

MR. CHEW: Okay.

DR. NETON: Yeah, I -- I've looked through that, Mel, and -- and I think that there -- there is a pretty good picture here that -- that the health physics program paid a lot of attention to this activity. I mean there are -- there are air samples like I just talked about. There are recommendations for hand and foot monitors. There are protective equipment, clothing recommendations. And there is certainly indications of use of respiratory protection.

MR. CHEW: But I -- I want to --

DR. NETON: I put this in a situation though where we have monitoring data. We have -- We have indications that there was a -- a

reasonable health physics program but everywhere I look in here there are indications that -- that say that they are maybe below the maximum permissible levels. You know, they put respirators on when they reach 70 DPM. Yet we have acknowledgement then in their own reports that there were exposures. Yet we have no confirmatory bioassay data to -- to rely on to validate that that actually happened. And so I'm in a little bit of a quandary myself right now as to how -- how robust those data are in order to cover polonium exposure for cyclotron workers. That's where we are so I wish -- I wish we had more to offer. We certainly firmly believed we had -- had the data covered.

DR. MAURO: What kind of doses are you talking about at 70 DPM?

DR. NETON: Well, if -- if one -- and I haven't run this to ground but if 70 DPM were the -- were the back or the MAC or whatever you want to call it in that period, you potentially, you know, at the -- in that time frame 15 rem to a critical organ maybe?

MR. RICH: It was -- It was set up for uranium.

MR. GRIFFON: Do you think that was a week though? I mean I don't know if they'd be doing that for --

MR. RICH: -- for the uranium.

DR. NETON: What's that?

MR. RICH: The 70 DPM was set up for uranium.

DR. NETON: Right. So that was not clear to me why they were using 70 DPM alpha in the polonium 208 facility. That -- That doesn't jive.

MR. RICH: Well, that's a relatively short-lived isotope.

DR. MAURO: Yeah, that's what I was going to --

DR. NETON: Well, it's two years. It's not that short. So you're going to get your 50-year dose within six years or so maybe but we could run that calculation and show what -- what workers were exposed to, if they received the maximum allowable exposure at 70 DPM. Is that plausibly bounding? I -- I'm not sure. Let me look through that and say well, is this -- what do we do with that?

DR. MAURO: Is there an endangerment issue here? I mean that's what --

DR. NETON: Well, yeah.

MR. GRIFFON: Yeah.
DR. MAURO: I just wanted to make sure I understood that.
DR. NETON: Yeah, I -- I think with 70 DPM if -- if, you know, it's -- it's an alpha activity so let's assume it's similar to uranium in terms of its dose premiere intake. I think it's lower but it's in that ballpark. You're going to get into the range of doses that would endanger health. Okay. No doubt in my mind. Now, there's a whole additional piece. The cyclotron only operated for polonium for a year and a half period
MS. MUNN: Sure.
DR. NETON: But there may have been some residual contamination issues here. I mean it was clear they couldn't get rid of the problem. Once they -- once the polonium kind of distributed itself in the process it was kind of hard. You'll -- You'll see the locker rooms had contamination at this point so -- but yeah. I really wish we had some polonium bioassay samples, which I thought we had but we don't, to bracket. Again, the health records program seemed to have done everything they

could to limit exposure below the maximum allowable dose. But again it's been our practice in the past not to use that as a -- a logic path to say that that's what the maximum are. We've just not been comfortable doing that. So again I'll leave the issue open at this point but I guess that's as much information as I can present to you at this time.

MS. MUNN: Jim, there -- this report -- you had to turn in this report.

DR. NETON: Uh-huh.

MS. MUNN: It indicated that there were 63 names identified in 1951 as being associated with this.

DR. NETON: Right.

MS. MUNN: Is this pretty close to the -- to the worker population we're looking at --

DR. NETON: I think --

MS. MUNN: -- in the '60 to '70?

DR. NETON: I think it's our opinion that that's in that ballpark.

MR. GRIFFON: It's fairly close.

MS. MUNN: Just about covers it?

DR. NETON: Yeah. We -- We had heard --

MS. MUNN: And we have well less than 100 people.

MR. KERR: There were some people coming and going here as far as --

MS. MUNN: Oh, yes. Yeah.

MR. KERR: -- depending on what was being done.

MS. MUNN: Right.

DR. NETON: But it's our understanding from interviewing people who were involved with the process and others that cyclotron operation was a relatively small process operation relative to Y-12. Many of the people were actually X-10 workers --

MS. MUNN: Right.

DR. NETON: -- not Y-12 workers and, you know, (inaudible) of physicists, technicians with some supplemental maintenance staff --

MS. MUNN: Right.

DR. NETON: -- that worked there. Certainly it's our opinion it's less than 100 workers.

MS. MUNN: And the whole thing lasted less than a year and a half?

DR. NETON: Well, for polonium.

MS. MUNN: For polonium, yes.

DR. NETON: The cyclotron --

MS. MUNN: Yes, the cyclotron.
DR. NETON: But the number is a relative, numbers of people working cyclotron I think stayed about in that ballpark.
MS. MUNN: Okay.
MR. KERR: Some of the, those studies done after -- immediately after this (inaudible) where radiation (inaudible). It was (inaudible). So it wasn't really radiated conferences.
MS. MUNN: These workers should be fairly easy to identify, shouldn't they?
MR. KERR: We have to. That's what I said. We've got -- we have obtained at least three or four memos that have the names of people --
MS. MUNN: You know just exactly --
MR. KERR: And we know --
MS. MUNN: Yeah.
MR. KERR: -- and has badge numbers.
MS. MUNN: Yeah.
MR. GRIFFON: A complete listing or as best you know?
DR. NETON: Be careful. As best we know. We know --
MR. GRIFFON: As best you know, right.

DR. NETON: We have written memos but --
MR. GRIFFON: We know it's a small group, a relatively small group.
DR. NETON: The cyclotron facility. We have that list. We have worker lists.
MR. KERR: We have some of the lists of people who have been monitored.
MR. GRIFFON: You know, I don't -- you probably haven't done this yet but do you know if all these people are in a similar department or -- or is there any consistency there? Probably not because --
MR. KERR: Not now.
MR. GRIFFON: -- groups and other, yeah.
MR. KERR: We have people that have keys to their (inaudible) and those you can -- I've looked at departments that they're out of. And they're mainly out of I think the department number for molecular nuclear --
MS. MUNN: Yes.
MR. GRIFFON: I counted up here some of the --
MR. KERR: And the other one was electrical maintenance had some people with keys and a research support group has several -- a number of people with keys. So those --

MR. GRIFFON: That's about it, yeah.
MR. KERR: -- about three departments.
MR. GRIFFON: I'm just thinking of other ways if you didn't -- I'm not sure your list is complete. Maybe you could know with departments, you know. I mean but --
DR. NETON: But nonetheless, I'm still not clear how we're going to put a bound on this.
DR. MAURO: That's what I was going to ask now. What I'm hearing is if you do go down the road and try to place a plausible up or down, what I'm hearing is you have fair measurement data to have quite a large distribution. So the handle you might have -- the only real handle you have is to somehow use that data -- and I don't know if this is (inaudible) own data or (inaudible) data but somehow come up with a number that you're going to say this is a plausible up or down and apply it to all of these workers. Is that -- one -- one thing that's --
DR. NETON: That -- That -- That would be at this point given the data that we have, that would be an option.
DR. WADE: And the other option would be to --

DR. NETON: Revise the SEC evaluation and add this cyclotron worker class.

DR. WADE: And so as we pursue this option it would be good to have discussions obviously with DOL as I'm sure the Board will have questions for DOL related to that at the next meeting.

DR. NETON: I think you know --

MR. GRIFFON: How about the other nuclides? I mean you --

DR. NETON: Yeah.

MR. GRIFFON: This is polonium, right?

DR. NETON: The story -- The story gets a little murkier --

MR. GRIFFON: Right.

DR. NETON: And that's where I -- I --

DR. MAKHIJANI: That would be the easy part.

DR. NETON: True. At least we have some air monitoring data for the -- Now, you have these other exotics, so-called exotic radionuclides that Mel Chew and his team did a great job putting together the table. We know when they were produced now, you know, under what time frames and what they weren't. Or it pretty much covers almost the periodic table as to

what was produced. We found no -- we would hope that these incident reports would have fleshed those out as well. And there's nothing there. So now we don't know how to bracket those potential incidents that may have occurred. It seems unreasonable to me to believe that none occurred and that's why we don't have any incident reports. I just -- I just have trouble believing that because in the 1960s we have some reports that we actually showed. That gallium is a good example of that. And we said, geez, this -- it was actually one MAC into the -- into the (inaudible). So they're out there somewhere. They may be at X-10. We don't know. I also mentioned early on that the external data for the cyclotrons are not all necessarily in the CER database. Some maybe but not all. Given that then we're in the position of -- of having to say that let's go to the Delta View database. Sound familiar? You know, we can -- we can pull these data out. They may be there. They may be at X-10. So we have no way to reconstruct right now internal exposures from which I believe were fairly low doses, but we

have no way of proving that. And secondly the external exposures at this point are not covered by any of our existing co-worker models. So the cyclotron worker issue really looks to me to be fairly, you know, -- I don't know what word to use on that. We don't have a lot of data.

