Centers for Disease Control
National Institute for Occupational Safety and Health
Advisory Board on Radiation and Worker Health
Work Group on TBD-6000
Thursday, April 1, 2021

The Work Group convened via Videoconference, at 10:30 a.m. EDT, Paul L. Ziemer, Chair, presiding.

Present:

Paul L. Ziemer, Chair
Henry A. Anderson, Member
Josie M. Beach, Member
R. William Field, Member

Also Present:

Rashaun Roberts, Designated Federal Official
Nancy Adams, NIOSH Contractor
Bob Barton, SC&A
Ron Buchanan, SC&A
Zaida Burgos, NIOSH
Grady Calhoun, DCAS
Nancy Chalmers, DCAS
Rosanna Gogliotti, SC&A
Megan Lobaugh, NIOSH
John Mauro, SC&A
Pat McCloskey, ORAU Team
Jenny L. Naylor, HHS
Lavon Rutherford, DCAS
Mutty Sharfi, ORAU Team
Tim Taulbee, DCAS

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Proceedings

(10:30 a.m.)

Roll Call/Welcome

Dr. Roberts: Good morning, everybody. I'm Rashaun Roberts. I'm the Designated Federal Official for this Advisory Board on Radiation and Worker Health. If you're not aware, this is a meeting of the TBD-6000 Working Group.

We, today we have a three-item meeting agenda, if you've seen it. If you haven't, you can find the agenda on the NIOSH website under schedule of meetings for today's date, along with the meeting materials which has been disseminated to this Working Group in advance.

So again, I want to officially welcome all of you to this video conference, or teleconference. First off, I want to address conflict of interest, of course, and I will speak to that with regard to Members of this Board, who sit on this particular Working Group. They should not have any conflict of interest.

So with that, let me move into roll call for Members of the Board who are on this Working Group, starting with the Chair, Dr. Paul Ziemer.

(Roll call.)

Dr. Roberts: So at any rate, thank you, all, and welcome again.

Before we officially move into the meeting, I just want to cover a couple of items. Of course in order to keep things running smoothly and so that everybody can be clearly understood, I'd ask each of you just to make sure that you mute your phone, unless of course you need to speak.

So, if you're on the phone, you press *6 to mute, *6 to unmute. For those on Zoom, the mute button is on the lower left-hand side of your screen. Please periodically check your phone and your computer to ensure that you're remaining on mute if you're not speaking, as we have occasionally had some interference here and there.

As I mentioned before, the meeting for today's agenda, the agenda for today's meeting rather, can be found on the NIOSH or DCAS website. Access to the other materials was provided to the Board Members and to staff prior to the meeting.

For the rest of you, the agenda, presentations, background documents, et cetera are posted on the website. So, with that we can move into the main part of the agenda. So, I will now turn the meeting over to the Chair of the TBD-6000 Working Group, Dr. Paul Ziemer.

Dr. Ziemer?

Meeting Business and Agenda planned by Dr. Paul Ziemer

Chair Ziemer: Thank you, Rashaun, and good morning, everybody. Good to see at least some of your faces. About half of you just look like black boxes to me, but I assume there is somebody behind the black box and you'll contribute as necessary, so thank you.

The meeting agenda for today is rather brief. We have one principal item to take care of. We're focusing on Superior Steel and we had an item that goes back to about a year or two to kind of close out the Site Profile types of issues.

So, we're -- and it's Finding 1 in the original group of findings that we reviewed. This finding we have

updated, and we have reviewed it before, but the Work Group had asked NIOSH to go back and clarify some additional details based on some of the comments made by SC&A. So, we're going to go through that this morning.

Megan Lobaugh will begin and review what NIOSH has to present. And then, Rose, I think you'll have an opportunity to discuss the Evaluation from SC&A on this latest item.

So, let's begin and, Megan, if you're ready to go, are you going to put some things on the screen for us as well?

NIOSH Response Paper-Additional Information in

Response to SEC-00247 ER Review -Finding #1

NIOSH Presentation by Megan Lobaugh

Dr. Lobaugh: Yeah, I can share the presentation that I put together.

Chair Ziemer: Good, and I think, as Rashaun has already mentioned for others listening in, if you're not on Zoom, these documents are on the NIOSH website. I think the, certainly the Work Group Members have all received copies of them in advance as well. So, okay good, and I see it on my screen now as well. So, let's proceed.

Dr. Lobaugh: Great. Just so you guys know, I have two screens so if I'm not looking at the camera it's because I'm looking at other screen.

As Dr. Ziemer said, I'm Megan Lobaugh. I work with DCAS and this presentation here provides a quick overview of the findings. So, if you would like me to do that, Dr. Ziemer, I can go through kind of the history of the responses that we've had and then go into our actual response paper that we sent in

March of 2020.

Chair Ziemer: Yeah, I think that would be good. Make sure everybody is up to speed on that. Thank you.

Dr. Lobaugh: Great, yes. So, let me back out of here. So, as I said I'll go through a quick summary of the Evaluation Report, the SC&A review, and then the responses and Work Group discussion that we had for Finding 1. And then I'll go through the more specifics that we provided in our March 2020 NIOSH response to that request for additional information.

