Centers for Disease Control
National Institute for Occupational Safety and Health
Advisory Board on Radiation and Worker Health
Uranium Refining AWE Work Group
Thursday, January 30, 2020

The Work Group convened telephonically at 9:30 a.m. Eastern Time, Henry Anderson, Chair, presiding.

Present:

Henry Anderson, Member
William Field, Member
David Kotelchuck, Member

Also Present:

Ted Katz, Designated Federal Official
Nancy Adams, Niosh Contractor
David Allen, NIOSH ORAU
Matthew Arno, NIOSH ORAU
Robert Barton, SC&A
Elizabeth Brackett, NIOSH ORAU
Ronald Buchanan, SC&A
Rose Gogliotti, SC&A
Karen Kent, NIOSH ORAU
Matthew Smith, NIOSH ORAU
John Stiver, SC&A
Timothy Taulbee, NIOSH ORAU
Thomas Tomes, NIOSH ORAU

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(9:30 a.m.)

Welcome and Introductions

Mr. Katz: Well, it's 9:30, and I know all my Board Members are here, the three. Let me get the preliminaries rolling here. So welcome, everyone. This is the Advisory Board on Radiation and Worker Health. It's the Uranium Refining AWE, which is Atomic Weapons Employers Work Group.

And our Work Group today is discussing the review, its review of a Site Profile for W.R. Grace in Erwin, Tennessee. So, which has been in progress for a while.

So the three Board Members, Henry Anderson, Dr. Henry Anderson is the Chair, and he's here. And then I have Dr. Bill Field and Dr. Dave Kotelchuck, and they are both here, Members.

We're speaking about a site so we always address conflict of interest where there may be for members of the staff and Board Members. The work groups don't by definition have conflicts or they wouldn't be on the work group. So I don't need to address that for them. But let's go on to then the staff for this Work Group, and please address conflict of interest as we go. So let's begin with NIOSH ORAU staff and see who is here.

(Roll call.)

Mr. Katz: Then let me just remind everyone, except when you're speaking, please mute your phones for everyone else's benefit. If you don't have a mute button, use *6 to mute your phone, *6 to come off of mute. And please no one use hold. Hang up and dial back in if you need to.

Okay, so, Andy, are you back?

Chair Anderson: I am back.

Mr. Katz: Okay, great. So we sort of have arrangements between NIOSH staff, Tom and Ron Buchanan, about presenting, but, Andy, you want to get this rolling?

Chair Anderson: Yeah, basically this is not a review of the SEC, but rather to bring really the determinations and information in the SEC into -- to be consistent where the TBD is consistent with the information that's being used for the SEC.

So there were a number of reviews back and forth, and so we're, I would hope we're pretty near the final conclusion, or at least that's the hope. SC&A and NIOSH have been communicating back and forth. We've had some White Papers and some other responses, so let's begin to go over their -- finally I'm up and running here.

So I think, Ron, which of you I guess --

Mr. Katz: Tom starts for this one.

Chair Anderson: Okay, Tom starts for this one?

Mr. Katz: Yeah, Accuracy and Completeness of Records.

Chair Anderson: Okay.

Mr. Stiver: Hello, this is Stiver. I just got on a little late.

Mr. Katz: Welcome, John.

Dr. Taulbee: Hey, Tom, are you still on?

(Simultaneous speaking.)

Mr. Katz: Might be on mute.

Participant: He's talking to himself.

Mr. Tomes: I was talking away on the mute button. Sorry about that.

Dr. Taulbee: Okay.

Mr. Tomes: Okay. I thought I would start with a little background on the facility just briefly, just to, since we haven't met in quite a while, just to review that.

W.R. Grace is an Atomic Weapons Employer facility from 1958 through 1970. The residual contamination period is from '71 through March 2011. And the listed period is for their work, contract work with the AEC to recover enriched uranium from unirradiated scrap.

In the listing it also mentions that they did work for the civilian nuclear reactor industry. And they did Naval Reactors Program work. The site is currently called Nuclear Fuel Services, which is presently owned by BWXT.

Some of the work they did in the 1960s, besides the AEC contract work, was mixed oxide fuel work for the Shippingport reactor, which involved thorium and U-233 mixed oxide fuels. They also used some U-233 zirconium oxide fuels.

And the SEC from 1958 through 1970, the facility is based on the inability to reconstruct thorium doses. And the thorium doses are not applicable in the residual period since it has not been identified as a weapons related program.

Accuracy and Completeness of Records

Okay, I'll move on to Finding 1. And I'll just read the, briefly the wording of the Finding here on the accuracy and completeness of bioassay records not being addressed.

"The accuracy and completeness of the recorded bioassay data have not previously been addressed by either DOE or NIOSH as part of a routine verification and validation database review. SC&A performed a preliminary scan of the DOE files and found -- for a small sampling of claimants and did not identify any outstanding issues."

"However, a broader and more detailed survey should be conducted that would determine if workers

who should have been monitored because of job title and/or location have recorded bioassay data for the corresponding periods when working in these areas."

During a previous Work Group meeting in August 2015, this was discussed. And at that time NIOSH responded that we have no bioassay records from the site until late 1964. So that's known to be deficient in that period. And we have no bioassay data for thorium, which was the basis for the SEC.

We do have some plutonium bioassay data available for claimants starting in 1967. And so at that time we decided that we needed to do more evaluation to determine if the data we have in later years is sufficient.

And specifically, we determined that we needed to do another evaluation to see if the workers' bioassay data in 1991 and later was sufficient to reconstruct intakes of uranium.

That -- the basis for the 1991 date is the fact that during the residual period the TBD has default intakes from residual contamination calculations, but in 1991 the TBD requires us to reconstruct intakes from workers who were exposed during remediation of burial grounds.

The assumption there is that the material in the burial grounds was commingled with covered and uncovered materials, and there's no means to distinguish between the two.

And we also determined that we needed to do a review to see if the plutonium bioassay data is sufficient for reconstruction of plutonium intakes. This we'll be discussing in more detail with Finding 3 later.

So specifically this paper that we issued in August of 2019 is the results of our review of the bioassay records in NOCTS. That was issued after we reviewed all claimant records.

First, I'd like to provide an overview of what we found out from review of the records. Most of this information comes from our observations out of the database. But we did supplement that with information from the Site Research Database on the site.

Starting in the fourth quarter of 1964, most workers, most claimants in NOCTS had multiple bioassay data for uranium in all years through 1993. 1993 we see a change in the way workers were monitored for uranium.

And this, there was a few workers who did not have bioassay, but they are -- it's just a few, and they were -- and their job titles indicate they were typically office workers and not expected to be routinely exposed.

And there are a few claims for which you would expect the workers to have bioassay data in NOCTS, but they do not. And I'll discuss those here in a few minutes.

For the -- the reason we do not need plutonium bioassay data prior to 1990 -- I mean excuse me, uranium bioassay data prior to 1991. The TBD has, besides the residual contamination intakes, also has default intakes of uranium, so for the operational period. So we have a means to assess intakes of uranium all the way through that period.

I'll go on to the other, the rest of the monitoring program -- excuse me here for a second. I have to get my thoughts together.

As I mentioned the data for 1993 shows that most workers were monitored with multiple records in every year. In 1993 the routine program appeared to have ended. And I believe that was due to a scale-back in work at the site. And there, however, there were -- some work continued.

From -- and then starting in 1994, we see a resumption of a bioassay program. The bioassay

program that was resumed in -- excuse me, 1997, was more selective. Not all workers were monitored. That's apparent from reviewing our claims in NOCTS.

However, we do not really know the criteria they applied to determine whether an operator would get monitored or not. So we found out that approximately 43 percent of the claimants have bioassay data for uranium in that period.

Whereas earlier it was nearly all workers who were exposed with the exception of some office workers who would typically not be exposed. So that was just an overview of the uranium bioassay program.

The plutonium bioassay program, the data starts in 1997. And there are multiple claimants with data starting in 1967 and that data's scattered pretty evenly throughout through 1973 when the plutonium operations ended.

Past 1973 we do not see any routine programs for plutonium bioassay. However, we do see some bioassay, plutonium bioassay for workers who, or at least one worker who was on a routine long-term monitoring program due to an incident earlier.

So basically our Pu bioassay program on a routine basis ended with the end of plutonium production. And plutonium production never resumed at the facility. It was in standby for many years prior to D&D.

We also looked at in vivo monitoring programs. We noticed that many workers have in vivo chest count data starting early 1970s. It was performed by a contractor and used a phoswich detector. NFS constructed a modern facility with germanium detectors, an array of four detectors, I believe it was, that became operational in 1987.

And from 1987 forward most all workers have annual chest counts. And this period would cover the period of the plutonium facility D&D, as well as the period of remediation of the burial grounds.