DR. WADE: Fairly clear.

DR. NETON: Not very clear.

DR. WADE: Well, it is clear. I mean our actions will be clear. That's what we're -- that's what we're here to do. So look at the reality and make decisions.

DR. NETON: We have to make decisions. I'm not saying that we've -- we've made that decision at this point but you -- given the -- given the weight of the evidence that we presented here it's going to be hard for us to come up with a bound -- a plausible bounding analysis.

MR. GRIFFON: And I think part of that consideration might be the small number of --

DR. NETON: It's a small number of workers on top of that so then how much effort do we expect. I believe the reports are there somewhere.

MR. GRIFFON: Right.
DR. NETON: But do we spend a massive amount of man-hours to pull these records out to prove that those doses were small?
MS. MUNN: Has there been an effort to?
MR. GRIFFON: Because out of those --
DR. NETON: Yes, Mel mentioned that they were yesterday looking for incident reports in the library for X-10. We found the investigations. They -- They typically, the ones we've looked at, the ones that I've seen, two or three, are related to external exposure where someone walked into the area --
MR. GRIFFON: Unlocked.
DR. NETON: -- unlocked and they received an exposure. They did nice to follow up. I would have expected to see a similar level of attention paid to internal. Now, it may be because as we'll talk about later in that case study that John threw over our side, you know, the mindset in this time period was not so much let me figure out what a person's internal dose is but are we concerned at all that workers are above the maximum permissible amount at that time. Very much like TLV for industrial

hygiene. As long as we know workers are below X they weren't really concerned with calculating a detailed internal dose. That just wasn't the way business was done back then. And -- And this may be what we're up against. Everyone recognized that these are short liberated nuclides. Yeah, you blow a little bit into the air but it goes away so we don't have a good way to hang our -- well, it's anything to hang our hat on right now. So I cut that pretty short but that's --

MR. GRIFFON: You did.

MS. MUNN: There's nothing to argue about.

MR. GRIFFON: I was just going to ask -- I know what I was going to ask. A lot of the claimants -- I don't know if you have a way to figure this out but how many were potential cyclotron workers?

MR. KERR: I think we've been looking back at that.

MR. GRIFFON: Have you looked at that?

MR. KERR: There's two at Y-12.

MR. GRIFFON: Right. So we're talking --

MR. KERR: And I briefly looked through the (inaudible) and I wasn't able to identify

anybody, you know.

MR. GRIFFON: So we're talking 65 to 100 in the whole population and two in the claimants?

DR. NETON: Well, maybe in the claimant population.

MR. GRIFFON: Maybe a few more in X-10, yeah.

MR. KERR: I looked at X-10 and I -- just a quick look --

MR. GRIFFON: Right.

DR. NETON: I think there's a third which is the gallium incident one that we found in the '60s that led us down this path --

MR. GRIFFON: Right.

DR. NETON: -- thinking, oh, my gosh, look at the wealth of --

MR. GRIFFON: It is significant, yeah.

DR. NETON: We went into a detailed investigation of this gallium and we thought, well, this is great. Everybody must have some similar level of documentation and it's turned out to be --

DR. WADE: Are there cyclotron operators outside the period covered by this SEC?

DR. NETON: Yes.

MR. GRIFFON: Yes.

DR. WADE: So it's -- could re-- depending upon our judgment it could result in an identified class.

MR. GRIFFON: Expanded year class.

DR. NETON: Yeah, it would be expanded year I think.

DR. WADE: Or by us as -- as another class.

MS. MUNN: Oh, yeah.

MR. KERR: In 19-- 1960 -- 1960 and 1961 an operation of the cyclotron went entirely X-10.

MR. GRIFFON: Yeah.

MR. KERR: But it was used for us.

DR. NETON: You've got to be careful though. Under the change of geographic location, the way we're doing business right now is --

MR. GRIFFON: Yeah, yeah.

DR. NETON: -- is an X-10 -- it's a Y-12 operation.

DR. WADE: It opens up various issues inappropriate for us to look at. It's really what is supposed to come from this process. It's a good thing.

DR. NETON: I think for purposes of this SEC for instance if we were to make a supplement to add cyclotron, I think we -- we would cut it at

'57 with the understanding that we would have an ongoing investigation into an additional -- I just don't want to delay --

MR. GRIFFON: Right.

MS. MUNN: Yeah.

DR. NETON: -- for the effort.

MS. MUNN: Yeah.

DR. WADE: Because if you were to find claimants who would fall outside of that time frame --

MS. MUNN: Right.

DR. WADE: -- then we could work with those claimants.

DR. NETON: We could work with them through the process or whatever.

MR. KERR: System workers --

MR. GRIFFON: Did --

MR. KERR: I guess what -- maybe after this '57 period we ought to walk through the monitoring data on the people who were working at the cyclotron when we go back in the early '50s which may make a difference.

DR. NETON: Example we had for gallium.

MR. GRIFFON: Right. So we could leave that open.

MR. KERR: Right.

DR. NETON: Because after '58, you know, the recommendations to work were incorporated and they were a little better about internal monitoring although I don't make any -- I don't make any predictions any more about what was done.

MR. GRIFFON: That's where we are, like you said, yeah. I think we're at -- that's the issue four and five actually. I don't think there's anything else to add on that.

DR. NETON: No.

MR. GRIFFON: The only thing, I was looking back at my questions coming into today and eveything's been answered except for the question, and it's from an earlier issue we discussed but some of these memos -- all these memos that you've emailed, some of the memos have been cited by Mel and others. And can you just make sure they're on the O-drive or whatever in that directory so we can look at them?

DR. NETON: Sure.

MR. GRIFFON: And also the -- the -- I think you used some of this data from these -- these

reports. I emailed you on this. These reports that were under classification review, the health and safety reports. Are they available yet or not yet?

DR. NETON: No.

MR. GRIFFON: I think you said they were still under -- under review or whatever. So if they become available you'll post them, okay.

DR. NETON: As soon as we get them we'll put them out.

MR. GRIFFON: Okay. I think we're at a -- I think we need a break.

DR. WADE: To the people on the phone, so we'll break and we assume we'll come back at 2:00 p.m.?

MR. GRIFFON: 2:00 p.m., yeah.

DR. WADE: We're going to break contact with the call now.

MR. CHEW: All right.

(Whereupon, a recess was held from 12:55 to 2:10 p.m.)

ISSUE 6: 1948 AND 1949 SALVAGE AND RECYCLING WORKER INTERNAL DOSE

MR. GRIFFON: Jim, we're on the record now. I guess we're going to pick up with issue six.

DR. NETON: Issue six.

MR. GRIFFON: '48 to '49 salvage and recycle worker internal dose.

DR. NETON: I don't have a real handout for this so I can just talk through it but it's a fairly straightforward issue in my mind. The issue is that we -- as people -- you recall we have no bioassay data for '48 and '49 for workers at Y-12, at least none that we have access to. I think there is some but we just don't have it. So it turns out we took workers with bioassay in 1952 and -- and used them to recon-- to -- to predict what the maximum intake could have been in '48 and '49 given what the excretion rates were in 1952. And we came up with what we believed to be some fairly generous estimates. And I think in general there was agreement --

MR. GRIFFON: Yes.

DR. NETON: -- among the working group that that seemed to be a reasonable approach with the proviso that we had to demonstrate somehow that, you know, we're the subset of workers who were called the salvage workers in 1948 and '49 also present in 1952. And as importantly was their distribution similar to the overall

distribution of workers in 1952 or were there -- is there some subset that we should account for and -- and increase their dose? That's the story. Now, the result was that we found there were 352 workers who we had monitored data for in 1952.

MR. GRIFFON: I think you did send something on this issue.

DR. MAURO: There was something.

DR. NETON: Okay. I did. That was the -- in fact I can pass this out.

MR. GRIFFON: Right.

DR. NETON: This has actually --

MR. GRIFFON: Yeah, that's it.

DR. NETON: -- a hodge-podge of -- of information. And what's relevant is item number one here on the chart that talks about 393 ID's with urinalysis data in 1952. We check the job categories or titles of those people and nine have salvage related job titles. Okay. We also went back and looked at workers -- the job titles of workers who were there in -- prior to 1950 and it turns out that there were nine people with job titles of salvage workers before 1950. So we have gone

back and actually looked at the distribution of the nine people who have salvage job titles at Y-12. And of the people who were listed as salvage workers the minimum bioassay was zero, the average was 24, and the maximum was 576. And these are in DPM for 24 hours. If you look at the total population of 393 workers the min was -1, the average was 33, and the max was 38,000.