So, we'll start with the summary. And I'll try and make this quick, but feel free to jump in, Rose, if there's anything additional you want to add when I'm talking about the SC&A review or the responses.

So, as Dr. Ziemer said, we're talking specifically here about Finding 1, that was established after the review of the ER for SEC-247.

So this finding is specific to or affects internal and external dose, and it's specific to the exposure time that we're assuming for the rolling hours. So, Superior Steel was on a contract with the AEC so their full-time work was not with uranium. Their full-time work was with non-radioactive materials.

So, their AEC contract was a part-time kind of job that they had. And so we needed to determine a specific set of rolling hours, or how often they were actually working with uranium.

So, in the ER, we proposed to use a surrogate billing rate approach where we used the Vulcan Crucible billing rate. And I'll remind you, through the discussions, if you remember, this, we actually ended up finding the Superior Steel contract or a version of the Superior Steel contract that gave a

specific Superior Steel rate.

So, some of this early discussion, became kind of null once we found that, found that billing rate. But our initial proposal was to use this Vulcan Crucible billing rate of $132 per mill-hour. And using the Superior Steel specific contract payments. And the approach we specifically provided was to use that 19 -- the fiscal year 1957 payment.

With those numbers we came up with 414 mill-hours, and proposed basically rounding that up to 500 hours. The SC&A finding initially questioned, you know, a selection of the surrogate billing rate, a Vulcan Crucible bill, for Vulcan Crucible billing rate. And said that we provided no rationale for why this billing rate would be a reasonable surrogate.

In that same finding, they also mentioned a Joslyn Manufacturing Company mill rate of $80 per hour, which would have resulted in a higher number of rolling hours.

Our initial response was provided in October of 2019, and at that time, we reviewed the five criteria in the NIOSH Implementation Guide, for using surrogate data, surrogate information in dose reconstruction. So, this is Implementation Guide 4, the use of data from other facilities in the completion of dose reconstructions under the EEOICPA.

So, in that there, like I said, there was five criteria that we looked at and provided justification for why Vulcan Crucible was similar to Superior Steel. So, the first three are listed here on this slide, source term, facility and process similarities, and timing. So, in all cases we found that Superior Steel was similar to Vulcan Crucible.

The fourth criterion was data evaluation, and this

criterion wasn't directly applicable based on the description in that implementation guide that we have. And that is because the implementation guide specifically talks about the quality of exposure data. And this data that we're talking about here is not direct exposure data. This is the rolling hours, which would be used to calculate an exposure for a year.

So, the exposure rate would be determined from the actual source term at Superior Steel, not from this data directly, if that makes sense.

I hear a little bit of an echo, I'm not sure if someone is unmuted. I think it's a little better now, thanks.

So, the data evaluation, how we looked at this was we actually considered the fact that this was type 2 data, so not direct exposure data. And we basically looked at this as reviewing other available billing rates and their applicability or their effect on the exposure hours calculation that we were doing with this data.

So, we did searches of the SRDB with our current holdings at the time, as well as additional data captures using source terms like rolling rates, rolling hours, hours milling, pieces per uranium, thorium and typical sites that we know rolled uranium. So those included Fernald, Hanford, some of the other AWEs.

In those searches, we found these four billing rates. So, let me scroll down a little bit --

Dr. Roberts: Wait.

Dr. Lobaugh: -- so the Simonds Saw --

Dr. Roberts: I'm sorry to interrupt Megan, it looks someone with the number ending in 137 is not muted. If you could check and mute, please, your telephone. Sorry about that.

Dr. Lobaugh: That's okay, thank you. So, let's talk, I'll talk briefly about each of these rolling rates and the conclusion that we provided in our responses.

So, the first one here is Simonds Saw and Steel at $110.53 per rolling hour. So this, our calculation if we looked at this with the Superior Steel contract payments, we found that this was very similar to the 500 mill-hours that we calculated and provided in the ER.

For the Joslyn rate of $450 per rolling hour, we found that this was actually for different processes. So Joslyn, this rate was for taking 4.25 inch rounds down to 1.5 inch rounds and had very strict quality control on the temperature for the processing of that uranium.

So, we found that since these were different processes, and a lot stricter controls were based on the rolling at Joslyn, this would not be applicable to Superior Steel, given the process that we know Superior Steel followed.

The second Joslyn rate here of $88.03 per hour, or $0.11 per pound is what was brought up in the SC&A finding. And in our review of it, we actually found that this reference discussed, this estimate was actually for Simonds Saw and Steel and was never implemented due to the strict medical and security requirements that were placed on Simonds Saw and Steel.

So, they decided not to go through with that contract. So, we didn't find that that was appropriate to use since that contract was never actually implemented.

The fourth one was the Superior Steel contract actually. So, we located Modification No. 5 to the Superior Steel contract and it gave $1.01 per

pound. It also discussed additional payments per pound for additional services like planing and pickling of the slabs. So, it was kind of nice, that was nice because it laid it out directly in the contract.