That system was an on-site system ran by Canberra. And all the claimants have detailed reports of their examinations, which include P search results. Identifies the nuclides they were looking for and the detection limits for the various nuclides, including plutonium, americium, uranium, the nuclides that were of interest in this review.

In addition to the chest count data and the urinalysis data, claims we received has other monitoring data. Starting in 1994, which coincides with the end of the prior uranium bioassay program, all of our claimants have NRC Form 5 dose reports sent to us.

And many of those, quite a few of those have intakes on various radionuclides and units of microcuries listed -- reported to NRC. These are supplemental data that may be useful. But our primary data will be the bioassay and in vivo data.

In addition to that we do have some personal air sampling data for some of the claims. Some of them quite a few. Some of them are sparse. They're just some, there was not a complete database of all workers being tracked. But we do have a number of supplemental data in the files for that in case they are useful for dose reconstructions.

Based on all of that data, we went to look specifically at that data and see if we could verify that it was sufficient for our purposes for dose reconstructions. The most obvious data that was the most, broadest conclusion, the most people was our in vivo data.

We had a number of, most of the workers had uranium bioassay through '93, but there was that period when there was no uranium bioassay. And then the later period there was only partial bioassay data. But we determined that the in vivo data for chest counts was sufficient to reconstruct intakes or bound the intakes of uranium.

And likewise for the plutonium work, the in vivo data has chest count NDAs for americium-241. However, those could be useful, but however, for the workers

on the plutonium D&D project from '90 to '93 they had quarterly fecal/urine bioassay data for plutonium, thorium, and uranium. So there is a substantial amount of monitoring during the D&D period for workers who were exposed.

So based on these reviews, and there are statistics I've provided in the White Paper which I will not go into unless that's requested, but we determined that the data on -- the in vivo data alone is sufficient to determine that we can reconstruct -- that the workers who should have been monitored, were monitored. And it's sufficient for us to reconstruct doses.

In many cases, the other bioassay data will be more sensitive and used. And so we concluded that this finding can be resolved by that review that we have done.

And I would say that this review was done, actually this review of the bioassay records started a few years ago and it was gradually added onto it when more claimants became in the system. So we cut off in May of last year, looking at claims. This is all the claims that we had in NOCTS as of May of last year.

So it's a pretty extensive amount of records, 200 and something records. I don't have the number, 200 and -- I have it here somewhere, 200 and something claimants that we've reviewed in detail. And the files are typically a hundred pages or more long. Some of them are just a few depending on how long the people worked there.

And after we submitted that SC&A reviewed our reports. And they spot checked records to verify our methods, conclusions, and concurred that the -- with our conclusions. They noted that three -- oh, this is one I mentioned earlier. SC&A noted in their report that there were three claimants that records in NOCTS appeared to be lacking.

During that review of all the workers that indicated to us they should have been monitored, we found

three workers who did not have bioassay data in the period under review in NOCTS. And based on looking at those claims, it appeared to us that those workers may not have had complete data sent to us from the NFS.

And one of them, there was an indication that he was monitored but for some reason only a special form was in there, not the actual bioassay data itself.

So we sent a special request back to NFS on those three claims. They responded back to us, two of those claims, they found the files and sent extensive data that was sufficient for estimating intakes for those workers.

On the third one, they failed, they responded back to us saying that the worker was monitored, but they couldn't locate the file. And so I looked at that claim. And this was a claim that we have a few bioassay results.

This is the one where we had a form in the file that showed some bioassay results where they evaluated him. But there was no typical forms that they send to us that had all the results.

And I read the CATI, and the worker indicated that he was monitored. This particular claim did not need further work because he was compensable based on the values in the Technical Basis Document.

And the other two claims that they found data for, they will eventually get reworked once the TBD issues are resolved.

And that's all I really have about Finding 1.

Chair Anderson: Any questions?

Member Field: No.

Member Kotelchuck: No. This is Dave.

Chair Anderson: Okay, let's move on then.

Dr. Buchanan: Okay. This is Ron Buchanan of SC&A.

Mr. Katz: Well, Ron -- Andy, do you want to -- I mean so we have the --

Chair Anderson: So do we want to close it out?

Mr. Katz: Yeah, do we want to, I mean -- Ron, unless there is, is there anything you want to add to Tom's summary?

Dr. Buchanan: Yes, I just wanted to say that we went through this data. And it's pretty length; we can't present it all here. But we went through and verified and spot checked, and verified their conclusions and agree with it. And so we recommend that we -- we're satisfied, would recommend closure.

Mr. Katz: Okay. So then I think --

(Simultaneous speaking.)

Mr. Katz: -- decide if you want to close this or not.

Chair Anderson: Okay. So I think everything's been covered. One of the other Board Members want to make a motion that we close this?

Member Kotelchuck: So moved, Dave.

Member Field: Second.

Chair Anderson: Okay, so we're all set then. Anyone object, speak up, if not, thanks to both groups. I think we went over this pretty thoroughly. There was a lot of information there to discuss.

Okay let's move onto question two.

Dr. Buchanan: Okay. Again this is Ron, and I'm going to present some slides, but I haven't tried this before. So I -- it says here presenting. Now someone can tell me how I get that slide I want loaded on here.

What do I click to share my PowerPoint presentation?

MS. GOGLIOTTI: Ron, you should be able to just

share your screen. And that would show up for everyone.

Dr. Buchanan: Okay. Share screen, I've got that. And then if I click on my presentation, now do you see an SC&A slide?

Dr. Taulbee: Yes, we do.

Dr. Buchanan: Okay.

Participant: Yeah.

Insufficient Uranium Intake Data

Dr. Buchanan: Okay, good. Okay so this is current status, W. R. Grace TBD Finding 2. And so we see that we reviewed the TBD in -- 43 in 2013. And the Finding 2 was insufficient uranium bioassay/intake data. And this kind of dovetails with Finding 1. But at the time we reviewed this it was somewhat two separate issues.

One was V&V and the other was the data that was hinged mainly on, we questioned the use of a 1961 air concentration for the entire operation period. And so we recommend additional investigation of the 1961 data for the '58 to '70 era. And plus there was a residual era after that.

And so there are two periods, '58 to '70, and then residual '71 to 2011. And NIOSH's approach to resolve the intakes for these two periods was discussed during the Work Group on -- during the teleconference in 2015 and accepted.

However, it was a bounding approach, and so the Work Group recommended that NIOSH further break down the intake by worker category because this was a bounding, that would be the maximum. So they wanted to break it down to other, such as office workers and such.

So NIOSH issued a paper in July of 2019, and they called it NIOSH Resolution of W. R. Grace Site Profile Findings 2 and 7. So we'll see this again when Tom

covers Finding 7. They incorporated their White Paper -- incorporated both Findings.

And the White Paper provided for inhalation and ingestion intakes by the worker's category, such as operators, office workers, or laborers and such. And so we see that Table 1 of their White Paper covers the first period. And Table 2 covers the residual period form '71 to '11.

So SC&A reviewed their White Paper and issued an evaluation report November 2019. We analyzed the derivation of NIOSH's intake values in conjunction with TBD-6000 of 2011 to determine if it was based on the right assumptions.

And we evaluated the first period, '58 to '70. And we concurred with the values derived, which is in Table 1, Page 6 of the White Paper, which would be -- was the final results of that analysis. And we checked those calculations and assumptions and agree with that.

And the residual period '71 to 2011, again we analyzed this data in conjunction with TBD-6000 and agree with the values listed in Table 2, Page 7 and 8 of the White Paper for the residual period. And in conclusion, SC&A found that NIOSH sufficiently addressed Finding 2 concerning uranium bioassay and intake data.

And we had no further issues concerning this Finding. So we would recommend that this would be closed since it's been satisfactorily addressed. Open for discussion and questions.

Chair Anderson: Any comments from NIOSH or the Board Members?

Mr. Tomes: This is Tom. I have no additional comments. I believe he covered our position on that fairly well.

Chair Anderson: That's what I thought too. So, Board Members, so everyone comfortable closing this out?

Member Field: Yes, I think that's fine. Make a motion to close, Bill.

Chair Anderson: Okay. Need a second? I'll second it, and I think we're all in agreement, so officially we'll close this, consider it completed.

Okay. So now let's move on to -- let's see what do we have?

Mr. Katz: Plutonium. This is Tom Tomes again.

Chair Anderson: Yeah.

Plutonium Doses Are Not Consistent With the SEC

Mr. Tomes: All right, Finding 3, this is a White Paper issued for Finding 3 that is fairly detailed. It's a 41 page paper, and it has our coworker analysis in it. This was to address assigning --

(Simultaneous speaking.)

