

 **Memorandum**

To: Metals & Controls Work Group  
From: SC&A, Inc.  
Date: January 26, 2024  
Subject: NIOSH Use of “Extreme Conservatism”: SC&A’s Perspective

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The Metals and Controls Corporation (M&C) Work Group tasked SC&A on December 12, 2023, to review and provide its fuller assessment of the National Institute for Occupational Safety and Health (NIOSH) approach for M&C that applies “extreme conservatism in its modeling to account for intrusive activities, high exposure conditions, uncertain facility activities, or unknown contamination sources” (NIOSH, 2023a, p. 17).

SC&A had previously questioned the back application of pre-decontamination and decommissioning (D&D) sampling measurements taken in 1995 over the 27 years of M&C’s residual period. The bases of this concern are the pronounced uncertainties and unknowns involved with intrusive maintenance worker activities, exposures, and radiological source terms during that extended time period. NIOSH’s response was that it is “not back-applying conservative D&D measurements” (NIOSH, 2023a, p. 16), but instead that “NIOSH is back-applying measurements taken by M&C and NRC contractors before D&D that they used to characterize the area to determine the maintenance and subsequent D&D work controls” and that, in addition, “NIOSH incorporated extreme conservatism in its modeling” (NIOSH, 2023a, pp. 16–17). In a later response, NIOSH claimed that “SC&A and the Work Group are misinterpreting NIOSH’s use of the phrase ‘extreme conservatism’ to mean implausibly high. NIOSH is using conservative assumptions that are appropriate for a bounding scenario” (NIOSH, 2023b, p. 32).

In its December 6, 2023, work group presentation, NIOSH also claims that SC&A “selectively quoted” former Chairman Melius’ statement regarding the plausibility of extreme bounding analysis from the Linde Ceramics Special Exposure Cohort (SEC) deliberation (NIOSH, 2023c, slide 25). However, it should be noted that SC&A’s supplemental report included that citation to balance NIOSH’s earlier use of another Melius quote to substantiate its arguments for addressing uncertainty at low dose levels. NIOSH interprets SC&A’s and the work group’s position as questioning “whether high bounding doses were sufficiently accurate,” and emphasizes that 71 millirem (mrem) as a bounding dose is “very low” and “sufficient accuracy is not an issue at this low dose” (NIOSH, 2023c, slide 31).

SC&A specifically addresses these most recent NIOSH responses on extreme conservatism as an attachment to this memorandum. While NIOSH has since chosen not to reference its originally

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defined approach for extreme conservatism, SC&A made it clear in its December 6, 2023, presentation (SC&A, 2023c, slide 23) to the work group that:

- SC&A has cited NIOSH’s defined application and scope of “extreme conservatism” precisely as given and in the context it was given by NIOSH in its January 2023 response paper. Its application is manifest in the substantial conservative assumptions and statistical margins relied upon in M&C bounding models.
- If NIOSH’s bounding model cannot account for M&C’s “intrusive activities, high exposure conditions, uncertain facility activities, or unknown contamination sources” (NIOSH, 2023a) without resorting to extreme conservatism, *sufficient accuracy* and *plausibility* become concerns.

To enable the fuller and focused discussion of extreme conservatism that the work group requested, this SC&A memorandum moves away from discussing quotes by members of the Advisory Board on Radiation and Worker Health (ABRWH, “Board”) regarding conservatism and comments regarding the low levels of radiation dose involved.<sup>1</sup> Instead, this memorandum examines the existing procedural basis for establishing sufficiency of information and addressing uncertainty in dose reconstruction with sufficient accuracy.

## Background: SEC Procedural Basis

Under Title 42 of the Code of Federal Regulations (42 CFR) Part 83, “Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort under the Energy Employees Occupational Illness Compensation Program Act of 2000, paragraph 83.13(c)(1)(i), the feasibility of estimating radiation dose with sufficient accuracy is defined, in part, as: “Radiation doses can be estimated with sufficient accuracy if NIOSH has established that it has access to **sufficient information** to estimate the maximum radiation dose, for every type of cancer for which radiation doses are reconstructed, that could have been incurred in **plausible circumstances** by any member of the class” (emphasis added). NIOSH must also determine that it “has information regarding **monitoring, source, source term, or process from the site** where the employees worked to serve as the basis for a dose reconstruction” (42 CFR 83.13(c)(1)(i); emphasis added).