So, the last criterion in the implementation guide was review of the bounding scenario. Again, this isn't directly applicable to -- the discussion in the implementation guide isn't directly applicable to the data that we're looking at here, because the discussion in the implementation guide is specific to exposure data.

And again, we're not talking about exposure data here, we're talking about the type 2 data that would be used with an exposure rate that's based on the source term. So, what we did in order to look at this criterion was actually compare our calculation using the billing rate approach to other information that we had available that told us estimates of rolling or mill-hours.

So, one of those things, one of those parts, or points of information was Table 7 in the ER. So, in Table 7 we provided compilation of rolling information that we found from several SRDB references.

And if we look at that with the, look at the number of dates that are provided in there, and come up with a conservative estimate of the time spent rolling, we came up with about 60 hours per year of rolling exposure, just looking at that data.

The second piece of information here we talked about, was that Modification No. 5 to the Superior Steel contract. And if we look at the $1.01 per pound calculation, with the similar information we used in the initial approach, we came up with about 510 hours for the entire contract.

So, one thing that we were initially concerned about was, in order to use the Superior Steel Company, or Corporation contract, we had to incorporate two additional pieces of information that from what we could tell had a lot of variability. So, two additional inputs that we didn't have direct references for, and from what we could tell, had a lot of variability in the information that was available in the SRDB.

And that would be the weight of the slabs as well as the number of slabs rolled per year. So, our initial response in October of 2019 stood by that approach of using the Vulcan Crucible billing rate to determine the number of hours.

In January of 2020, SC&A provided a response to our response that the billing rate in the Superior Steel contract really should take precedence over all other billing rates because it's site-specific. And they provided the following inputs that they would suggest using to calculate the number of hours, the number of milling hours of uranium using the approach, including slab weight and process, the slabs processed per year.

So, here are the numbers that were suggested in the initial SC&A response. That billing rate, that is basically a constant, no question about that based on the contract itself, $1.01 per pound. The slab weight, which would be based on the multiple SRDB references we have that discussed slab weights that came to Superior Steel and chose 216 pounds, which looked like the smallest known weight.

The number of slabs processed per day were 25 is what they chose. And then milling hours per day was ten, which again was agreed upon by the Work Group that that's a typical number of hours per day spent rolling for AWEs. That's our normal assumption, I would say. And then using the highest billing rate to maximize this approach.

So, here's how that calculation actually falls out in the SC&A response. Using that highest billing rate per year of $138,246 divided by the contract payments, the $1.01 per pound, gives us 136,877 pounds per year. And that's a maximum given the choice of the annual payment.

And then multiplying the pounds per slab, the 216 pounds per slab by the 25 slabs per day, gives about 5400 pounds per day that was rolled. Dividing those two numbers, gives us 25.3 days per year or 253 hours per year. So, the final conclusion that SC&A provided was that the assumptions are believed to place a plausible upper bound on the number of rolling hours.

In February 2020 was the last Work Group, and at that time the Work Group agreed that the intakes could be bounded and closed the SEC aspect of the issue. And so the discussion that they really focused on, this variability that we're seeing in the input numbers using that rolling calculation.

So, at the time NIOSH agreed to provide a summary of that available data for the rolling hours calculation. So, that's what we're going to talk about today. And that's the response that NIOSH provided in March of 2020 was to that request for additional information for Finding 1.

So like I said, we sent it March 27, 2020. And it reviews the history of the finding, like we just did here, this quick summary. And it provides a summary of the available information that we have regarding slab weights, slabs processed per day, annual payments, all of those input parameters to that calculation, we provided a summary of what we see available for Superior Steel.

It also provides an approach that uses all of this available data in the uranium rolling hours

calculation. So, we'll step through each of these kind of individually here.

So, to start with, SC&A and NIOSH, we both agreed on the formula for the rolling time. So how will we actually calculate it? How will we actually calculate the number of hours spent rolling uranium based on the information that we have available?

So, let me see, I don't think I can turn it.

Can you guys see my mouse at all?

Maybe not, I'll talk you --

Dr. Roberts: Yes, we can see it.

(Simultaneous speaking.)

Dr. Roberts: No, we can see it.

Dr. Lobaugh: Okay, so I'll try and point to what I'm talking to, too, just to help it out. So, looking at this equation, the numerator here is the annual payment, dollars per year.

So, what we're trying to calculate here is pounds per -- or hours per year, and we have to do some conversions, so that's why this looks a little overwhelming with the number of inputs here.

So, we have the annual payment dollars per year, divided by the billing rate and dollars per pound, times the slab weight and pound per slab, and the slabs rolled and number per day. And then, we multiply that entire equation by the time and hours per day. So, we can get that rolling hours and hour per year.

So, looking at this equation specifically, I did some color coding. The annual payments, slab weight and slabs rolled, are those three input parameters that

we talked about that had variability to them, that we're seeing different numbers, with a fairly wide range in the SRDB documents.

The brown inputs here are what are considered constants or things that we've agreed on. So, if we look at the actual calculation itself, that's what's in the table below.

First thing we did was we looked at minimizing this number and maximizing this number for rolling hours, and hours per year. So, to maximize the number, we need a large numerator and small denominator. So, the smallest slab weight, small slabs rolled per year.