COURT REPORTER: Sorry to interrupt, this is the Court Reporter. Excuse me, who is speaking right now?

Mr. Tomes: Yes, this is Tom Tomes, speaking.

COURT REPORTER: Thank you very much.

Chair Anderson: Sure, Charles. Okay, go ahead.

Mr. Tomes: Finding 3 was the plutonium doses during either period are not consistent with the SEC.

A little background on some more information on this particular finding. It was discussed in the previous Work Group meeting. The TBD, our Technical Basis Document has instructions to assign plutonium based on bioassay if they are available in the AWE operational period from 1958 through 1970. And it doesn't -- and it did not consider that plutonium is covered in the residual period.

So as I mentioned earlier, the plutonium was

commercial fuel projects. And it was questioned whether they should be covered or not. We did an extensive review of the information and, with counsel, determined that we should cover those in those in the -- the plutonium exposures in the operational and residual period. So that was what we discussed in the previous Work Group meeting.

So to implement that we needed to do additional research. For all of these findings, actually we did additional data capture efforts. ORAU gathered quite a bit of data. And we reviewed it, and we went back and got more data. And we exhausted the efforts to be sure we had all available information that we could use.

And so this paper actually summarizes information on the plutonium work they did. There was a table in there, Table 1, that -- or 2, that lists the projects. There's a timeline of plutonium works provided in Table 1. Then there's projects listed in Table 2.

And then there's a summary of the plutonium work in Table 3. So this gave us a basis to assume that plutonium work was -- went from 1965 through the end of it in -- early 1973 when it ended.

So we know we have bioassay data for some workers in that period. There was really no way to determine that we had sufficient bioassay data for all workers. So we developed a coworker database to estimate intakes for unmonitored workers, or workers whose data may not be sufficient.

We know that the period like prior to 1967 it's insufficient because there is no data. So we developed this database. What we did, we went through the NOCTS, looked at the 200 and something claims we had. We found enough bioassay data to do intakes for each year from 1967 through '73.

And that data was analyzed according to our established methods for analyzing coworker intakes. And we presented intake rates in the table in the White Paper and -- for both Type M and Type S

materials. Type Super S will be addressed according to OTIB-0049 instructions.

So our intake rates provide through 1967 through 1973. We extend that intake rate back to the start of operations in '65. Due to no other means to assess data, we thought that was our best available data.

And that was one of the observations on this paper that we presented from -- by SC&A. SC&A, one of the observations they noted was that there was no strong support in our White Paper for doing that.

So I went back and just to try to describe what information we have on that. If you look at the projects that were going on at the site -- the timeline. The timeline shows that the, on Table 1 of our White Paper, shows the timeline of '64 to '65; '64 is not known to be an area -- that was just the timeline for when they were constructing facilities.

The first known Pu project was in 1965. And we don't really have much details on that. It's identified by NFS as a project that involved 16 kilograms of plutonium for a DuPont/Savannah River contract for MOX fuel rods, the mixed oxide fuel rods.

We don't really know any other information about that particular contract, and we don't have monitoring records. Our White Paper used the nominal start date for intakes of 1965 because we couldn't confirm the actual start date.

There is one other piece of information for 1965 that possibly is an indication of when it started precisely. There's a January 1966 annual report to Congress, AEC reported that a contract was signed with W.R. Grace in Erwin to recover 16.5 kilograms from scrap being stored at Hanford.

This is in November of 1965. It sounds like the same project that NFS lists for DuPont/Savannah River. But we really have no details of the exact start date. So our TBD just nominally gives a 1965 start period without a precise day or month.

So we determined that the use of 1967 default intakes from our coworker study, and plotted backwards to cover this period. There's another reason to believe that it may be sufficient to bound that is the amount of material thought processed at that time. Both the early project and the work being done starting in 1967 were manufacturing MOX fuel rods.

The early project in '65 to '66 only involved 16 kilograms of plutonium. The work from '67 through '71 involved 746 kilograms. Nearly an order of magnitude higher for throughput if you were to calculate this. So we just assumed that this likely is a bounding. We have no way to give an accurate accounting of '65 to '66 intakes because we have no bioassay data.

We believe this was a reasonable method to extend it backwards and favorable, because we're using basically the highest intake rate we calculated from bioassay data to do so.

That was my response to Observation 1 on that data that I just mentioned being extended back. Because we believe that that is, given the lack of any other data, that that seems to be a reasonable approach.

And Dr. Buchanan noted that this lack of data is somewhat mitigated by the fact that this is also an SEC period for thorium -- an inability to reconstruct intakes of thorium. Now that gets us through the period of being able to reconstruct intakes of plutonium through 1973.

Starting in 1974 we have no bioassay data other than long-term monitoring. But the facility was idle for many years awaiting D&D. The D&D was delayed many years partially while they were looking for a place to dispose of the waste.

And they instituted a continuous air sampling program in the facility in the idle period. But the data from that is not available in 1974. The data for that starts in 1976. So we have a period there where we

have no data.

So what we did, we took the air sampling data from the idle period, which ran from '74 through 1990. And we estimated intake rates from the ambient air in the facility for all those years based on a favorable 95th percentile intake rate. And we've applied that to each year from '75 through '90, when the facility started D&D.

And as I mentioned previously on the findings, starting in 1990 when they did D&D, we have bioassay data for the workers involved with that.

So we have this period from after the bioassay ended and before the air sampling started, that we have no data. So we looked at the intake rates. The intake rates based on the bioassay data was higher than the air sampling data taken a couple years later, which would be expected.

So we basically just did an exponential decrease of the intake rates from the bioassay data during operations down to the years when the air sampling data is available. And we just did the annual intakes based on that, which is basically just dropping the intakes every year until the two data points meet.

And we did that for both Type M material and Type S material because the intake rates are different depending on the solubility types used in the urinalysis. And so therefore we come up with an intake rate for the facility from 1967 through the end.

What we've done for the end, we've extended the air sample data at the end also for ambient intake rates, although we have workers who were exposed during D&D, we also have monitoring data for the air sample locations.

So that's also published in the White Paper for incidental entries for people who were not necessarily working on the plutonium project, we do have air sample data just for the ambient air in the facility. But that -- but like I said, plutonium workers

themselves will be done -- intakes based on bioassay data.

And we concluded that the combination of the data provided in this White Paper and the bioassay data, that we can reconstruct the intakes of plutonium. And SC&A did have some comments on the paper. One of them I previously discussed, which was the -- they had no findings but they had some observations.

One of them was the -- give me just one second here. Well, maybe I should hand this over to Dr. Buchanan and let him mention his issues he may have had with the paper, and see if I've represented their faults on it correctly.

Dr. Buchanan: Okay. This is Ron Buchanan with SC&A. And thank you, Tom, for that good, detailed presentation. We went over this White Paper fairly thoroughly and evaluated it on assumptions and data and did some calculations and such. And we also evaluated it when they developed the coworker data in light of NIOSH's 2015 guidance for developing coworker.

And we give a summary of that in our report there and believe that they did follow its guideline. And so we had no problems with the White Paper itself. We did have a couple of comments, observations.

One Tom had already talked about was that extending it back to '65. And our main question there, had they looked at that? And apparently they had looked at it and had, I think, gathered what data was available for that period, '65/'66. And there does not seem to be any indication that there was greater use of material during that time than later times. So we have no further questions or problems with Observation 1.

We did have Observation 2 and 3. And that was more questions than anything. Observation 2, Tom, was you used the 30th percent and 3.9 percent factor is somewhat unclear. Had you had time to look at that?

What it looked like is maybe the results of, in the tables from the plots, were multiplied by a factor of 250 divided by 365 when they was put into the table, when they was taken from the plots to the table to compensate for the number of work days in a year. Is that true, or was that the explanation for those difference in values?

Mr. Tomes: Yes, that was, well a minute ago when you started speaking, I had misplaced my notes for this as -- yes, you're correct, exactly correct. When that information is incorporated into the TBD, we will make sure that is apparent. And note the units that's counted -- that units.

Dr. Buchanan: Okay, so that addresses Observation 2. Observation 3 was we noticed that it's kind of in the wording, in Nuclear Fuel Services' 1989 PDF page 170 states that bioassay frequencies, at a minimum, will be quarterly for urine/fecal samples and annually for in vivo lung counting.

It's not clear, because we did not find many in vivo lung counting during this period. It's not clear whether it required both, or. I know we found quite a few urinalysis. Do you know if this was meant to be "or" or "and" in their requirement on that?

Mr. Tomes: I don't know. I looked at the wording. And I think it's probably subject to interpretation.