DR. MAKHIJANI: Where are you reading from? Sorry.

DR. NETON: I'm reading from my own private piece of paper here. I'm sorry. I didn't mean to be facetious. I -- I'm sort of elaborating on that -- that first sentence on the sheet that was just handed out that said internal bioassay review. It talks about the 393 ID's.

MR. GRIFFON: Oh, yeah. Right.

DR. NETON: We went back and looked at the -- at the bioassay records for those nine salvage workers and I was just comparing the distribution -- a rough comparison of distribution. And it turns out that the average value for the overall population is a little higher than the average value for the

nine salvage workers. They're in -- it's in that ballpark. There doesn't seem to be any issue with -- with them being way out of whack which -- which is kind of consistent with what we were thinking is these people were pulling residual contamination of uranium off the pieces and parts. I guess one could --

MR. GRIFFON: Jim, is this -- is this salvage related job titles, what -- is there any -- there was a salvage department I saw in some of the health physics reports.

DR. NETON: I actually think that they had salvage worker in their job title.

MR. GRIFFON: It did say salvage worker, yeah.

DR. NETON: Yeah, that's what Bill -- Bill Tankersley was clear on that --

MR. GRIFFON: Yeah.

DR. NETON: -- that they did have a salvage worker title.

MR. GRIFFON: Okay.

DR. NETON: So now, the other comparison was I think that there were -- of the people who were monitored, 393 who were monitored in '52, I believe, and someone help me out, is about 140 -- 40 percent of workers also had -- were also

working in the pre-'50 period. We don't think that's necessarily an issue of attrition so much as of maybe adding new workers but nonetheless, there was a very good overlap of workers in '52 with the pre-'50. And in fact the nine salvage workers seem to match up between those two periods. So we don't have what seem -- there doesn't seem to be an issue here for us anyways that -- that what we've done is -- is a fairly reasonable approximation or if anything a claimant favorable approximation of their exposures. We do -- went back and tried to identify any air sample data that may be useful in helping to also corroborate this and couldn't find it. That we did not find. It didn't pan out for us.

MR. GRIFFON: Jim, I think that's reassuring. I don't know if --

DR. MAKHIJANI: Give us the data and we'll be able to see the, write the worker numbers down.

MR. GRIFFON: That's -- That's -- That's what we asked for and, you know, it looks like you've done it so --

DR. NETON: We -- We -- The good news is we were able to track it. We've identified it and

we'll get you the data.

DR. MAKHIJANI: Good.

DR. NETON: Okay.

ISSSUE 7: Y-12 WORKER DATA INTEGRITY ISSUE REGARDING INTAKE INCIDENT

MR. GRIFFON: And I guess we're on to issue seven.

DR. NETON: Issue seven. That is the case study; is that right?

MR. GRIFFON: Right.

DR. NETON: Yeah, I -- I -- I looked at that case in the last conference call. I hadn't had a chance to -- to review the case. And I sent around an email --

MR. GRIFFON: Yeah.

DR. NETON: -- I thought that was about a page response to the -- what I thought the issues were and I'm still on that -- on that bent that, you know, the spectra theory looked like there was in the K-40 there. And my knowledge of that system was that they were using a -- a complex technique that I wonder -- wonder why they do that but they did it nonetheless. And certainly it's plausible that that 30 millirem contributing to the content continuing in the 185 region. My guess is there's about ten

(inaudible). I'm looking at the K-40 versus the --

DR. BEHLING: That's where I came out after I realized that I had missed the --

DR. NETON: Yeah.

DR. BEHLING: I mean I looked at that and I said, why are they squeezing all of that 1.5 in the -- into 500 channels? I expected that to be --

DR. NETON: Yeah.

DR. BEHLING: -- 4,096 channel -- multi-channel analyzer and I looked at those two peaks and I jumped to a conclusion that it wasn't -- the data wasn't there for me to say no to it. It was only after you explained it that I realized. And the striking fact is that the 93 and 186 are a factor of two apart.

MR. GRIFFON: Oh, yeah.

DR. BEHLING: And the 66 and the 1 -- 4.6 happen to be exactly --

DR. NETON: I can sort of see how you came to that conclusion but I --

MR. GRIFFON: The energy is written over those peaks but I realize --

DR. BEHLING: Well, now, I wrote that in there

and there was --

DR. NETON: (Inaudible) original (inaudible) and I said there's more energies here.

MR. GRIFFON: Yeah. Yeah.

DR. BEHLING: It was intended to be an internal memo --

MR. GRIFFON: Right.

DR. BEHLING: -- which I had sent to John.

MR. GRIFFON: That's fine.

DR. BEHLING: And I had said for -- for explanatory reason I'll make the assumption. And it was an assumption that I had no qualms with because there was nothing there that says it's 2.9 KV per channel. It could have easily been .4, in which case the two peaks would have corresponded.

DR. NETON: I think that counter was used for multiple purposes and one was to do thorium measurements. And I think if 228's got a peak of 911 KPU that they would have used to quantify thorium exposures and -- and other issues. But you're right. I mean I -- I don't -- it doesn't make a lot of technical sense to measure something. I'm pretty sure this was 11 by 4 inch detector. That's a pretty big --

DR. BEHLING: That's a huge volume detector --
DR. NETON: Yeah.
DR. BEHLING: -- that is not usually used for lower energy protons.
DR. NETON: And that was actually what was in the mobile counter which this may be the count from was two of those detectors. The person was sandwiched between two of those detectors. Nonetheless, you know, they did try to account for that count being scattered but the problem is variable mass people, someone like myself versus a skinny person, the peak would change even in that. And so the ability to predict how many cesium counts were in that 185 region is pretty poor.
MR. GRIFFON: Yeah.
DR. NETON: And even worse in the 6393. One thing that should have tipped you off maybe was that the 93 should have had a (inaudible) of 63 because that's equally a (inaudible) that has the 93 before --
MR. GRIFFON: Yes.
DR. NETON: -- the 234.
MR. GRIFFON: Yeah.
DR. NETON: Anyway, so -- so I think that issue

kind of goes away with the exception that, okay, how good is mobile counter and -- and what does that really mean in terms of the overall program ability to measure dose. Oh, let me follow up.

MR. GRIFFON: Yeah.

DR. NETON: They did follow up as I said, with a urine sample which the practice --

MR. GRIFFON: Right.

DR. NETON: -- to say, okay, I see an evidence of a positive uranium intake. Let me take a urine sample. It showed up I think it was --

DR. BEHLING: 69?

DR. NETON: -- 63 or 96 DPM which was below their stated action level at that point of 90 DPM per year. That 90 DPM, even as late as 19-- I had to think about this for a little bit but even as late as May 1989 DOE workers were still being monitored under the old ICRP-2 requirements. So you can calculate Q, the maximum body burden that could be in the lungs, but 365 a year and not exceed 15 rem per quarter. For a lung counter they're only focusing on insoluble uranium. So that came out to be somewhere around 17 microcuries I

think, worked up in micrograms. And so they exceeded what they thought was over 15 rem potential exposure to lung if that were there all year. They took a urine sample and you could also calculate under the old ICRP-2 concept what would be in the urine if I had 117 microcuries using that old sample one model of a 120-day half-life in the lung. That comes out to around 90 DPM. So as long as I'm excreting less than 90 DPM per liter I don't have the potential to exceed the --

DR. BEHLING: Exceed 15.

DR. NETON: So -- So they took a sample. It was less than the 90. They go out. I got this issue going here. It's less than 90, it's good to go. And -- And it wasn't their practice in those days to record any dose at all for workers who were just were below the --

DR. BEHLING: You know, it seems so strange when I compare it to Rocky and then, you know, Rocky Flats, when you look at their TBD they introduced detectors. Subsequently they used high purity uranium -- detectors and they used urinalysis that would have an MDA value of less than one DPM in a 24-hour urine sample. And of

course, when you look at the MDA associated with Y-12, under optimum conditions 26 DPM in a 24-hour period. And that's optimum; more than likely twice that realizing that you're potentially going to be looking at higher background in a -- in a proportional (inaudible). So I'm looking at that and sort of saying why did they risk, at that late date, up until September of 1989, they used gross alpha and urinalysis data that was so far out of whack with what the rest of the industry was doing.

DR. NETON: I totally agree with you. I mean that -- that's something that I -- I actually went out -- went back and pulled their -- their procedures back in that era and they were using gross alpha with proportion in there. And if -- it was electrode deposition which attributed --

DR. BEHLING: That's 20 volumes.