To minimize this equation, we need a small annual payment and a large slab weight and a large slabs rolled, because the other inputs here are constant.

So, if you see here in the table below, you'll see that that's how we did these calculations, was maximizing the numerator, minimizing the denominator, to come up with the maximum number of rolling hours at 691 hours per year.

To minimize that, we again, made the smallest annual payment and the highest slab weight, and slabs rolled, and we got 14 hours per year. So, we're seeing a range here of 14 to 691 hours per year.

What I'm going to do next is step through each of these input parameters and discuss the kind of information that we were seeing, and how we go forward.

So, before I step through those parameters though, I want to kind of just discuss this approach that I talked about before. How are we going to look at this in a way that we can represent all the data?

And so, the best approach that we came up with was actually trying to simulate that distribution for the rolling time. So, by looking at these input parameters, we can come up with a way to describe them and then make this calculation multiple times to come up with a distribution for that rolling time in hours per year.

So, I'll talk more specifically about each of those parameters and what we decided would represent those parameters well in that simulation.

So, first is the annual payment, this was in the numerator. The annual payment, we have one specific SRDB reference that gives us all of the payments given to Superior Steel, and it's fiscal years 1954 through '57.

So, you'll see here this table that I put together with each of the amounts paid to Superior Steel for those years. I do want to note that 1955, we summed in this table because the SRDB reference actually provides two payments for that year because the payments are based on where they originated, which operations office they originated from. And in 1955 there were two operations offices paying Superior Steel.

In 1956, this number here of $130,246 is not the specific number you see in SRDB reference and that's because the payment in the SRDB reference is larger.

And what we agreed upon in the discussions, I haven't mentioned yet, is that this payment is much larger than the other payments seen to Superior Steel, and there's no indication that there was additional rolling that year.

But what the modification to the contract, Modification No. 5, shows us is that Superior Steel

was actually approved to receive payments for equipment upgrades, or make purchases for equipment upgrades.

And so, that year, in the Modification No. 5, you see an estimated, it's called Schedule A. In the Schedule A, there's estimated cost for what this equipment would be, you know, basically what their request was for the equipment.

So, for the 1956 payment, we actually took the payment for that year, seen in the SRDB reference quoted here, and subtracted the estimated money that they would receive for that equipment.

So, for this simulation that I mentioned, how we're going to go forward, is that we would randomly sample these four annual payment values. So, basically each of these annual payment values is considered equally, in terms of how we would simulate them. And they would -- it would be sampling with replacement.

The second input parameter here would be slab weight. And in Table 2 of our March response, we provide 56 average slab weights based on information in several different SRDB documents.

These documents, we had to use several references because there was no one reference that discussed the typical weight of slabs received by Superior Steel Company, or the typical weight of slabs that they would be rolling.

And there was no slab weight information in any of the references that we used for the next parameter either. So, this was a compilation of customs and shipping documents.

So, we have several customs and shipping documents that show total box weight with the

number of slabs in them. And so, that's what was used to complete Table 2 with the average slab weights.

What I would note is these would be weights at receipt, and not necessarily weights at, you know, while they were working with them, or what was leaving Superior Steel.

So, the simulation input, we assumed a log-normal distribution. So, you can see to the right, this histogram has average slab weight on the x-axis and frequency on the y-axis, so we looked at all of those average slab weights, binned them, and then determined a log-normal distribution for those slab weights.

So, the geometric mean was 234.2, and the GSD was 1.073. I would also like to note that this 56 average slab weights covers a total of 606 slabs.

So, the last input here that was variable is the number of slabs rolled. In the March 2020 response, this information is provided in Table 1 and it's a compilation of different SRDB documents, again.

And these types of documents would be the Hassell Air Monitoring Data documents, where they mention how many slabs were rolled during the air sampling campaign, or we had one SRS technical report that discussed the rolling campaign that they had contracted with Superior Steel, and it gave number of slabs rolled.

As well as, a letter from Superior Steel to the Oak Ridge operating office, discussing specific rolling data, like temperatures that were -- temperatures they did the rolling at, thicknesses of the slabs, and different technical data for the actual rolling itself. Where we had numbers of slabs that we rolled during a specific time period.

So, the simulation input for this data point here. Somebody isn't muted, if somebody could mute, that would be great, thank you.

Chair Ziemer: I think we're hearing sounds from a phone ending in 321, needs to mute.

Dr. Roberts: Yes.

Dr. Lobaugh: Thank you. So, the simulation input here was a triangular distribution. So, given the small amount of data that we had, triangular distribution seemed to be the best approach.

So, the lower limit of that distribution, we chose to use the minimum average number of slabs rolled per day, which was ten. And the upper limit we chose to use the maximum, which is 50. And the mode became the weighted average of the number of slabs rolled in a day, which was 28.14.

So, the simulation itself. So, how the simulation works is we want to calculate the number of rolling hours multiple times. So, here you'll see we repeated this calculation ten to the six times.

And what we do for each calculation, we're going to randomly sample from each of those input variables that we have variability in. So, we're going to randomly sample from the annual payments.