However, I can, I did look at the records that we have, that we get from the site, and it looked like to me that, of the ones I saw, I can identify plutonium workers because they have quarterly fecal and urine results in -- from 1990 through 1993, which is was the exact period of the D&D project. And they also have lung counts. So it looked like to me, we have no problem as I mentioned in the previous finding -- we have no problem reconstructing -- have sufficient data for those workers. But it looked like to me that they did quarterly fecal, urine, and chest counts, all three.

Dr. Buchanan: They did annual chest scans, okay.

Mr. Tomes: Yes, yes.

Dr. Buchanan: Okay. Well, I just wanted to clarify that. That really wasn't a real important point. All those we assumed were correct, but we just wanted to verify that. So as far as SC&A was concerned, we had no further issues with Finding Number 3 and would recommend closure on that.

Chair Anderson: So, Board Members, there's a lot of documents in this particular file. And are we --

(Simultaneous speaking.)

Chair Anderson: -- especially understandable that, especially on the coworker model that that's been covered adequately to be consistent with the guidelines?

I think you've reviewed it. And I would agree that it follows the guidelines, but I just want to be sure that in the documentation all of this can be found. I tried to go through it, but there's so many different documents it's a bit hard. But any questions from the other Board Members?

Member Kotelchuck: We're discussing Finding 2, right?

Chair Anderson: Yeah.

Member Kotelchuck: Yeah, right. I had a little question if we can go previously, on that White Paper, the NIOSH White Paper on that Table 1 on Page 6. The operational period uranium intake rates. I --

Mr. Katz: Wait, wait. Dave, we're discussing Finding 3.

Chair Anderson: Three, we just --

(Simultaneous speaking.)

Member Kotelchuck: That's what I'm wondering. That's, I don't -- okay, I don't. And that's --

Mr. Katz: Plutonium.

Member Kotelchuck: I'm having problems here, but I don't see anything -- we have Findings 2 and 4 that Ron's -- okay. That's, I've been wandering, forget about it. But where is the -- I'm trying to find where Finding 3 is in our --

Chair Anderson: It wasn't a PowerPoint.

Member Kotelchuck: Right.

Dr. Buchanan: It's Number 4 on --

Mr. Katz: Well, so, Dave, Finding 3 is addressed in the reports from -- the NIOSH/ORAU report from March and the SC&A report from August.

Member Kotelchuck: Okay, all right. I --

Member Field: I'm glad you're having the same problem I am.

Member Kotelchuck: There is no -- and I -- in the agenda there -- it's items 1, 2, 3, 4. The findings numbers are different. And I --

Mr. Katz: Yes, yes the numbers in the agenda are just item numbers, not the finding numbers.

Member Kotelchuck: And I thought I was in sync and I was trying to find -- okay.

Mr. Katz: Yeah, I'm sorry. That's my fault. They're just the item numbers and not the finding numbers in the agenda.

Member Kotelchuck: I was out of sync, and I'm sorry, and that's okay. And I was looking around trying to --

Mr. Katz: Yeah.

Member Kotelchuck: -- figure out what was going on. So we are on Finding 3.

Mr. Katz: Correct, which is plutonium doses.

Member Kotelchuck: Yeah, yeah.

Mr. Katz: Yeah.

Member Kotelchuck: Okay. Well.

Chair Anderson: But I think all the documentation we need is there. It's just --

Mr. Katz: Yeah.

Chair Anderson: -- is it adequately organized so you can find what it'll be, whether there's going to be a lot of references when you revise the TBD and pull it all --

Mr. Katz: So, yeah. So, Andy, I think once the TBD gets updated, it'll all be easy to follow. I think it's the -- the White Paper process of course is a little bit of cats running around all over the place. But --

(Simultaneous speaking.)

Chair Anderson: That's really -- I don't have any objections or problems, as neither -- as SC&A didn't either.

Mr. Katz: Yes, right.

Chair Anderson: I'm only wanting to be sure that when the TBD gets redone if somebody, especially in the public side, wants to go in and has a question like this, that it in fact all gets incorporated and cross-referenced in the TBD so that it's easier to find and --

Mr. Katz: Yeah.

Chair Anderson: -- our own process here, once it's dragged out over quite a period of time. And I think we have it all and getting up to speed here has been --

Mr. Katz: Yeah.

Chair Anderson: -- been a helpful exercise, so I'm --

Mr. Katz: Well, yeah, it is, I mean there's no question it's, you know, for the public to go back and reconstruct the discussions is always a challenge. We go through that when we have to brief the Secretary on SECs. So --

Chair Anderson: Yeah.

Mr. Katz: -- we have to reconstruct the whole storyline, which is a lot of work. But the TBD should be pretty, you know, will be laid out in a straightforward fashion, I think. So they should be okay with what is actual for now, what the procedure is.

Chair Anderson: I think it was helpful to have SC&A go through and look at the coworker criteria because most of this began before we had the coworker criteria.

Mr. Katz: Yeah.

Chair Anderson: Just need to be sure whenever we now sign off on a coworker approach to be used that in fact it is consistent with the criteria. And I think SC&A did that pretty well, so.

Mr. Katz: Yeah, and now this is, I guess, this is actually the first coworker model that we've said so with. So that's good.

Mr. Tomes: Dr. Anderson, this is Tom. Maybe I'd like to add one little comment on the organization being able to -- for the TBD, being able to understand. For the White Paper it is -- there is a lot of information in that. And we tried to -- and some of that can't be made simple just because it is detailed.

So but what we did in the White Paper, we have the -- basically a -- a basic section of the paper where we summarize what -- the intake rates and provide intake tables. And then the more details, that gets really heavy into the details and the statistics and everything, are actually in attachments.

You know, we could do that in the TBD to -- that was done just to make it easier to understand what we're doing. And then if you need more details, we go to the attachments to see the details, if that helps any.

Chair Anderson: Yeah, no I'm sure it'll get done. I just want to raise the issue so that we be careful that we don't close things out and then it remains shuffle through the papers for what you're looking for.

But, and again as a coworker model, I'm not sure it's comparable to the other coworker models that have been developed. It's basically looking for -- I'm not sure we have coworker data involved more than trying to extend where we don't have data. And then utilize earlier data in the same population that -- so it may be the first one we've signed off on. But I don't think it's as complicated a coworker model. We're not really looking at going to other companies and things like that at least on this component.

Mr. Katz: Yeah, there are a lot of flavors of coworker models, but yeah.

Chair Anderson: Yeah, I mean it's, yeah, I mean it's a broad definition of a coworker model --

Mr. Katz: Yeah.

Chair Anderson: -- I guess. So any other comment, Board Members?

Member Field: No comment. I agree there were some tracking issues, but I think all the information is there. It's just being able to describe where it's at.

Chair Anderson: Yeah.

Mr. Katz: Do we have a motion?

Chair Anderson: Yeah, somebody or someone want to make a motion?

Member Field: I'll make a motion.

Chair Anderson: -- to close it. Fine.

Member Kotelchuck: Right, this is one. Look I got out of sync here. And I really -- I'd like to abstain on this vote because I was not following properly. And I, for whatever reason, I have no problem with the other colleagues, you know, responding and were following, but I wasn't.

And I just don't think it's best for me to vote on something that I read briefly, but --

Mr. Katz: Dave, that's fine because this will come again to the full Board at some point for the Board to close out the procedure too.

Member Kotelchuck: Good, okay.

Mr. Katz: But you can go ahead and close it as a Work Group. And, Dave, you can vote on it --

(Simultaneous speaking.)

Mr. Katz: -- at the full Board.

Member Kotelchuck: -- and I will abstain, and that's fine.

Mr. Katz: That's fine.

Member Kotelchuck: And I'm sure, I trust --

Mr. Katz: It's not a problem, not a problem.

Member Kotelchuck: Okay, sorry.

Chair Anderson: So we're going to close it, and clearly when we close it, the understanding is we're not expecting any more work to be done. And we don't have any --

Member Kotelchuck: Right, right.

Mr. Katz: Right.

Chair Anderson: You know, so that's different than final sign-off by the full Board. But I -- I'm beginning to worry about how we're going to present all of this in a clear and concise manner to the full Board --

Mr. Katz: And we've done these with other Site Profile reviews. It's manageable actually because we don't go into all this detail with the full Board. But they have access to the records; if any of them want to plunge into the gory details, they can.

Chair Anderson: Okay, so we're closing out three. Let's move on to the lack of neutron dose assessment.

Mr. Katz: Correct. And that is Ron Buchanan.

Ms. Gogliotti: For the record, can we --

Chair Anderson: SC&A is --

Ms. Gogliotti: -- those observations are also closed, associated with that?

Mr. Katz: Yeah, yeah.

Chair Anderson: Yeah.