DR. NETON: -- that appeared to be right out of the urine sample after it may have been digested slightly. So it -- it was a very high level. I guess one -- one could speculate that, you know, it met -- it met the need at

the time, you know. You want workers in plutonium. Plutonium had a -- a more stringent controls on it.

MR. GRIFFON: I'm sure that was the rationale, right? I mean --

DR. NETON: Why -- Why -- Why spend, you know, I can see management saying why spend $300 a sample when you can process it within -- within the regulations for 50. I mean I don't know if that's true but that -- that certainly could be why. So, you know, that's -- that's the bottom line I think on that issue. I don't really see that there's -- I think the mistake that was made was to try to attribute the cesium P.

DR. BEHLING: No, I completely -- completely misread that spectrum.

DR. NETON: I've seen better --

MR. GRIFFON: That's interesting because that caught my eye because I've heard people down there in interviews say the same thing, that I -- I came out high on my count and they just said -- they said, oh, do I hunt deer, you know, and they -- so this isn't the first time that's -- that's come up. I never saw it in

writing like this but --

DR. NETON: At Savannah River it's even worse. I mean the -- the clay soil in that region for some reason binds --

DR. BEHLING: Binds cesium.

DR. NETON: -- binds cesium. So then the deer graze on the vegetation and even fallout from years and years and years ago are still available for uptake in the plants. There doesn't seem to be a kind of source for cesium for this worker and that doesn't seem to be the issue --

MR. GRIFFON: Right. Right.

DR. NETON: And I guess at the end the bottom line is that the DOE provided us every number that -- that we used to try to validate whether they did it right so in that sense we were -- we were focusing on the integrity of the data.

MR. GRIFFON: Yeah.

DR. NETON: I would say that the data were not sensitive.

MR. GRIFFON: Yeah.

DR. NETON: We could argue about the interpretation that they made but they provided us all the values in order to make that

interpretation.

MR. GRIFFON: And I guess the other add-on is you're not relying on that data to do dose reconstructions anyway. You're using end data, right?

DR. NETON: Yeah, lower -- the 69 DPM certainly comes into play.

MR. GRIFFON: Yeah, right. It does come into play.

DR. NETON: And I think this was a TIB 2 approach originally that the -- the case -- I don't want to get too much into detail --

MR. GRIFFON: Yes.

DR. NETON: -- but I think the case was non-compensable first pass.

DR. BEHLING: I think he has the second cancer which will now be valued under the revised lymphoma DCF.

DR. NETON: Exactly. So the second cancer which -- what would be a different dose reconstruction but I believe that the urine sample was bounded by the two two over-estimate approach in the first pass.

DR. BEHLING: Uh-huh.

DR. NETON: But yeah. That was what I was

trying to say in my last sentence of my write-up that we need to look at this through the lens of modern interpretation and dose models which I think we're doing.

DR. BEHLING: I did look at the historical other -- I checked on data and get an understanding of just the insensitivity of that because if you look back, and I brought a few photocopies with me that are, you know, crossed out, blackened out the name I can distribute, but they had in one instance a historical whole-body count or chest count -- they really didn't distinguish between them -- where the uranium 235 was recorded as -99 micrograms negative meaning that between plus and minus 100 there was really no way of determining whether or not you had anything in you.

DR. NETON: Well, the problem depends on where that -- I'm very familiar with the Y-12 mobile -- mobile counter. It was used for (inaudible) but I had -- I had on my desk data, this being for all the workers and for all that had been measured with that counter and it's very, very subject to radon fluctuations in air. You can imagine you're doing this count, and you do it

in the -- in the afternoon hours your background when there's a conversion -- or whatever and the next thing you know it's attracting a huge amount of radon background that's not there in the situation.

MR. GRIFFON: Yeah.

DR. NETON: And you -- I can usually see getting --

MR. GRIFFON: Yeah.

DR. NETON: -- any negative numbers. My recollection -- strange I remember this but the detection limit for that system is 5.2 milligrams of thorium uranium 238 and about 38 micrograms reportedly in good conditions for U-235. For some reason that rings a bell because there was a lot of workers that had those notations there. Yeah, it probably was -- yeah, the lung counter, we need to look at what it was about. The lung counter was not as a primary mechanism for control of exposures. It was a sort of follow up to make sure they weren't exceeding the 5 -- 15 rem lung doses in that time period. And the urine sampling program was more sensitive than the lung counter by far but were insoluble. If you

believe the 120-day half-life that was used in the -- I can't remember -- But interestingly enough it does -- Jerry Barber at Y-12 went back and looked at all the monitoring data historically at one point and published an article on how physics -- he came up with what he called Q-class uranium which it fit pretty well. Quarterly clearance class rather than -- than monthly. And it came out about 120. Most of the uranium at Y-12 was in that -- that ballpark. Interesting -- Interesting exercise.

DR. BEHLING: Yes.

DR. MAKHIJANI: A couple of questions just for clarifying the scientific issues in my head. One would be that essentially the in vivo data has to be disregarded even as a validation so far as uranium is concerned because I mean using the subtraction from them it becomes quite variable and, you know, you have no idea. It seems from the data that Hans showed me -- it seemed to be very difficult to make sense of the in vivo data and I just wanted to --

DR. BEHLING: The low doses?

DR. MAKHIJANI: -- the impressionistic idea not

-- not the studied idea.

DR. NETON: It's very low incidence levels I think that, you know -- this came up in the original review, the Y-12 site profile; why aren't we using the in vivo data more. And the answer was that the urine sampling was much more sensitive and would be more representative of workers' exposures. Now, it doesn't mean though you can't use the in vivo data as a bounding estimate of some point to say okay, I -- I -- my urine sample shows me a very massive intake for some reason. It is a contaminated sample. And I've got a -- and I want to see if it possibly was. And I've got a urine -- I mean in vivo count that was done and it shows that it's much lower than what you'd expect. Within certain limits one can make those comparisons and -- and -- and use it to your advantage. But -- But you're right, Arjun, you've got to be careful when you start using in vivo to do anything. In vivo normally -- I never say always anymore but you will normally use the in vitro urine data --

MR. GRIFFON: Uh-huh.

DR. NETON: -- as -- as an exposure indicator.

DR. MAKHIJANI: It -- It would seem to me that if -- if the setup of the counter, and you know, this is obviously I don't have field experience in the way that you do -- but just looking at the theory of how it was done and the -- the data that Hans showed me and your explanation, if -- if -- if the frequencies of interest from the uranium and the thorium are left and -- and -- and the counter is merely centered on the cesium peak and you've got a back stabber that you're subtracting out that would alter significantly, if you -- you would be left with a piece of data that would be extremely uncertain and -- and very unreliable. So my -- my question is how could you use -- it would seem to me that so long as the other was arranged in the way that this one seems to be that you could not use that in vivo data; that in vivo data has become unusable for uranium 235.

DR. NETON: Within certain limits. I mean I -- I -- I can -- I can guarantee that if you put enough in front of that detector you start seeing a photo 185. It's not insensitive. I mean the intrinsic efficiency of that detector

is virtually 100 percent for 185 KPU's, so thick it's got 100 percent intrinsic efficiency capturing those photons. The question is when does that intrinsic rise above his continuum there --

DR. MAKHIJANI: Right.

DR. NETON: -- amidst the noise that might be present from radon and (inaudible). There was a calculable value there and it's not worthless. I mean I wouldn't characterize it as that at all. I'd say you have to be careful because if you get somewhere above 100-and-something micrograms I'm very certain you could start to see -- you could start to see photons.

DR. BEHLING: But like I said, I -- I made a copy of some of his historical and you can certainly say one thing. Every time you see a negative value that's obviously an error because by definition that's an impossible situation. And so it lends you some understanding of the limitation of the data when you have a minus 99 there's no explanation for that other than to say it's in error.

DR. NETON: Well, it's...

DR. BEHLING: Well, it's an indication of the -

- of the statistics. By stripping something out you end up unfortunately at times with a negative value.

DR. NETON: It's -- It's not an error. It's -- It's -- It's a number generated as a result of this measurement process and it's -- it's an indication of variability of the process.

MR. GRIFFON: Right.

DR. NETON: It's a valid number based on the measurement. Now, how valid -- how uncertain that is and can you come up with minus 99, how does that bracket the uncertainty distribution that we're trying to measure? That's informative. It's not in error.

DR. BEHLING: Uh-huh.

DR. NETON: I mean I'm clear on that.

DR. MAKHIJANI: Looking at -- Looking at the sort of rather large amount of stripping that would have to have some value for -- for the back stabber people from cesium, that -- that would really -- I mean you'd have to have a pretty well defined instruction for dose reconstruction when they could use this because a vast majority of them -- the vast majority of this in vivo data would appear to be unusual up

to mid-1989.