And that's going to be, like I said, we're going to count each of those equally, and we're just going to randomly sample the four payments themselves. For the number of slabs, were going to randomly sample that triangular distribution to come up with an input.

And then for the slab weights, we're going to randomly sample the log-normal distribution, and we're going to put those into that formula that I showed you before, to calculate the number of

rolling hours. And like I said, repeat this a million times.

So, what do we get? We get this histogram here. So, along the x-axis is the rolling time in hours per year, and the y-axis, again, this is frequency.

So, what this represents is the number of -- each of these bins represents 20, basically, hours per year broken up across the x-axis. And each time we got a number within that bin, we put, we made a bar graph, right, so we put a result in that bin.

So, what we can see here is this simulated distribution for that rolling time. The blue line, the first line here, the blue line, represents the 50th percentile of our distribution, which was 78 hours per year.

The next line, the dashed line, is the SC&A estimate that they provided. The red line is the 95th percentile of the rolling time distribution that we calculated, which was 267 hours.

The next dashed line, is the NIOSH proposal in the ER, which was 500 hours per year. And the pink line here, or magenta line is the maximum that we calculated when we maximized that equation and that's at 691 hours per year.

So our conclusion was, given the variability in those input values that we talked about, we really ended up having a large range of possible calculated rolling time in hours per year.

So, we thought the best approach would be simulating this rolling time, the rolling hours per year distribution, using all the available data and determining which parameter within that distribution was best.

So, our proposal was the 95th percentile of that

distribution at 267 hours per year, is what we would propose to use for the exposure time, that would then feed into our calculation of the internal and external dose, specific to the rolling time.

So with that, that is the end of my presentation.

Chair Ziemer: Thank you very much Megan. Very good discussion. Before we hear from Rose, let me ask the Work Group Members if any of you have any questions, any clarification on any of the slides, or other questions?

Member Beach: None here, Paul.

Chair Ziemer: Josie? Josie, okay.

Member Beach: I'm okay, thanks.

Chair Ziemer: Andy?

Member Anderson: No, my only issue is somewhat with the statistics that you used. There remains quite a tail on your distribution. So, the geometric mean and all, for -- that does help make it more of a normal distribution, but there's still quite a tail on that distribution.

So, I'm just wondering from your statistical people, are they comfortable on, this is the best you can do? Most of your statistics depend on a normal distribution, and you try to improve it by using a geometric distribution, but that doesn't shorten it all that much.

So, it adds, it just adds so much --

Chair Ziemer: So, was that a question or a comment?

Member Anderson: No, no, I'm just saying, that's my concern that we sort of routinely assume that

what we've done has been able to normalize the data distribution so that all the other parameters that are based on the assumption and normality are still adequate estimates.

I mean, if this is the best that you can do, but at some point, the distribution has to be remembered that it is really quite skewed.

Chair Ziemer: For the slab weights, you had the actual weights, so was that not correct? Yeah, the previous slide there?

Dr. Lobaugh: This one, on the -- oh, sorry, the slab one --

Chair Ziemer: Well, the diagram itself. Weren't those actual slab weight distributions?

Dr. Lobaugh: So, these were average slab weights based on the customs document information. So --

Chair Ziemer: Now, for example, at about where the mean is 234, it looks like there were like 30-some slabs of that weight? Is that, do I understand that right?

Dr. Lobaugh: Yes, yes.

Member Anderson: But on --

Chair Ziemer: So, in a sense --

Ms. Gogliotti: Average.

Chair Ziemer: -- in a sense those are actual values and that looks --

Dr. Lobaugh: Yes, I hear -- I think I just heard Rose say that they're average.

Chair Ziemer: It looks a little bit like a geometric, but the main bulk of those are pretty much a

normal distribution.

Dr. Lobaugh: Yes so, again, I will reiterate that these are average weights. So, we really only had total weight for a whole box, which would have multiple slabs in them.

So, we didn't have individual slab weights, but we would have weights for, say, nine slabs, weights for ten slabs, and so this represents actually represents average weight, yes. I think I heard Rose say that.

Member Anderson: But I would, on your bottom scale there, if the geometric mean is 234, okay, I see. Okay, fine. I'm just, I mean that's just something to keep in mind when you look at that: how confident are we in that because it impacts all of the subsequent modeling that's done, but that's okay.

Ms. Gogliotti: It does. If you want me to go through my evaluation of it, maybe I can give you more confidence in it?

Member Anderson: Okay, that's fine, yeah.

Dr. Lobaugh: I'll stop sharing now.

Member Anderson: If that's the best you can do, and I'm comfortable with it, I'm just raising the issue, because you got to keep in mind when we're very heavily dependent upon modeling, and random sampling, and all this kind of thing, we have to look at what are the underlying assumptions on the distribution of the data.

And that's just a caution I always look at.

Chair Ziemer: Okay, thank you. Let's see, Bill Field, did you have a question? Was Bill on the line?

Dr. Lobaugh: I don't think he's on the line.

Chair Ziemer: Oh, okay. I thought I saw his name here before. Okay, good. Are we ready to go on and hear from Rose?