Mr. Katz: They're -- it's all closed. Because they were only I think -- the Finding's closed, right, and the observations are closed, three. Thank you. Thank you, Rose.

Lack of Neutron Dose Assignment

Dr. Buchanan: Okay. We ready for Finding 4, lack of neutron dose assignment?

Chair Anderson: Yeah.

Dr. Buchanan: Okay, says I'm presenting, so I'll try to see if my --

Chair Anderson: Try to get your PowerPoint loaded up.

Dr. Buchanan: Right, okay, is that screen --

Chair Anderson: There you go, we got her.

Dr. Buchanan: Okay. This is the current status of Finding 4.

Okay, and this was concerned with lack of neutron dose assignment. When we reviewed the TBD in 2013 the question of lack of neutron dose assignment, and we did not locate any recorded neutron doses in the claimant files that we'd reviewed.

So we suggested further investigation into potential neutron exposure and methods to assign appropriate neutron doses was needed. And the response to our concerns was that NIOSH agreed that further investigation was necessary.

And this Finding was discussed during the Work Group on August in 2015. And NIOSH presented a proposed method. And we agreed to that proposed method and would evaluate it when it became available.

Now NIOSH issued a White Paper in May of 2017 entitled Neutron Dose Assignment for Plutonium Fuel at W.R. Grace. In that White Paper NIOSH had analyzed N-P ratios at other DOE sites that processed plutonium in a similar manner and a similar composition as we used at W.R. Grace.

And so we evaluated this paper and issued an evaluation report in September of 2017. And for that evaluation we reviewed the N-P ratios used at other DOE sites that processed plutonium and found them to range from 0.2 to 1.1 for non-glovebox workers, and from 1 to 1.7 for glovebox workers.

We also reviewed Nuclear Materials and Equipment Corporation, NUMEC, TBD in 2017 and concurred at that time with the N-P ratio of 0.34 for non-glovebox workers and 1.0 for glovebox workers. And this seemed to be similar physical exposure that could be similar to W.R. Grace. So we concurred with their selection of those values.

And we still had finding -- remaining concerns though with this. Although we agree on the N-P ratios, we found that it was difficult at W.R. Grace to determine who may be exposed. And NIOSH recommended in the White Paper, Page 6, in conclusion that we use

the guidelines from, I think it was Savannah River Site.

But we, the problem with that was that they depend upon neutron measurement ratios before and after the period. And at W.R. Grace there wasn't any significant neutron monitoring. So we can't hardly look at previous or post period N-P ratios to determine -- or neutron monitoring to determine that that person should have been monitored during the non-monitored period.

And we already decided on the N-P ratios. And also at the recommendation, they used the 17 keV film badge data to look at possible plutonium exposure. However, W.R. Grace Finding 5, we went into quite a bit of detail back in previous years to determine their dosimetry program. And talked to Landauer and some of the dosimetrists there and such.

Could not find any detailed information on W.R. Grace dosimetry that would give us an indication of the lower energy exposures. So we can't use that as criteria for selecting the people that should be assigned neutron dose using the N-P ratio.

So I guess -- and our conclusion was unless there's consistent DOE records for W.R. Grace workers indicating that they did work or did not work in the plutonium facility -- it's a little different at W.R. Grace in that there was only two buildings, Building 234 and Building 110 that actually processed plutonium. And that was an active area, then an inactive area, standby, and then a decommissioning area -- era.

And so it would be difficult to determine which ones were in and out of there perhaps and were exposed and not exposed. So almost anybody that signed in and signed out would almost have to be assigned neutron dose.

And so we -- our conclusion is that we need to know how -- when you're going to assign neutron dose to the plutonium workers, how you're going to know that. And also the storage phase in '73 to '87 and the

decommissioning phase from '87 to '94 was not covered.

And also in TBD 43, Page 28, they talked about neutron exposure from uranium; however that wasn't covered in the White Paper and is yet to be addressed. So that is our concerns at this point, those three points.

And so I'll turn it over to Tom to see if he has any response at this time on those concerns.

Mr. Tomes: Thank you, Ron. This is Tom. We -- at the time of the neutron paper that was issued in 2017 we had another document under development that was not issued yet that gives us neutron dose ratios from highly enriched uranium at the facilities and the gaseous diffusion plants.

And we believe that would be sufficient to provide a ratio for highly enriched uranium for the AEC contract work from '58 through '70. So, we do believe we have a method to assign neutron dose for those workers.

We also looked at the ratios and job descriptions of how we may apply the neutron-photon ratios to plutonium work. We have a 0.34 ratio for non-glove box workers and a 1.0 ratio for glove box workers.

We -- our internal dose evaluation puts workers into four categories, whether it be operator, laborer, supervisor, or clerk.

And we believe that the operator should be assigned a glove box ratio because they would be the ones with material, handling material that was in the glove box.

We believe the other workers should be assigned the lower ratio, the laborers, supervisors, and clerks. They would not be expected to be handling plutonium in the glove boxes. So we believe that we can split them up based on job categories.

The job categories from the records I've reviewed in

NOCTS indicates that we have a pretty good handle on job categories. They don't necessarily match the exact descriptions of the four categories in TBD-6000 that we modeled that after.

However, the operators are called operators, but there are numerous categories. So we select, for example, we have office workers and other people who have various different titles which would fall in the clerk category that we would not expect to receive neutron dose.

But then we have other workers that we would default to assigning the dose if we don't have information of where they worked. And so that would be our proposed method of how we determine who gets assigned which ratio rather than using the Savannah River method that was mentioned.

Dr. Buchanan: Okay.

Mr. Tomes: And the other --

Dr. Buchanan: Yes, go ahead.

Mr. Tomes: Ron, can you put your slide back to the other? There we go. In regard to your first bullet there on that slide that said there was no significant neutron monitoring before, during, or after, I just wanted to clarify one thing that we have found in going through all these records recently.

We've identified plutonium workers in the D&D period and I believe they were kind of obvious. When they modified the decommissioning plan they submitted to NRC that we mentioned earlier about requiring quarterly monitoring.

We went back and looked at some of those claimants and all the ones I looked at who had that quarterly monitoring, they were working on a plutonium project. A number of those people have neutron monitoring data from 1990 to 1993.

I only saw one that actually had a recorded positive

result which was very low, 20 millirem. But we do have some neutron monitoring data that is available in the D&D period. I have seen no records -- I agree with the rest of it, there's no records prior to that that I've seen in the personal monitoring records.

But we do have some dosimetry data used in the D&D period. And I would expect based on the requirements they had that the workers who were potentially exposed to neutrons in that period have neutron data, is the indication I got from looking at the records.

It's different from the entire workforce because when I look at all the bioassay data and identifying plutonium workers, the sites in general do not have that quarterly bioassay data that the workers in the D&D did. There was three different programs going on there during that period.

I believe -- I may want to turn this over to Matt Smith from ORAU. He may have some questions on the clarification of -- I think we understand your points, Ron. But he may have -- maybe you can tell us what -- I think he wanted to clarify what issues you still have that may not be addressed by what I was just discussing with our response to that.

Mr. Smith: This is Matt Smith with the ORAU team. And I think Ron clarified it as he went through the slides. I believe if we back up to, I believe it was slide number 6.

In the slide we were wondering if it was dovetailing and agreeing with the memo from 2017 which affirmed the N-P ratio choices. And verbally you said that as you went through the slide presentation. It's just that as we read the slide presentation we didn't get that same affirmation.

But it states that in the memo and you repeated it verbally during this presentation. So it sounds like we're okay with 0.34 and -- for the general workers and a value of 1 for glove box workers, correct?

Dr. Buchanan: Yes, that's correct.

Mr. Smith: Okay. And the only other thing I'd add is information that came from Mutty Sharfi just for everyone on the record. It's SRDB-150887. And page 15 is where the indication is given that during the D&D period that dosimetry capable of gamma and neutron measurements was required.

Dr. Buchanan: That was 150887?

Mr. Smith: Yes, 150887. And it's PDF page 15. And again thanks to Mutty for referring us to that. That's all I have right now.

Dr. Buchanan: Okay, so what is the next step? Are you going to reissue a neutron White Paper or are you just going to incorporate this in the TBD changes, or what's the next step at this point?

Mr. Tomes: This is Tom. Well, I believe I'd have to ask the Work Group that question. If we can -- if there's a transcript of this record we can resolve this based on, when we write the TBD according to what we determine here during the meeting if all the issues were satisfactorily resolved.

If not we can follow up and issue another White Paper. We can do either one.

Dr. Buchanan: SC&A can review another White Paper, or of course we'll review the TBD when it's issued. So whatever the Work Group would prefer.

Mr. Katz: Ron, it's probably helpful to the Work Group if they just hear your reaction to the discussion that Tom just gave.