DR. NETON: Again, I don't know unusable or not. I mean within a certain limit. Now, again we don't put a lot of -- of emphasis in using the in vivo data other than for confirmatory issues of let's say a person had a sample here and someone argues you had an incident a year ago and you -- you could have had an intake or who knows how many micrograms. Well, you can say, well, no, there's no indication in this -- this path given, you know, whatever the reliability of system.

MR. GRIFFON: I would also say we're getting into TR discussion more than SEC discussion.

DR. MAURO: I'd like to point out that just listening to this discussion, the level of -- of knowledge -- experience that's reflected in this conversation. This I guess is caution. If you're in a production mode and you're moving out large numbers of cases and you have 300 health physicists moving through the process, the kinds of judgments you're talking about I certainly trust what I'm hearing. Incredible health physics but I think that you're in an -- in a -- in an area now where

you've got to be really careful.

DR. NETON: Oh, yeah.

DR. MAURO: Because this is not just turning the crank now. There's a lot of judgment being made here.

DR. NETON: Again I don't know -- I'm not aware of any program -- could be where the workers had in vivo accounts without urinalysis. I mean we don't have any.

MR. GRIFFON: Right.

DR. NETON: It's not -- It's not like they used in vivo as a cheap way out to monitor the workforce. They are almost -- there may be instances but typically they're always on some prior assay frequency for urine and then a lesser frequency for in vivo. Almost as a safety check -- check, you know, are we missing something here big time? Matter of fact, you'll see big peaks on some people; more than likely it's because external contamination. It is possible. I -- I've seen positive counts on these -- these -- these counters and I can assure you that they are observable and, you know, there's one, granted, what we would call a standard peak search by today's technology,

but the detection limit is here.

DR. MAKHIJANI: Yes. I just wanted some -- some clarification.

DR. NETON: I totally agree that we have to be careful in using the in vivo counter data.

DR. BEHLING: And what would be the default value for in vitro urinalysis given the fact that probably 30 to 40 DPM per 24-hour urine excretion is probably the MDA value and -- and would you be interested in looking to assign that for all instances where there is below MDA?

DR. NETON: Yeah. That's our standard practice. We've done that a lot. Most of the lung cancers that get paid on this program are the result of a missed dose calculation --

MR. GRIFFON: Right.

DR. NETON: -- for people excreting urine below -- what class below the detection limit in the measuring process. So this means that if the detection was 24 DPM we would assign not necessarily 24 DPM, probably half of the MDA, you know, if I modeled it, the uncertainty propagated on there.

MR. GRIFFON: Zero to 24?

DR. NETON: Yeah, I think so. Zero to 24 -- That's been our standard approach and again we've been -- we've had many -- numbers of people go through here and never excrete a positive sample in their -- in their work histories that are coming out with lung doses that are compensable based on just that and I have no problem. That's the -- That's the technology, limit of the technology.

MR. GRIFFON: I think we're through that one.

ISSUE 8: INTERNAL DOSE DATA VALIDATION

Issue eight and then we're done.

DR. NETON: Here's coffee, too if you want.

MR. GRIFFON: Don't need it now, right?

DR. NETON: We're winding down. Well, I don't know. Is issue eight the dose reconstruction?

MR. GRIFFON: Oh, issue eight I added. This is kind of an -- an add on.

DR. NETON: Oh.

MR. GRIFFON: But it's the internal dose val-- it wasn't really in the conference call --

DR. NETON: That -- That actually is included in I think some of the material that I -- I sent around yesterday. There is a -- a brief mention of August of '55, the second item

listed speaks to an attempt at validating some of the later external data as you see back there. And the remaining one -- two -- two write-ups speak to looking at HP reports and trying to validate some of the -- some more urine data. Although I think in looking at it this morning it appears that the HP October '53 report is a rehash of what's in our evaluation report. So really the only new one here that we were able to look at for the health physics --

MR. GRIFFON: '55.

DR. NETON: -- was the '55 and the '53 HP report which talks about average weekly excretion rates and DPM for 24 hours and there's very good -- ex-- perfect agreement with the exception of sample number four there where you see that the electronic database had a -- a weekly average of U32 versus -- help me out here, Tim. These columns are labeled the same.

MR. GRIFFON: Yeah, they are the same.

MR. ADLER: The one on the left is the document that the report --

DR. NETON: Okay. So the document for this

particular individual had a weekly average that was slightly higher but there's perfect agreement among the other samples. And I won't ascribe any value judgments in there other than that's what we can see.

MS. MUNN: We can see, yeah.

MR. GRIFFON: And similarly on the bottom table, right?

DR. NETON: Yeah.

MR. GRIFFON: Except for the 110 versus 13?

DR. NETON: Right.

DR. BEHLING: Why is there a pretty big -- been labeled as average weekly if it's at 20 DPM in the 20 -- I mean what does the weekly refer to?

DR. NETON: I don't know. These are weekly samples so -- and I didn't do this comparison so I'm not going to be able (inaudible) labels. That must have been the label on the report and that's just carried over from the report. My guess is, and I can't confirm this at this point but if you take a weekly sample, usually they had a two-day -- two-day off the work period and took a sample.

DR. BEHLING: But it's strictly a 24-hour urine sample that was?

MR. GRIFFON: It says 24 hours.
DR. NETON: Unless -- Unless this is -- I got to be careful here. This could be actually over a period of time. Do you know what I'm saying? I mean if they had 52 weeks or a quarter.
MR. GRIFFON: Uh-huh.
DR. NETON: I honestly don't know. I'd have to check --
MR. GRIFFON: That might be good.
DR. NETON: -- with Bill Tankersley on that. But it's a good question, Hans. I don't know the answer.
MS. MUNN: But in either case --
DR. NETON: Even --
MS. MUNN: The data agrees.
DR. NETON: -- the numbers appear to be fairly close.
MR. GRIFFON: And so the '55, and that would report as one of the ones hung up in classification, right?
DR. NETON: Yes.
MR. GRIFFON: That '55?
MS. MUNN: I think what we're after is agreement. The assurance that the CER is okay.

DR. NETON: And, you know, this is sort of similar to concluding the cancer with the other -- They're not perfect but they're --

MS. MUNN: No. You wouldn't expect them to be.

MR. GRIFFON: I guess there was no more of those percentile curves though.

DR. NETON: If I -- I got --

MR. GRIFFON: That's what I was hoping for.

DR. NETON: I specifically asked that question could we get these percentile curves out of the data that are still not -- haven't been reviewed for classification?

MS. MUNN: I can't conceive it myself.

MR. GRIFFON: Those reports change over time. Different authors, different, you know --

DR. NETON: Bill Tankersley assured me that there were no ones that he could locate anyway for comparisons.

DR. MAKHIJANI: There's one -- one discrepancy that's rather large.

DR. BEHLING: And it's that 110 13?

DR. MAKHIJANI: Yeah.

DR. NETON: Yeah.

DR. MAKHIJANI: Everything else looks alright.

DR. NETON: Yeah, I agree. I'm not sure. We

can follow up and see what -- what may be the basis of that.

MR. GRIFFON: And just follow up and tell us what these values, you know...

DR. NETON: Yeah.

MR. GRIFFON: In other words, it looks -- another piece of data to fill in. I think the internal one was the stronger -- you have more strength in the case there anyway.

DR. NETON: We have three or four --

MR. GRIFFON: Right.

DR. NETON: -- forms for comparison in this case. Again, 50-year-old data is never perfect but it gives at least me a pretty good sense that we're -- we can chase it through this one.

MS. MUNN: In my experience one-year-old data is not perfect, transcribed from one thing to another.

DR. NETON: Yeah.

MS. MUNN: And any time you enter -- disperse information with human activity.

MR. GRIFFON: Well, then you probably have typos.

MS. MUNN: Yeah.

MR. GRIFFON: That's why I was impressed with

those percentile curves and all those graphs they did, all by hand.

MS. MUNN: Yeah.

MR. GRIFFON: A lot of work.

DR. NETON: Look at those memos on the external side. I mean they were clearly using IBM keypunch --

MS. MUNN: Hodge-podge.

DR. NETON: -- computer technology back in the early '50s.

MS. MUNN: Yep.

DR. NETON: For -- To generate punch cards for -- for the data and keeping track of them and stuff.

MR. GRIFFON: Yeah, I think there were --

DR. NETON: They were using modern technology to their advantage.

MR. GRIFFON: Yes, right.

MS. MUNN: I think --

DISCUSSION OF SAMPLE DR'S

MR. GRIFFON: And then the last thing I have on the list is just a good discussion of the sample DR's.

DR. NETON: Some of these are probably going to become not important at this point if we're

going to rethink our approach to cyclotron workers. I think at least one, maybe two of them are -- are in that.