Now, Rose had asked me before whether she should prepare a PowerPoint. And we made the decision that what could be done here rather handily since SC&A's in -- pretty much aligning with the NIOSH approach, that she just might use the matrix itself.

Now, the matrix is pretty extensive it has all the other things that we've done over the years on Superior Steel, but I think we're going to start, I think Rose -- oh, I see it on the screen now. Rose, you're going to start with your response which is SC&A response for, in March 2021, which is the response to what we just heard, is that correct?

Ms. Gogliotti: That's correct.

Chair Ziemer: Okay, why don't you proceed then?

SC&A Presentation by Rosanna Gogliotti

Ms. Gogliotti: Okay. Well, as you know SC&A, we really initially just proposed a value of 253 hours per year rolling. And that was based on a really quick calculation, common sense values, to try and bound the number of rolling hours that could have possibly taken place in a single year.

And NIOSH came back with their simulation that Megan just, did actually a really great job of summarizing a fairly complicated simulation.

And their simulation came back with 267 hours per year, which right of the bat, we're very close. That's somewhat to be expected since we're using the same data to estimate the same value.

So, I was happy with that. And first off, I thought it was important to try and replicate their calculations

by using the values that were presented in the NIOSH, March of 2020 response.

I attempted to recreate their simulation and I got a very close value, but it wasn't the same exactly. So, I questioned Megan, and she very quickly sent me their R files, as well as their CSB files that were done to support their calculation.

And when I looked at those it was clear that the only difference was really a minor difference. They're modeling a log-normal distribution and seed value, the random seed that was chosen for the simulation.

So, that gave me confidence in their numbers. However, I did go through and look at each of the parameters independently, because I think that's important since they're the basis for the simulation, it's important that we establish that the right numbers line up.

And Megan had up previously her Slide 13, which is the equation that was used in the simulation. Here I broke down by each parameter in it, first being the annual payments.

As Megan mentioned, there were four annual payments that were known, these are the values from 1954 through 1957 with the modification that she mentioned.

For 1956, for the Schedule A reimbursable expenses were subtracted out. I will mention that the contract also stipulated that they were eligible for reimbursement for 50 percent of a slab furnace, as well as security costs.

And since we don't really have a good way of estimating those values, and they weren't specifically stated in the contract, we just ignored

them, which essentially gives you a higher value in the calculation.

So, that's a higher value that ultimately calculates more rolling time than perhaps was possible. So, that's a conservatism immediately built into the model, and I think that that's appropriate.

I will note that we do not have values for 1952 and 1953, which are the first two years of the covered period. We don't have any reason to suspect that they were doing more rolling at that time than they were in the later years.

And actually, the core values that we have, sum to the known contract expenditures that were reported in later reports and AEC. So, I think that, in all likelihood, that those two years' payments were covered by the prior year, or previous year's payments. So, that also builds a level of conservatism into the model, and I think they're easily bounded by those four numbers.

Moving on, the cost per pound. NIOSH has seen a constant cost per pound of $1.01 per pound of uranium. That value comes from Contract Modification 5, that we've discussed.

As we know, the contract allowed for additional services provided that could add up to 13 and a half cents per pound of uranium. We don't know how often those services were provided. I think it's reasonable to assume that they were provided to some scale but what proportion would really just be a guess.

So, using the lower value, I think, is appropriate here. That is the numerator in the equation, so if we were to add those values in, it would actually decrease the projected rolling hours.

So again this, this just helps to make sure that we are really bounding the number by not using that additional.

Okay, and the next parameter would be the number of slabs rolled. And what NIOSH did here was they used a triangular distribution of the known values from Table 1. And Megan showed those previously. And there was a minimum of ten slabs rolled and a maximum of 50, based on that table.

I did go in and look at the table in detail and look at the references that were contained in it, to make sure, one, that they were accurately represented. And two, to make sure that it was all-encompassing of the data that we have, the known data that we have available. And I did feel that that was appropriate.

I do note that one of the values, the maximum, the 50 slabs rolled per day, I believe that is likely referring to multiple slabs being rolled at that time, based on looking at the data.

There are time stamps on it that indicate that multiple things were happening at the same time, which doesn't really seem possible given the parameters that we know at the site. But since it was referred to the August 3rd rolling, I think it's reasonable to assume that they were all from the same day.

For the sake of this, leaving it in actually increases the rolling hours, if we were to remove it; as the denominator, it would lower the denominator again, and reduce a smaller estimate of, of hours.

So, for a bounding calculation, it's very reasonable to leave this value in. I think there is some uncertainty with it. I also think it was very reasonable that they selected the triangular

distribution, given the limited number of data points that we have available.

For daily rolling time, as Megan mentioned, they use constant ten hours' rolling time per day. I could not find any clear documentation indicating the number of hours that were spent rolling at any given time.

I think it's safe to assume that that number probably fluctuated based on throughput of that individual day, but NIOSH just used a constant.

I did do some digging and I found that the contract does stipulate that no one supporting the contract was allowed to work in excess of eight hours per day, unless they were compensated for a rate of one and a half times that base rate of pay.