Dr. Buchanan: Okay. Well, as far as SC&A's concerned, like I stated, we agree with the N-P ratio. Our main concern was what workers do you apply this to since you didn't have some information that would have been handy.

And it appears that they were applied to everyone that was potentially exposed in the plutonium facility.

So, I would like -- I agree with that approach. Just like previously, I agree with their approach. I think it's claimant-favorable.

We would -- I'd like to see it in writing before I sign off on it. Either in the TBD or in a White Paper.

Dr. Taulbee: This is Tim. Is the best thing to do if other Board Members agree to put it in abeyance?

Mr. Katz: That's the normal -- this is pretty straightforward. It's not really complex in a technical sense. So that would be -- abeyance would be the terminology, right. It's pretty much it.

Or, actually I think close it, either. I mean abeyance we normally do when there's like a lot of details to sort out, but we agree in principle.

In this case sort of the answer is pretty well explained and it's just a matter of wanting to see it in print. But agreeing with it so the Work Group can close it, they can put it in abeyance, but either is fine in a sort of rather simple situation like this. It's up to the Work Group.

Chair Anderson: Other Work Group Members? It seems to me the only actual measurement data we have is from '90 to '93 for neutron monitoring.

Member Kotelchuck: I think that's correct, yes.

Chair Anderson: And so for the other periods we're using the alternative data and the ratio to assign a value.

Mr. Tomes: This is Tom. That is our understanding of how we would do it.

Chair Anderson: My question is when you look -- when you don't have much data, you said there was only one positive monitoring value from '90 to '93, does that fit with your application of the ratio?

(Simultaneous speaking.)

Chair Anderson: -- what you expect based on the decay curve and everything that the values between '73 and '87, during the standby, and then the earlier part of the decontamination phase. There are assigned values there that are consistent with what was then observed in '90 to '93?

Mr. Tomes: In '90 to '93 they basically were not removing material or handling material. There would only be any holed-up material they may have encountered. So they were basically just decontaminating and removing glove boxes in the facility.

So we wouldn't expect to see a lot of neutron dose. And I don't have -- I can't say for sure that we only had one positive result because this was just a partial look at the data. I haven't examined every single record.

But I have seen enough of them to know that typically there was no recorded neutron dose except for that one case I mentioned. And from my discussions with other people this would be expected that we would not see very much neutron dose.

I don't know if other people would agree with that, but that is what I have -- my understanding.

Dr. Buchanan: Yes. This is Ron. I think you have two different situations. So in one place you're handling plutonium. In another place you're just removing equipment that had plutonium in it.

So, I don't think we can correlate between the earlier period and the '90 to '93 period. I wouldn't expect there to be a lot of correlation there.

Chair Anderson: Okay. The concern I have is in fact our understanding of this facility, that it's quite typical for the other data we're using.

So that it wouldn't be -- the concern would be is there some unusually -- is this an outlier, unusually high potential here, or is it really quite typical and

therefore we really don't have any monitoring data. So we're applying the ratio that we're trying to make that claimant-favorable and things like that.

So that's my only concern. How comfortable are we that we are adequately characterizing this based on this other information.

I would say it's almost like we don't really have any ground-truthing data to suggest yes, it fits with what we -- how we will be using this. Probably not making myself terribly clear here, but that's the only issue I'm concerned about.

You're left with what you have to work with, and this seems to be everyone is in -- I assume everyone is in agreement that this seems to be a reasonable approach to it.

But the reasonableness of how you manage assigning a dose is that it is consistent with the type of activity here, and that it wasn't particularly unusual.

Mr. Smith: This is Matt Smith from ORAU team. I'll -- again, I'm addressing the selection of the N-P ratios that SC&A has agreed with.

We focused in on another facility called NUMEC because they were doing this same plutonium fuel fabrication work. And in addition to that the values came from an analysis of worker dosimetry.

So rather than survey values, this was really based on worker-specific data, in fact, the workers that were assigned to do the plutonium fuel fabrication process.

So, again we feel we found a process at another facility that closely aligns with what was going on here at W.R. Grace.

Chair Anderson: And SC&A agrees with that? I don't know, I haven't looked at anything from any other facility, that's all. I just want to be confident that when we don't have data at all, that we're hunting

around here.

Mr. Katz: So the only thing I could add, Andy, is that this is something we've done at many facilities with this -- using these ratios, finding analogous operation at another facility and applying the ratio accordingly. So it's not uncommon at all in this situation.

Chair Anderson: Right.

Member Kotelchuck: This is Dave. I mean, I feel comfortable that NIOSH and SC&A agree on the N-P ratios, and I see where they're using the NUMEC data.

So, I'm comfortable with the way it's being handled. I still don't know administratively how we -- what we should do.

It doesn't seem to me -- I don't think it needs to come back to our committee, but -- and I don't have questions to say answer this question and come back to us.

So, it is clear that it's, you know -- I'm comfortable with the procedure. I don't know. Ted, you mentioned before in abeyance would be a proper way of doing it.

Mr. Katz: Well, so, yes. So, I mean, abeyance or closing the finding. What I was saying about the difference between abeyance and closing the finding is normally we put things in abeyance when there's sort of technical details to work out. We agree in principle, but there are technical details that we really want to see how those get worked out before we finally close it.

In this case there's really no sophisticated details to work out. It's all sort of settled matter.

But I think the Work Group can close it. And of course when you present it to the Board, the Board can take another -- ask questions again about is this application here analogous with the site it's being

compared to.

And it sounds like nobody seems to have any questions about whether it is indeed analogous. And like I said, the Board has approved many of these applications, the ratio from a similar operation at another site. This is not uncommon.

Member Kotelchuck: So Henry, I feel comfortable closing it.

Chair Anderson: Okay, well, that's what I wanted to hear as well. I think I am as well. It's really finalizing the write-up as it gets into the TBD. But I think we work through and discuss back and forth how it is so we've kind of got it verbally, and now it's just a matter of finalizing that.

So, other comments?

Member Field: Yes, this is Bill. I'm confident, I think we can close it. It's mainly a matter of getting the write-up completed, and I trust that will be done.

Chair Anderson: So let's just formally decide to close it.

Member Kotelchuck: That's fine. Bill, are you okay?

Member Field: Yes, I'll make a motion on that.

Chair Anderson: Okay, good. Okay. So I think we're all in agreement. So we will close this rather than put it in abeyance. And just keep it in mind so when we put the presentation together we mention that.

Member Kotelchuck: Very good.

Mr. Katz: So the next one is Tom Tomes again.

Mr. Tomes: This is Tom. The next one is Finding 7. We're at Finding 7, is that right?

Mr. Katz: That's adequacy of environmental dose.

Mr. Tomes: Yes.

Mr. Katz: Yes. Finding 7.

Adequacy of Environmental Dose

Mr. Tomes: NIOSH reviewed that. We went back to the site and gathered as much data as is available. I think we're confident we got all the data that's available from NFS. And so we did a thorough review of that data to address these issues.

The issue is that TBD does not provide environmental doses. I've separated it out into issues that we identified based on discussion that SC&A had in their reports.

One is that the burial ground remediation may have exposed unmonitored workers to airborne reactivity. As you recall we said we were going to use bioassay data to estimate intakes of uranium from those workers so that workers who may not have been on the project, such as people in the main part of the site may have been exposed. That was one issue.

The other issue is that the TBD methods do not account for plutonium intakes of unmonitored workers. And we responded to that in Finding 3 a few minutes ago. We addressed the environmental plutonium issues in this paper.

And another issue identified in SC&A's write-up is that, it says the TBD says some office workers were not assigned dosimeters in later times. So we addressed that issue.

And another issue identified by SC&A is it says, in general, the Technical Basis Document does not provide an adequate assessment of the environmental intakes and external environmental doses for all years, operational and residual.

So this White Paper that was issued by NIOSH in July of last year addresses all those issues. It was the one that was titled Resolution of Site Profile Findings 2 and 7. Dr. Buchanan discussed Finding 2 earlier so we'll discuss the remaining part of that paper, Finding

7, now.

Our review of the records that we received from NFS indicates that they had an independent environmental monitoring program that began in 1968. As you recall the operations for AC work started in 1958.

And we have a few records available from 1968 through 1970, but these data were for all offsite locations that were -- by themselves were not useful for estimating onsite environmental doses.

But we also found records from the NRC that described the rigorous environmental monitoring program that began in 1978. And we have records from that program starting in 1979 continuing through 1995.

Records are available after that, but they're somewhat different, which I will discuss here in a minute.

Associated with those records the White Paper presents images of the site showing the site layout and the locations of the environmental monitoring stations. There were several of them placed around the site.