MR. GRIFFON: Are related to that.

DR. NETON: In that area.

DR. MAKHIJANI: And about the plutonium one I don't think there was a question.

DR. NETON: Maybe -- Maybe I could start there, if there's any questions on these. But I -- I really -- I prefer to answer your questions rather than me just go over them. But honestly I -- I have them here in front of me. I may or may not be able to answer specific questions because I -- it's been awhile since I've -- I've refreshed my memory on some of them.

DR. MAKHIJANI: I have the same question on one and three.

DR. NETON: Okay.

DR. MAKHIJANI: Which was that it says that the highest exposed people were monitored for neutrons.

DR. NETON: Uh-huh.

DR. MAKHIJANI: And I try to follow the reference trail to that statement and I went to

Dr. Kerr's paper from 2004 I think, the part two of that extended dose paper.

DR. NETON: Uh-huh.

DR. MAKHIJANI: And that actually referred -- that statement was not as strong in that paper but it was there. But it referred me to the TBD. And in the TBD I did not find a clear statement the neutron monitoring all the way back to 1949, that all the people with the highest exposure -- exposure potential were monitored. It did provide me a reference to the 1949 May health physics report which I then looked back and I did not find any statement about monitoring critical (inaudible). This is from a relatively quick survey of these documents. I might be mistaken. Let me just make that caveat. But as I understood the health physics report they -- they essentially indicated that that's when they started neutron monitoring but no (inaudible) was indicated.

MR. KERR: Actually they started monitoring earlier than that for neutrons.

MS. MUNN: Get close to a mike, George.

MR. KERR: You'll get in trouble.

DR. NETON: Okay.

MR. KERR: Here's some neutron monitoring data, a little bit like from '49. That was their first attempt. I think that it'll start adding -- they used -- earlier they used some neutron sensitive ion chambers or PIC's to get the workers. But in '52 they started printing NTA films in the badges with the beta gamma. But if you go back and look, typically what they did --

DR. MAKHIJANI: '52?

MR. KERR: '52 is when they started putting the NTA films in. If you go back and look the indications I have is that they were monitoring anybody who was in an area where they could get a neutron exposure. And I think you'll find that's stated in -- in the books. Here they -- if you were in an area where neutrons were being produced you had an NTA film. Now, the one thing they didn't do is they didn't always develop those films and look at them unless the HP in that area said that these people had worked in a neutron field that week. They -- Part of the reason they had some indication that he had, he was probably looking at the pocket ionization chambers. Then the films

were developed and read. But if you worked in a neutron area you had a neutron film in your badge. And I think in the cyclotron they probably -- anyone who went in and worked around a cyclotron that week, you know, had one of those. Now, some of the supervisors didn't. As a matter of fact if -- if you look under cyclotron crew in 1954 you'll see Alvin Weinberg's name. But I doubt if Alvin Weinberg was over there every day working at the cyclotron. Because usually it says, you look at his badge, not used.

MS. MUNN: Not used.

MR. KERR: Not used. But anyway, they did monitor. Everyone had a potential for neutron exposures. If you worked in an area where there were neutrons you had an NTA film in your badge.

DR. MAKHIJANI: That -- That's the statement that I could not find a reference for because it's made in the BR's, in both the neutron BR's. I tried to follow the paper trail so far as I could and I'm sure I didn't follow the whole paper trail.

MR. RUTHERFORD: So you're looking for like

something back in the --

DR. MAKHIJANI: There --

MR. RUTHERFORD: -- like an HP report or something that says all personnel and --

DR. MAKHIJANI: Right. Something like that.

DR. NETON: I have something to that effect here. I can't locate it. I can provide you that.

I think -- I think I just saw this in reference to one of these incidents where some people strayed into a neutron area accidentally. There was an evaluation in '51 and it basically talked about who was, you know, why people were monitored for neutrons, who was monitored. We need to pull that out.

MR. GRIFFON: And this was in case one and three?

DR. MAKHIJANI: Yeah, the same statement was made in case one and three. And the reason I kind of started tracking this is -- is -- well, one reason is that it went back to 1949 when there was very little monitoring going on so I thought it was -- would be rather extraordinary and so I wanted to track down the statement. And then -- But according to what you -- I'm

not sure -- I'm not sure I followed everything you said but the universal monitoring from neutron exposure would have started in '52 when they put the NTA film. And before that they were giving PIC's but there was some monitoring.

MR. KERR: Yeah, they had -- they -- they used PIC's before. A cyclotron crew in '50 and '51 had -- there's -- there's two kind of pocket ionization chambers you can find. One of them typically had boron in it so if you wore it on the body it was sensitive to reflected neutrons. And some of them actually had a, I want to say Teflon. I'm not sure if they had Teflon back in those days but they were some that had a some kind of a plastic in them that would give you a little better response to some fast neutrons. But I think the ones they were using mainly were the boron coated ones. And nevertheless, if you calibrated them on -- on a body and saw a reflected neutrons it's just like the albito (ph) dosimeters today. You don't see (inaudible) neutrons.

DR. NETON: I would also point out I guess that the -- the main source of neutron exposures

were the cyclotrons which is what we're trying to do here. And depending on the outcome of our evaluation what we're doing with cyclotron operators --

MR. GRIFFON: Oh, yeah, a moot point.

DR. NETON: This may or may not be a -- a relevant issue.

DR. MAKHIJANI: This issue might go away.

DR. NETON: This issue would more than likely go away -- would go away if we added cyclotron operators to the SEC.

MR. GRIFFON: Can I ask this one follow-up question?

MR. KERR: The only other known site was the (inaudible). That was another one where people were exposed to neutrons on a regular basis.

MR. GRIFFON: And the -- the criticality accident of '58, was there a special treatment when you'd do DR's for people that were potentially involved in that accident? Was there a --

DR. NETON: You've got the whole report, yeah.

MR. GRIFFON: Yeah, you have the whole report.

DR. NETON: It was published yesterday by...

DR. MAKHIJANI: I saw it -- I downloaded it

this morning.

DR. NETON: We have -- We have George's write-up which is out there for --

MR. KERR: It was just put on -- it was put on the O-drive I guess for anyone that wants to look at it.

DR. NETON: I guess what you're asking though is are dose reconstructors especially cautioned --

MR. GRIFFON: Right.

DR. NETON: -- other than through the fact of their training --

MR. GRIFFON: -- through their training.

DR. NETON: -- and the fact --

MR. GRIFFON: There's probably -- There's probably a listing of who was involved in this and --

MR. KERR: If you'll look --

MR. GRIFFON: -- and then it comes up a --

MR. KERR: If you'll look in the back of that there is a reference that says official use only. And that is the 20 -- the names and the Social Security numbers of the 23 people --

MR. GRIFFON: All right.

MR. KERR: -- that we have data on, and that's

on the O-drive. It's not part of the report.
MR. GRIFFON: And that listing, I've come across that and I think it only has a -- a photon disk doesn't it, or does it -- what --
MR. KERR: It's got both.
MR. GRIFFON: It's got both? Not --
MR. KERR: Neutrons and gammas both.
MR. GRIFFON: Not what I saw so maybe I -- if it's a -- it's a specific case I won't get into that.
DR. NETON: Well, the evaluation report went to great lengths to -- to figure out the neutron dose. I mean they actually irradiated a burro.
MR. GRIFFON: Yeah, I know. I know. I've seen that report, too.
DR. NETON: It's pretty -- It's pretty -- Scientifically it's pretty interesting.
MR. GRIFFON: Oh, yeah. They went to great lengths to recreate it.
DR. NETON: It's not great that it happened.
MR. GRIFFON: Right. Right.
Now, are we going through case by case, Arjun, or can I bring up the case numbers and see if there's -- have questions on those?
DR. NETON: Might be good, yeah.

MR. GRIFFON: I mean can I -- can I go to the case numbers and ask if anybody has questions on this case?

DR. NETON: Sure.

MR. GRIFFON: I am -- case one we just kind of talked about, right?

DR. MAKHIJANI: Yeah. On case one I had one more question.

MR. GRIFFON: Okay.

DR. MAKHIJANI: We're using the neutron photon ratio and I guess for an unmonitored dose they're using the back.

MR. GRIFFON: So we've already discussed the back extrapolations. That covers that I think.

DR. NETON: I hope.

MR. GRIFFON: Yeah. I don't want to go back there.

DR. NETON: It's too late in the day.

DR. MAKHIJANI: I think on -- on number one I don't have any more questions.

MR. GRIFFON: And you what, I may have an old file here but I have one, three, five, six, seven and eight. Do you have other -- you provided different cases than that, didn't you?

DR. NETON: Yeah, there's four. There's one

through eleven and three and two and --

MR. GRIFFON: Should have gotten my other computer.