And I believe that might have been incentivized completing work within a standard eight-hour day, but again there is no definitive evidence. So, I think it's very reasonable to select ten hours, and that's consistent with what's selected for other AWE facilities.

Okay, an average slab weight. This one as you could probably tell from Megan's graph was the most complicated by far. And the data that they had available was 56 groupings of slabs. So really, they only knew the total weight of the grouping and the number of slabs in that.

And so, NIOSH used that to calculate the average slab weight. And because there was a fair amount of variability in that data, they fit it to a log-normal distribution, and then the fitted distribution was sampled from in the simulation.

Now, to evaluate this, I had to go to their R code. And in their R code, which I wish they would have included the plot here, but they included the QQ-

plot that showed representation of their simulated, or fitted data, with their real data.

And if you're not familiar with the QQ-plot, it's essentially a visual, or graphical representation of how well your data fits a theoretical distribution. In this case it would be a log-normal distribution.

So essentially, it's just a scatterplot, plotting two sets of quartiles against each other, and if the points form, essentially, a straight line, it tells you that they're in good fit. But if they don't form a straight line, it tells you it's not really a good fit for your model.

And overall, looking at the data, it does look like it's a very great fit. As Andy pointed out, though, there is a long tail on the data, such that the upper points weren't very well modeled by the log-normal distribution.

There's not to say that's a problem, but because that existed, I thought it was important to dig a little deeper. So, I remodeled the simulation data that Megan provided, saving the inputs, to see how this simulation was actually performed, or how this data came out in the simulation.

What I found is that it actually modeled a minimum of 169 pounds and a maximum of 325 pounds, and that's a little bit different than the data that we had, which estimated a maximum -- or a minimum of 198 and a maximum of 533.

And so, what that means is essentially six of our 56 averages fell outside of the window that were being modeled, or 70 of the 606 slabs. So, roughly 12 percent of our data fell outside of what was modeled.

And initially, I think that sounds somewhat

alarming, but then I thought, looking at the data, it's important to keep in mind what it actually represents.

We have data on average slab weight at receipt, and it's being put into the equation as if it is the same as the average daily rolling weight per year.

Now, based on the Central Limit Theorem, we know that essentially irrespective of the distribution of the actual population of slabs, we know the distribution of samples. In this case, the average annual slab weights should approach normality.

In other words, we know that when we're sampling at multiple times, the average of averages are going to eliminate, essentially, the really high extraneous values. So, the high end's very low values are essentially going to be muted once you're doing the average of an average.

And so, in order to test this, I did my own simulation. This is a cursory test of their values. Using the simulated slab weight data from Table 2, I essentially simulated 606 slabs -- excuse me, assuming that each line in the data represented weights.

So essentially, I simulated a normal distribution, for each line, assuming the number of slabs equaled to the number of slabs, and the mean of the normal distribution equal to the total weight at receipt, divided by the standard -- divided by the number of slabs, with a standard deviation of five.

From that simulation, I generated 606 simulated slab weights, and I sampled from that, repeatedly, using the same distribution that NIOSH suggested, which was a triangular distribution for the number of slabs that were rolled per day.

And from that average, I found that there were a range of 214 to 341 pounds of uranium, which is not really that far off from what NIOSH simulated. 169 versus 325, max.

So that suggests that there is a much smaller range than the data initially shows. So I think it's very reasonable, the range that NIOSH went with in this particular instance.

So putting all of this all together, NIOSH suggested that the annual range should be from 14 to 691 hours. When I looked at the simulation, it actually predicted 26 to 715 hours. I think that's very reasonable, and you would expect so much of a difference, looking at how the values were simulated that went in.

I think these differences are very modest and reasonable, given the large uncertainty in the data. You can keep trying to polish it, but I don't think you're going to get a better number at the end of the day.

So in conclusion, if NIOSH wants to use this 95th-percentile value, I think it's bounding and reasonable for all years of operations. So, I would recommend accepting this number.

Workgroup discussion

Chair Ziemer: Thank you very much, Rose. I appreciate your review of that and, let me again, open it to the Work Group for questions or comments, or anything need clarification on this information? Josie?

Member Beach: I do not have any questions. I thought I did, but I went through my notes as Rose was talking, and clarified the answer. It was on that surrogate data slide of NIOSH's, but I'm -- so, I'm

good Paul, thanks.

Chair Ziemer: Oh good, okay. And how about Andy? Further clarification or comments?

Member Anderson: No, I think it's very -- I didn't get a chance to read this all before the meeting here. So, yes, I bet, this is good, it's very helpful to have that. Again, it's just the uncertainty, there is a fair amount of uncertainty in the data. And I think this is the best one can do.

Chair Ziemer: Okay. And again, I appreciate the analysis that both groups have done, and actually although, although perhaps we would like further detail on the data, we do have data. And we do have the information on the average slab weights, we have the information on the spread of the hours.

So, we have data from the site, so it gives more assurance that we're really not doing a surrogate, complete surrogate thing here, we're actually using site data. So, that's very helpful and fairly reasonable.

And I think when all is said and done, and using the 95th percentile, gives us good confidence that we have bounded the data. Particularly with the assumptions that are made and built into the final number.