The site was relatively small, the production area. And they strategically placed at these locations so that the entire site is fairly well characterized.

And so we have that data from all years from 1979 through 1995. And we've estimated intakes based on -- we've taken all that data and we've analyzed each location.

And Table 3 of our White Paper has the results of that -- the annual intakes. These were continuous monitoring done by the site for each year.

So Table 3 provides annual environmental intakes as gross alpha results for 1979 through '95. And the paper highlights in bold the location that results in

the highest intake, highest concentration there. That covers 1979 through 1995.

Starting in 1996 there's less data available. We only have -- the reports we got included more offsite monitoring -- onsite monitoring, but we do have some data from 1996 through 2000.

We only had one location that was monitored in -- the burial grounds area was the area they monitored onsite at that time that was reported.

There's other data. The site had another program, a work area monitoring program that was very extensive. It had hundreds and hundreds and hundreds of data that we have in our database.

However, these are not really indicative of environmental exposures because they were work area exposures and no way to really differentiate which is which. But we do have burial grounds area monitoring in those later years.

Then we have some results available even in later years than that. From 2007, 2008 we have a few results.

All these results in these later years were relatively low, very low. And so what we've done since there's limited data in those later years, we've used the highest value of all those results to estimate intakes from 1996 forward. And those are provided in the TBD.

So that gives us -- those two methods there gave us environmental intakes from 1979 through 2011 which is the end of the residual period for the site.

So we had to have a method to estimate environmental intakes prior to 1979 when we have the data. So we -- the paper provides part intake rates to substitute for environmental intakes. Per our earlier discussions we've set the plutonium default intakes and worker category, and we had the same thing for the uranium intake worker categories.

To substitute for environmental intakes we're going to use the clerk data. That's what we propose using, to substitute. That data is higher than we would see in the environmental monitoring in later years. That is the data that we would use.

However, we did some adjustments because some of the residual -- starting in 1971 when the residual uranium intakes were calculated, and then we had environmental intakes in '79.

Some of the residual intakes were lower than we calculated from the later data, environmental data. So we've recalculated and have a table in the TBD that recalculates the worker categories based on higher of environmental or residual contamination level intakes.

And that is provided in Table 7 of the White Paper which is basically a combination of either the highest of the occupational intakes or the environmental intakes for workers in all years.

That provides the means to estimate uranium intake, either environmental or occupational in all years at this site.

For plutonium we have a similar approach using the clerk intake rate for environmental plutonium exposures. As you recall the environmental air sampling data was gross alpha.

For interpretation for the TBD and for assigning environmental intakes for a worker instead of occupational intakes, we would assign the environmental intakes as either alpha uranium or alpha plutonium, whichever provides the highest dose to a particular claim. We have no way of differentiating which would be which on a particular air sample.

That gives us a means to estimate environmental plutonium in years that we have environmental data starting in 1979. And for the earlier years we have taken a similar approach and used the clerk intake

rate from plutonium coworker table, that was Finding 3. We've taken those clerk intake rates from that analysis and applied it for the plutonium environmental intakes in those years prior to 1979.

And those two methods give us a means to estimate plutonium intakes and uranium intakes in all years. I would say that these environmental intakes and plutonium intake rates are provided for those workers who are presumably not having dose reconstructions based on bioassay.

If there are dose reconstructions based on bioassay, these intake rates would not apply because they would be redundant intakes. But this does give us a means for anyone who was exposed in the general area of the facility, but not necessarily inside the plants.

That is the summary of how we assess the environmental intakes at the site. And there are a few comments SC&A had in their response to this paper. I will just briefly mention --

Chair Anderson: Let me break in. Is there supposed to be something up on Skype?

Mr. Tomes: I did not prepare a presentation for this. I can put the paper up there if you'd like.

Chair Anderson: Okay, no. Because my screen is blank and I am now shuffling my papers to track through your document. Okay. Go ahead. Sorry. Continue.

Mr. Tomes: Okay. SC&A had some observations on this particular internal dose assessment. They thought the -- one section of the paper was hard to understand. And that was specifically pages 16 through 20.

I think that primarily was little small sections in that paper on environmental intakes and dose reconstruction notes. There was some miscellaneous information that I placed in that paper in case there

was questions that arise on interpretation of the data, and that's the reason that's in the paper.

And Dr. Buchanan correctly noted that these were not well organized, and I would have to agree because I had someone else look at this to make sure there were no errors in it prior to NIOSH issuing the paper.

But what we can do to simplify this, some of this information in the TBD is normally in footnotes. So what we can do to resolve this observation, some of this information would simply be moved into a footnote in the TBD and to make it more clear and more organized.

And in some cases some of these comments we will look at this wording and make sure that it's clear during review for a dose reconstructor.

Because I think for us the bottom line is that the dose reconstructor who's using this TBD understands what we wrote. And so we will re-look at the organization of those notes to make sure that they're understood. That was the observation they had on the internal intakes that I think we can address adequately during the TBD writing.

The other part of this finding concerns external doses in -- environmental external doses. The finding noted that some workers in later years did not have badge monitoring.

There are a few claims of office workers who did not always get monitored in those later years.

So we've analyzed this environmental data that I mentioned. It included not only air sampling. It included environmental TLDs.

And the locations are around the perimeter of the site similar to what the air samples were. They appeared to be in approximately the exact same locations, or at least very close by.

And so we've taken all that data and we've analyzed that data to determine the highest dose rate in any one year. Those were provided in Table 13 of the White Paper. The highest year was 114 millirem in 1979 and through 1995 when the highest result was 9 millirem in a year. So we have that for environmental TLDs on the site.

There was another set of data that we analyzed for this issue and that was burial grounds characterization data. The site had a large burial ground area and they had a small burial ground area.

In 1987 ORAU had a contract to characterize both those areas prior to remediation work being done a few years later. And they performed dose rate measurements. They scanned the areas and they also did a 20 meter gridded readings in both areas.

And so we've analyzed all that data as separate areas. And the large burial ground area gave us the highest dose based on -- we used the 95th percentile of all that data.

And the result of that is in Table 14 of the White Paper. Ninety-fifth percentile dose is 54 millirem per year. So that was based on some areas of the burial grounds had elevated dose rates found in the survey.

So what we've done for reconstructing doses, we're saying that we're going to use the highest of either the environmental doses for people who do not have dosimetry. We would use the higher of either the burial grounds dose rate surveys, or the environmental TLD surveys. And those results are provided side by side in Table 15.

And as I said, this was all data from 1979 through 1995. So, we're recommending that we apply this 1979 data which was the highest year of the environmental TLDs back to all previous years starting in 1958.

And then we provide -- do the same approach for 1996 forward, the burial grounds dose rates, 1996

forward.

The burial grounds, the basis for that is the burial grounds were basically idle. The material was deposited in there in the sixties up into the mid-seventies. Then they didn't have a remediation project until 1991 to restore those areas.

So we believe that it was fairly static during those years, and we believe that that should provide an adequate means to assess ambient external doses to the site.

And I believe SC&A had no concerns with our methods to estimate the external environmental doses, but I will leave that to Dr. Buchanan to verify.

Dr. Buchanan: Yes.

Chair Anderson: Ron?

Dr. Buchanan: Yes. We went through all this data, analyzed the tables and did the calculations and feel that -- I had visited the site personally and feel that this is a reasonable dosage to assign people that weren't badged because it was a pretty tight operation and pretty compact. So I think this is a reasonable amount of dose, if not very claimant-favorable.

Chair Anderson: It is claimant-favorable you're saying?

Dr. Buchanan: Yes. I say it's very reasonable if not -- it's claimant-favorable, yes.

Chair Anderson: It's a reasonable approximation.

Dr. Buchanan: Right. Well, yes. They used the highest of the readings and such so I think that it probably covers it pretty well.

Chair Anderson: Other Board Members' comments?

Member Kotelchuck: Looks good to me, Dave.

Member Field: I agree.

Chair Anderson: I didn't hear you, Bill.

Member Field: I said yes, I agree.

Chair Anderson: Okay. So shall we close this one out?

Member Kotelchuck: Yes.

Chair Anderson: Okay.

Member Field: Agree.

Chair Anderson: So all in agreement, we'll close out this one. Any other comments on that? And are there other -- now we're on 7 on our agenda. Observations and secondary findings that we need to address. SC&A?

Observations and Secondary Findings

Dr. Buchanan: Yes, this is Ron again. On the secondary findings which we'd call observations today, I guess. Yes, that was under 7.

We had A, B, C, and D secondary findings. And now NIOSH did address finding D in their response to finding 2 and 7. D was at the end of it.

And what this consisted was originally our question in the TBD was Table 5-5 was not detailed. We didn't know what method they used to get the doses in Table 5-5. And so we asked for some clarification.