DR. NETON: Yeah. I left the numbers on there because it got too confusing --

MR. GRIFFON: Yeah.

DR. NETON: -- to renumber them after we started doing numbers. Four, five, six, seven, eight, ten and eleven.

MR. GRIFFON: Okay. So anyway, One -- One -- Three is the next one, right?

DR. NETON: Three is the next one. That's an unmonitored neutron reconstruction.

MR. GRIFFON: Three is similar, right?

DR. NETON: Similar, very similar.

DR. MAKHIJANI: I have the same question.

MR. GRIFFON: Okay. How about four?

DR. NETON: Okay. Four is extremity.

DR. MAKHIJANI: Four -- I'm trying to open up Joyce's file here.

DR. NETON: Four is extremity.

DR. MAKHIJANI: Four. Sorry, yes. I didn't have any questions about four.

MR. GRIFFON: When you get to the recycled uranium one you have questions on that.

DR. MAKHIJANI: I want to open Joyce's file.
MR. GRIFFON: Okay.
DR. NETON: Five is a uranium dose reconstruction with enriched uranium. This is during the period when there was no monitoring data so you're looking at '48 and '49 and in '50.
MR. GRIFFON: So this is starting on the model you just described back in '52?
DR. NETON: Right. So these co-worker intake --
DR. MAKHIJANI: I'm sorry. This takes me a minute.
DR. NETON: That's all right.
MR. GRIFFON: And I want to assume -- I'm talking about -- that one assumes no RU because of the time period, right?
DR. NETON: Correct. It's a straight -- pretty much straight out calculation if you buy the co-worker model.
DR. MAKHIJANI: Are we on five or four?
DR. NETON: Five.
DR. MAKHIJANI: Five? Yes, okay. All right.
MR. GRIFFON: Anything on five, Arjun? Are you still looking?

DR. MAKHIJANI: Yeah, co-worker model from '48 to '49. I think we covered that.

MR. GRIFFON: Yeah.

DR. MAKHIJANI: Right. Right. I -- I just want to review my notes in here.

MR. GRIFFON: Okay. Yes, I had the ten times question. Yeah. No, I don't have any questions.

DR. NETON: It's not on file.

DR. MAKHIJANI: Yeah. And I don't have any questions on five.

MR. GRIFFON: Arjun, is there -- this is a little bit of a side question, more -- more DR related but for my own education. Is there a Y-12 specific like DR guideline for how when you're -- when you're back calculating some real bioassay data how that this matrix would treat LOD values, how they'll treat -- because you can either treat them less than LOD, real, and it has different implications obviously. Is there a guideline?

DR. NETON: I -- I suspect that's in one of the tools or workbooks but I --

MR. GRIFFON: Yeah.

DR. MAKHIJANI: Oh, there is a question on

five.

MR. GRIFFON: I'm sure that's already in that tool.

DR. NETON: I know. I can't give it to you off the top of my head but --

MR. GRIFFON: But those aren't necessarily procedures. They're --

DR. NETON: No.

MR. GRIFFON: -- tools, right?

DR. NETON: Those tools are very -- I was looking at one yesterday for the -- I forget what it was now. Extremely elaborate.

MR. GRIFFON: Yeah. And they tend to be fairly prescriptive.

DR. NETON: Yeah. PIC here, PIC there, PIC --

DR. MAKHIJANI: Joyce had a comment on number five.

DR. NETON: Okay.

DR. MAKHIJANI: She said that chronic intake was considered and the most claimant favorable way would be to calculate acute intake on the first day of work. She got a somewhat higher dose. Not very much higher for the colon but it would make significant difference for other organs. That was her comment.

DR. NETON: That's sort of a generic comment on how we're approaching this whether it's chronic or acute. I mean that -- that may be tied up in this site profile review issue that Joyce has made.

MR. GRIFFON: Probably not an SEC issue.

DR. NETON: She's made that comment in the past.

DR. MAKHIJANI: Yes, I agree.

MR. GRIFFON: That's probably not an SEC issue.

DR. BEHLING: But what -- what would be the basis for you to --

DR. NETON: We acknowledge that this is another point of issue that we need to talk about with you guys but, you know, we need to get the plausibility versus reasonable.

MR. GRIFFON: I agree.

DR. MAKHIJANI: I would agree that it's not an SEC issue. But you have Joyce's comment.

DR. NETON: I understand.

MR. GRIFFON: So are we on six then?

DR. NETON: Yeah, six is very similar in the sense that SC&A was looking for how we would handle all of these compounds and I think the various chemical forms of uranium in the

exposure scenario and -- and the dose reconstructor apply the more claimant favorable chemical form to come up with a dose for -- this was a colon --

I think there may have been a one-year recycled uranium exposure here because it ended in '53 which is a time period that recycled uranium came into play and it included that in the dose reconstruction so this is virtually the same dose reconstruction as number five with the exception that we had to pick the most claimant favorable solubility class.

MR. GRIFFON: And --

DR. NETON: And we had to do the recycled uranium which may get into Arjun's question about what we used for recycled uranium. I'm going to stick to your question.

DR. MAKHIJANI: No. No. Feel free to --

DR. NETON: I'm going to hang myself on my own comments. Well, I -- Let me see. I don't recall honestly what we did here other than highly (inaudible). Attention, recycled uraniums were not included until '53. They were not introduced --

MR. GRIFFON: Until what part of '53?

DR. NETON: Well, until '53 so they added all of '53.

MR. GRIFFON: Okay.

DR. NETON: I don't see here --

MR. RICH: Is there an indication of intake rate?

DR. NETON: Intake rate per day is assigned. It looks like it was assigned right out of the site profile because that -- that looks like the table that -- do you remember that table that was in -- George -- I mean Bryce?

MR. RICH: Yes.

DR. MAKHIJANI: One of the cases I think she said this was not the only argued case, right?

DR. NETON: No. I think the next one is.

DR. MAKHIJANI: The next one is, yes. Case number eight I think was the one where --

DR. NETON: Here it is.

DR. MAKHIJANI: -- she found that one?

DR. NETON: I just want to look at Bryce Rich's table real quick because I think it's got an excerpt out of --

MR. RICH: It has an excerpt out of the TBD.

DR. NETON: Yeah. Where is that, Bryce?

DR. MAKHIJANI: The 110?

DR. NETON: I thought the intakes were listed there but apparently they're not.

DR. MAKHIJANI: Not the intakes.

DR. NETON: No, you're right. There are what to assign.

MR. RICH: It just -- It's just a ratio of the uranium and (inaudible).

DR. NETON: I can't speak to what these numbers were other than they appear to be standard recycled uranium numbers. There's no indication in this dose reconstruction as to why they didn't use the upper limit. I can't speak -- does she make that comment on this example or is there another one?

DR. MAKHIJANI: She made the comment on example number eight.

DR. NETON: Okay.

DR. MAKHIJANI: But the same may be applicable.

DR. NETON: Well, let me look and see what the table -- tables may be. Number eight doesn't even list the tables. That's interesting.

DR. MAKHIJANI: Yeah, I think -- it didn't seem to me that in the case of this worker that a factor of ten reduction should be taken.

DR. NETON: Yeah, it doesn't say that anywhere

in here.

DR. MAKHIJANI: It doesn't say that but that was how her calculation -- when she used the ratio --

DR. NETON: Okay.

DR. MAKHIJANI: -- she got numbers that were higher than hers.

DR. NETON: Let's -- Let's make a note of that and we'll get back to you because there's no indication there's dose reconstruction. That's what they did. I trust Joyce's calculation. We just need to go back and figure out if we indeed did that why we did it and explain it. If not then maybe this -- this was improperly done. I can't -- I can't answer the question now though. It would have been nice if the table had been in here. We'll -- We'll get back to you on that. Number seven was --

DR. MAKHIJANI: Before we move, number six I think she had the same comment. It didn't say so explicitly but that I can see from her comment that there is a kind of implicit idea that there should have been some acute intakes. Application of -- I'll just read what she said instead of trying to interpret it. Application

of chronic intake using MDA with the (inaudible) not claimant favorable. Two sets of data should have been applied to determine the missed dose, 1/1/50 to 5/30/52 and 7/15/52 to 12/31/52. I can -- I can put these in a little file --

DR. NETON: That would be good.

DR. MAKHIJANI: -- and send them to you.

DR. NETON: Just send them to us and then we can react to them.

DR. MAKHIJANI: The -- The ones that -- that -- ones that are outstanding maybe I'll just write a little memo for you.

DR. NETON: I think that would be good because, you know, these are difficult technical things to try to --

DR. MAKHIJANI: Yeah. That's why as I was reading it I realized it's not --

DR. NETON: Yeah, I'm not good enough to do these type of calculations in my head.

DR. MAKHIJANI: I'll just send you.