The recommendation from SC&A is that we accept the NIOSH proposal to use, what's my own number 267, 267 rolling hours for bounding. And I would ask if any of the Work Group Members object to accepting this recommendation?

Member Beach: Just a quick question. So, the 267 --

Chair Ziemer: Sure.

Member Beach: -- the 267 hours, that is going to go from 52 to 57, is that correct? Is it going to be a steady all the way across?

Dr. Lobaugh: Yes, that's what we proposed. To use 267 for each of those years during the contract, mm-hmm.

Member Beach: Okay, that's what I thought. Thank you.

Chair Ziemer: Yes. So, that any -- let me ask you a quick question Megan or maybe Tim Taulbee, how many claims have been processed already for Superior? I have that somewhere, but it's not before me, or do you know off hand?

Dr. Lobaugh: At the time of the ER, it was about 52, if I remember correctly. I have not checked recently to see if there's been additional.

Chair Ziemer: And do we have a number of these that we have to go back and redo them?

Dr. Lobaugh: Well so, through the PER process --

Chair Ziemer: Yes.

Dr. Lobaugh: -- once the TBD is updated, it would be each of the claims that were not compensated would be reviewed to see if this would affect their --

Chair Ziemer: Yes. So, we have a number of them, probably, that will be re-reviewed then on the process.

Dr. Lobaugh: Yes, yes.

Dr. Taulbee: Yes.

Work Group Recommendation for Closure-Finding #1

Chair Ziemer: So, I hear no objections from the Work Group to accepting the recommendation from NIOSH, and I personally agree with that as well. And so, we'll let the record show that the Work Group recommends closure of Finding 1, and I believe that completes all our issues on this particular matrix.

Member Beach: I think, I think --

Chair Ziemer: Oh, do we --

Member Beach: -- Observation 1 --

Chair Ziemer: We have any -- oh, do we have some, yes we do have some observations.

(Simultaneous speaking.)

Ms. Gogliotti: Observation 1 is still open, but it's kind of a moot point, and we left it open just in case we were not able to resolve Finding 1. But now that we have resolved Finding --

Chair Ziemer: Right, we can actually -- yeah, you're pulling it up here now.

Yeah, that was -- that issue of using the source term based on contract billing data.

Ms. Gogliotti: From another site, correct.

Chair Ziemer: And yeah, and whether the Board should weigh in on that? Now, actually what we're using, we're determining working hours and work time, which is a valid thing.

We're not using the (audio interference) we're using the billing. But at least to me, using that to determine work hours is like other documents we

use on other sites and sometimes from contracts, to establish worker work times.

I think we've done that at other places, certainly did some of that even at General Steel, but any of the --

Ms. Gogliotti: Well, I think that this observation had to do more that they were using Vulcan Crucible billing rate.

Chair Ziemer: Yes, but --

Ms. Gogliotti: They're not using that anymore.

Chair Ziemer: -- that's not really an issue anymore, so.

Member Anderson: It's now moot.

Chair Ziemer: Yes, moot point.

Member Beach: Rose, Rose, when I looked at the BRS yesterday, I didn't notice that observation in the BRS. So, when it was in your paperwork, so you might check --

(Audio interference.)

Path Forward Report on Finding #1 at next full Board Meeting

Chair Ziemer: Are there any other issues related to Superior Steel that we need to discuss? If not, I'll ask Rashaun Roberts, do you want us to report on this at the upcoming full Board meeting?

Dr. Roberts: Hi, Paul.

Chair Ziemer: I don't think it takes any Board action, but we can report on it.

Dr. Roberts: Sure. We can certainly do that. The

question is how would you prefer to do that. Do you want it to be a part of the Board work session, where you just do a report out, or an item on the agenda?

Chair Ziemer: I think I can report on it. This is simply closing a final finding on the Site Profile. I don't think the Board has to take action on it. So I think, since it's just a single finding, I think it would be simple for me just to report it out at that time, it wouldn't have to be an agenda item.

Dr. Roberts: Okay.

Chair Ziemer: Let me ask if the other Board Members are comfortable with that, other Work Group Members?

Member Beach: Yeah, Paul, I am. That should work.

Chair Ziemer: You're okay on that, Henry?

Ms. Gogliotti: I think we lost him.

Chair Ziemer: Okay. I see you there, Henry, but you're --

Member Beach: He gave you a thumbs up.

Chair Ziemer: A thumbs up, okay, very good.

Member Beach: It's the new yes.

Chair Ziemer: Okay. My grandfather clock is chiming in the background. I guess that's a reminder that we're almost done with the Work Group here.

Okay, Rashaun, I believe we're done, if you have any final comments or items you need to present before we sign off here?

Dr. Roberts: No, that does it for me. I just wanted

clarity on how you wanted to deliver your report on the, to the Board and we've resolved that. So, I think we're good to go.

Adjourn

Chair Ziemer: Okay. Thank you, everybody, and thanks to the other staff members who've provided support to both to Megan and to Rose, and the work for today. And we will look forward to seeing or hearing from you all in the upcoming Board meeting. So we are adjourned.

(Whereupon, the above-entitled matter went off the record at 11:32 a.m.)