And since that time they've reworked Table 5-5. That's the beta dose from the residual contamination from '71 to 2000 and forward. And so NIOSH did provide some detailed information on that table and its rework. They gathered some more data.

And so we went through those references, went through the calculations, went through the table. The final Table 16 on page 27 are the response to Finding 2 and 7.

And so for secondary finding D we concur with their

recommendations and their calculations and methods and such. Did NIOSH want to add anything to that?

Chair Anderson: How about A, B and C?

Mr. Tomes: This is Tom. I think I can respond to those. I've got a couple of notes here in front of me. Let me make sure I get which one. The secondary finding A concerns Table 3-15, 5-2 in the TBD. There were some questions in the original finding on the intake rates in those tables.

And during a previous Work Group meeting we discussed that and provided the calculations, that these are in fact intake rates and units of activity per calendar day intake.

And we -- and I thought we had resolved that. There is some --

(Simultaneous speaking.)

Dr. Buchanan: I think finding A, B, and C was going to be changes in the TBD, the wording in the TBD.

Yes, we discussed these previously at other Work Group meetings and we agreed on them. And I think that there was going to be changes in the TBD. So, D has been addressed to our satisfaction. We'd recommend you can close that. And A, B, and C, we agree with the method, we just are going to evaluate the TBD of course when the changes appear. More clarification than anything.

Chair Anderson: Okay. I view those as kind of clean-up.

Member Kotelchuck: Yes, agree.

Chair Anderson: Okay. So did we close those out before? I don't know if those kind of --

Mr. Katz: Those are observations. I think we can just -- we can consider them closed and of course look at them to make sure -- SC&A will look at the TBD when it comes out to make sure that those are cleaned up.

Chair Anderson: Yes, okay.

Mr. Katz: So, I'm a little foggy about timing with respect to the next step because we had a path forward, sort of. Everything is I think clear. This has been nice work on behalf of both staffs. Thank you from the Work Group.

But as far as reporting to the Board TBD, getting the TBD ready. Tom, what sort of sense do you have now that you know where the Work Group stands on this? I think we have enough clarification that I think you guys can go to work on the TBD. But of course, are you kind of feeling sort of held hostage until the Board actually closes this out entire? Tim, Tom?

Dr. Taulbee: This is Tim. Can you hear me?

Mr. Katz: Yes. Now I can.

Report to Board

Dr. Taulbee: Okay. Sorry about that. I think we can go ahead and update the TBD based upon what the Board has indicated here. I don't think we need to wait for the formal close-out of everything there. It sounds like once we do that SC&A will give a quick pass to make sure we've incorporated everything and we're good to go.

As far as timing, that's something we've really got to look at our resources and see from a schedule standpoint. We're not prepared to do that right now.

Mr. Katz: Okay. So I think then as far as reporting out to the Board though, I think it's just a question of pulling together a good summary. And I think I would leave that -- I think traditionally we have SC&A take the lead on that and then pass that summary, once it's developed, to the DCAS crew to go over and add to as necessary to make it good and clear and full.

And then just reference the background documents for the Board so they can -- anyone who wants to

take a deeper dive can. But let me just go ahead and I guess at this point we can pass that to SC&A. And of course I think this teleconference will be useful. It takes about a month for the transcription, sometimes shorter. I don't think we need to expedite it really at this point.

But you'll have the transcript, Ron, and whoever helps you with that to pull together a summary. I would make this a pretty detailed summary since there are a lot of important details through these findings.

For our presentation, we have lots of models for these presentations to the Board. If you folks would do it, whoever is going to take care of that for SC&A, I think that would be great. Is that okay with you, Andy?

Chair Anderson: Yes, that's fine. My only question was do we want to kind of view this as an interim report that we've done the review and we're all in agreement on it? Now, we're just waiting for the --

(Simultaneous speaking.)

Chair Anderson: I mean, do we need to do much, or do we wait for the final TBD and then --

Mr. Katz: So no, Andy. So you don't need to wait for the final TBD. This would be the report of the Work Group out to the Board on its review of the Site Profile.

The Board of course can do whatever with it once it hears the report, but this would be the final report of the Work Group unless the Board has some concerns and sends their feedback to deal with something.

Chair Anderson: Okay. So then we would have -- when the TBD is finished we would have another --

Mr. Katz: So you don't have to go back to the Board. Assuming that the Board doesn't have any issues then when the TBD comes out, whenever that is,

you'll check to make sure that it's all in order. If there were an issue of course you'd follow up on that. But it doesn't need to come back to the Board unless there's some great surprise which there generally never is.

Chair Anderson: Okay, that was just --

Mr. Katz: Yes.

Chair Anderson: -- if we would do a two-step here in which case we could shorten it.

Mr. Katz: There's no two steps. And as far as the presentation, I mean generally we don't lay it on the Chair of the Work Group to make the presentation when it's a detailed sort of thing like this.

We normally have a lead staff, so for example Ron could make the presentation. You can introduce it and then you can govern the discussion at the Board level of it.

But you don't have to do the detailed presentation unless you want to. And of course it's your prerogative to do the presentation yourself. But they'll prepare it in either event for you.

Chair Anderson: Do you think we can get this ready by April?

Mr. Katz: I think so. That's still -- we're just entering February here, so I think so.

Chair Anderson: Okay.

Mr. Katz: And no matter because if for whatever reason it's not April then absolutely by August, which is the next meeting.

Chair Anderson: Yes. Okay. Anything else people have?

Member Kotelchuck: Not me.

Mr. Katz: For the good of the order.

Chair Anderson: It's been long and arduous, but it's worked out well I think. And there were a surprising number of issues we had to deal with for this kind of a facility. So I think we've advanced things here and are ready to close it all out and chalk another one up.

Mr. Katz: Yeah, I think everyone has done good work. So thank you, everybody. It's really appreciated.

Dr. Buchanan: Could I ask a question, Ted?

Mr. Katz: Of course.

Dr. Buchanan: So SC&A to provide a summary, a slide presentation for the Advisory Board?

Mr. Katz: Yes. So what we'd have -- we actually need two things for the Board. We need a summary slide presentation of a fairly detailed fashion. So that they understand the substance, not just findings were closed. And then it's usually helpful to take the BRS.

I think Rose has been taking notes as things get closed, but take sort of the BRS material and make a sort of matrix document that goes into a little bit more detail than actually gets presented to help Board Members who want to go back and look at a particular issue to understand it better, and have that document available, that matrix available for the Board to review. And we can actually make that -- PA-clear it, make it available to the public too.

So those are I guess two pieces that aren't currently available that you'd prepare for the meeting. The Board meeting is April 21, I think. It's only going to be a day. And if for whatever reason we can't do it then and it's not critical that it happen in April then we have a meeting in August as well.

Dr. Buchanan: Okay. And you want me to do the slide presentation for the Board?

Mr. Katz: I'm not making -- assigning to SC&A as to who does it. But typically it's the lead staff person so typically it would be you. But someone else from

SC&A could do it as well. Unless Andy wants to do it and Andy will let you know.

Dr. Buchanan: Okay.

Chair Anderson: No. I mean, if you put it together I can look at it and if I'm comfortable doing it, but I don't feel compelled to make the presentation. But I'll certainly introduce it, be there to help you defend.

Mr. Katz: Just to remind you, SC&A will prepare these, share it with the NIOSH folks so that they can make sure it covers everything correctly from their view, and then we'll get that finalized, share it with also the Work Group Members at the same time and then we'll get that finalized for whichever Board meeting it gets presented at.

Dr. Buchanan: Okay, thank you.

Mr. Katz: Yes, thanks Ron, so much.

Chair Anderson: So we're going to have it on the 21st, the meeting in April?

Mr. Katz: Yes, that's my --

Chair Anderson: I have it marked here --

Mr. Katz: Is that the correct date? I don't have it in my head, but yes, I think that's right.

Chair Anderson: Okay, so travel on the 21st. Okay.

(Simultaneous speaking.)

Chair Anderson: I want to be sure I don't have any conflicts. Okay. And that's out at Hanford, right?

Mr. Katz: Correct. I think the only hotel we could find is in -- and we haven't contracted yet. There's some issues. But anyway, for now that's the plan. And it's out at Pasco, not in Richland.

Chair Anderson: Right, yes. Okay. Any other comments by Board Members or others?

Member Kotelchuck: No, thanks.

(Simultaneous speaking.)

Adjourn

Chair Anderson: Thanks a lot for everybody calling in and those who were listening, I hope you were able to follow us. So, thank you very much.

Mr. Katz: Yes, thank you. Have a good day.

(Whereupon, the above-entitled matter went off the record at 11:24 a.m.)