DR. NETON: I think that would be good. Okay. Then number seven was the -- was the -- was not a dose reconstruction. It was essentially a placeholder talking about the Paducah plant ash

material --

MR. GRIFFON: Right.

DR. NETON: -- and why we didn't believe that was a -- a dose reconstruction or SEC issue anyway. And then ten goes away and eleven, the polonium aspect goes away.

MR. GRIFFON: And there wasn't a nine so --

DR. NETON: Nine I dropped because -- for some reason. I think we had the general --

MR. GRIFFON: Yeah, we were --

DR. NETON: Now, eleven is a polonium and plutonium. Right, right, right. And so, you know, we're talking about the polonium exposure for the cyclotron workers and how we -- we may not be able to do those. The polonium was reconstructed right out of the -- the Delta View data center.

MR. GRIFFON: Plutonium.

DR. NETON: Sorry, plutonium. And so in my mind we took the highest values out of that data set to reconstruct them. And so I think there was some comments made that we didn't yet have a valid co-worker model but this was to serve a plausibility bounding analysis so we said, well, let's pick the highest value we

have of anybody exposed to plutonium in -- in that time period and use it. And that's what we did. Of course, the -- the values came out pretty high. Lung, bone and liver were all well over 90 percent. Colon, interestingly enough, though, was still less than 20 percent. Which is what you expect. I mean these were metabolic organs for plutonium and based on missed dose from any plutonium intake you're going to have them in fairly large -- large doses. And plutonium was exposed in the calutrons, right? That was --

MR. RUTHERFORD: Uh-huh. Yeah.

DR. NETON: They were -- They were separating and enriching the plutonium in some isotope I think. Interestingly enough when I -- I first started graduate school I measured plutonium in autopsy tissues of people who died in the Bowery of New York City and I got always great plutonium 242 as a tracer. It always came from Y-12. Now I know exactly how it was manufactured. I always wanted to say how do you get plutonium 242 pure as an isotope by itself? This is the way. Kind of interesting.

MS. MUNN: See? If you stick around long

enough you learn all kinds of stuff.

DR. WADE: And then you forget most of it.

DR. NETON: And you forget most of it.

MR. RUTHERFORD: You have a brain with the magnitude to store it all, too.

MR. GRIFFON: And that brings us through the cases, right?

DR. NETON: I think so.

DR. MAURO: I just wanted to mention something before we started getting close to the end. Joe Fitzgerald just mentioned to me that he thought this might be an -- since we're finished up early he was planning on getting Brant Ulsh on the line to talk a little bit about Rocky. Is there any interest in staying on about another half hour or so?

MR. GRIFFON: Just to do an update though.

DR. MAURO: Just an update -- just a --

MR. GRIFFON: Not a -- Not a --

DR. MAURO: -- where, you know -- sort of --

MR. GRIFFON: Not a transcribed --

DR. MAURO: Not transcribed.

MR. GRIFFON: What I think we said was an informal call.

DR. MAURO: Right. An informal, non-

transcribed, just to take advantage of the fact that we're all sitting around the table.

DR. NETON: That's fine. So we're going to go off the record at this point?

DR. MAURO: Close it out first.

MR. GRIFFON: Well, first make sure -- we'll close it out first, yeah, but I think -- I think we could do that, yeah.

DR. WADE: One thing I'd like to talk about --

MR. GRIFFON: I don't know how we'd get to the airport right now either with that thunder and lightning.

DR. WADE: I'd like to talk a little bit about what might unfold in our meeting in June. Now, I did allow a significant amount of time for the Y-12 SEC discussion. I guess the -- going into it is there's the possibility that NIOSH could be issuing an addendum to its evaluation report. You know, that addendum could be presented to the Board. And then the working group could present. The Board could decide to vote, to take it off the table and vote. The Board could decide not to. So I guess we need to be thinking about those things as we lead up to -- lead up to the meeting.

DR. MAKHIJANI: Dr. Wade, if an addendum is actually presented I want -- it would be good to have some sense from Wanda and Mark whether we would be doing something with that or whether we just sit back and watch the rest unfold and whether we've kind of done our support work for the Board sufficiently that you don't expect anything more of us other than the one or two cleanup items here. But I think the one on the table 45-B I think is what I'm responsible for.

DR. NETON: Yeah. Those are about the only issues I can --

MR. GRIFFON: Yeah.

DR. NETON: -- think of.

MR. GRIFFON: I mean it partially depends on what your addendum says so --

DR. WADE: But hypothetically speaking the addendum could go to the issues of calutron workers. It could go to the issue of an additional building for -- or buildings for thorium.

MR. GRIFFON: And then maybe issues where we -- we as a worker Board or Board, whether we've discussed it enough with SC&A and there's no,

you know -- or we may get it and say, you know, depending on what we add in, we may.

DR. NETON: Lew's right. If we did --

MR. GRIFFON: Need further assistance, right.

DR. NETON: If we did add cyclotron workers --

MR. GRIFFON: Right.

DR. NETON: -- and the appropriate buildings for thorium in it seems like the technical --

MR. GRIFFON: Right.

DR. NETON: -- issues are, with the exception of the -- the co-worker model and some -- some checking of table 45-B --

MR. GRIFFON: Right.

DR. NETON: -- were pretty much --

MR. GRIFFON: I think we're there.

DR. MAKHIJANI: I think so, I just wanted to make sure.

MR. GRIFFON: I think so, too, but I don't know how you're going to come out yet and neither do you, right? So --

DR. NETON: Yeah. I -- I can't -- I don't want to --

MR. GRIFFON: The Board's unlikely, but I think --

DR. WADE: The Board might have some questions

for DOL at that point. We'll try to get DOL there. So depending on how it plays out it's possible the Board will be voting on the Y-12 SEC petition. That's also a possibility.

MS. MUNN: I'd hope so.

DR. WADE: Well, I personally hope we do.

MS. MUNN: A lot of people hope so.

DR. MAURO: Mark, I presume we're still in a sit and wait for further directions from you and the working group on whether you'd want us to prepare any work product?

MR. GRIFFON: Well, you have the one task that Arjun mentioned --

DR. MAKHIJANI: Okay. Yeah.

MR. GRIFFON: -- with the --

DR. MAKHIJANI: And I'll -- I'll do that. I -- I need some information from NIOSH to be able to do it.

MR. GRIFFON: And then I know you guys will be keeping track of some -- small -- smaller items but -- but --

DR. NETON: I -- I will -- I'm not going to be available next -- starting Saturday through next Friday.

DR. MAKHIJANI: Me, too, so --

DR. NETON: I know time is of the essence --
MR. GRIFFON: Yeah.
DR. NETON: I'm going to try to read email but I'm going to be way far away.
MR. RUTHERFORD: I can help coordinate --
DR. NETON: So make sure anything that goes to me also is cc'd to -- to Bomber so that he can at least be aware of the issue and somehow get the message to me that I may need to do something although I'm sure he's totally capable of --
MR. GRIFFON: Some of these points -- I mean some of these things I saw you taking notes but --
DR. WADE: I got it all down I think.
MR. GRIFFON: Just putting some of these documents on the O-drive, and the faster that can happen obviously.
DR. WADE: But I don't want to hold up for example this 53-B analysis.
MR. GRIFFON: Right.
DR. WADE: I think it's important. The quicker we can get a consensus on this issue the better off we're going to be and if it takes a small phone call among ourselves again, you know,

we're probably willing to do that.

MR. GRIFFON: Yeah. Okay.

DR. WADE: Whatever -- Whatever it takes.

MR. GRIFFON: And I would leave open the -- if we need another informal call in between now and then. I think it's totally appropriate.

DR. WADE: We, of course, can't issue our supplement to you until we -- we issue it in general to the petitioners as well as the Board.

MR. GRIFFON: Right.

DR. WADE: But as soon as that happens we'll notify you that it's available. And I know there's going to be pressure on us if we're going to issue a supplement to get it out sooner than later. There are certainly requirements about federal register notices and just common courtesy that need to be -- be brought into play.

DR. NETON: We have our Board meeting in about three weeks out?

MS. MUNN: Yeah.

DR. WADE: Amazing.

MR. GRIFFON: Okay. I think that we're set to close out. Anybody else have anything else?

Then I think we can adjourn this -- adjourn this work group.

(Whereupon, the working group meeting was adjourned at 3:15 p.m.)

CERTIFICATE OF COURT REPORTER

STATE OF GEORGIA

COUNTY OF FULTON

I, Steven Ray Green, Certified Merit Court Reporter, do hereby certify that I reported the above and foregoing on the day of May 18, 2006; 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 19th day of July, 2006.

_____

STEVEN RAY GREEN, CCR

CERTIFIED MERIT COURT REPORTER

CERTIFICATE NUMBER: A-2102