Also, paragraph (c)(1)(ii) stipulates that “In many circumstances, to establish a positive finding under paragraph (c)(1)(i) of this section would require, at a minimum, that NIOSH have access to **reliable information** on the identity or set of possible identities and **maximum quantity of**

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<sup>1</sup> As established by statute, regulation, and precedent for the Energy Employees Occupational Illness Compensation Program Act (EEOICPA), the level of dose involved is not, a priori, a reason to preempt establishing the “sufficient accuracy” of dose estimation for an SEC evaluation as stated by NIOSH (NIOSH, 2023c, slide 31). There is no de minimis dose level at which an SEC evaluation would not evaluate sufficient accuracy. As stressed by SC&A in previous reports to the work group, both NIOSH and the Board have recommended SEC classes for workers at sites (e.g., Pantex, Sandia, other uranium processing Atomic Weapons Employers (AWEs)) that involved relatively low dose levels. The threshold question for SEC evaluations under 42 CFR Part 83 is whether dose reconstruction with sufficient accuracy is feasible based on available site information.

**each radionuclide (the radioactive source material) to which members of the class were potentially exposed without adequate protection”** (emphasis added).

Paragraph (c)(1)(iii) likewise stipulates that “In many circumstances, to establish a positive finding under paragraph (c)(1)(i) of this section would also require information describing the **process** through which the radiation exposures of concern may have occurred and the **physical environment** in which the exposures may have occurred” (emphasis added).

Under 42 CFR Part 82, “Methods for Conducting Dose Reconstruction under the Energy Employees Occupational Illness Compensation Program Act,” paragraph 82.2(c) emphasizes that in the absence of workplace monitoring data, it is important that process information be relied upon in the development of an exposure model:

If neither adequate worker nor workplace monitoring data are available, the dose reconstruction may rely substantially on process description information to analytically develop an exposure model. For internal exposures, this model includes such factors as the quantity and composition of the radioactive substance (the source term), the chemical form, particle size distribution, the level of containment, and the likelihood of dispersion.

In terms of case precedent, the U.S. Department of Health and Human Services (HHS) SEC designation basis for Linde Ceramics specifically addressed the importance of establishing the similarity of conditions and processes when applying radiological data from one time period (in this case, end of operational period) to another (Linde’s renovation phase), as follows:

**In order for radiological data from one time period to be considered informative about exposures during another time period, there should be some similarity of conditions and processes between the two periods.** The NIOSH ER [evaluation report] regarded the decontamination activities at the end of the operational period to be sufficiently similar to renovation activities during the residual period. Therefore, NIOSH believed that radiological data from the former were informative about exposures during the latter. Although NIOSH has proposed claimant-favorable dose reconstruction methods in its ER for workers at the Linde site during the renovation period, **the uncertainty (as discussed by the Board) concerning what activities actually took place during renovation and the impact such activities might have had on the resulting dose levels suggests that the dose reconstruction methods may not account for all exposure scenarios during building renovation.** [HHS, 2011, p. 3; emphasis added]

Regarding M&C, SC&A has raised unknowns and uncertainties in its previous reports (SC&A, 2022, 2023a, 2023b) regarding the source terms, exposure pathways, and conditions and processes (the “process” and “physical environment” pursuant to 42 CFR Part 83) during the entirety of the 27-year residual period prior to 1995 for which “sufficient” and “reliable” information is not available upon which dose reconstruction with sufficient accuracy may be

performed.<sup>2</sup> NIOSH's stated use of extreme conservatism in its M&C dose modeling to "account for intrusive activities, high exposure conditions, uncertain facility activities, or unknown contamination sources" (NIOSH, 2023a, p. 17) during the M&C residual period acknowledges these unknowns and uncertainties, but it applies extreme assumptions and statistical margins to compensate for what SC&A finds is a lack of sufficient and reliable information. SC&A finds that NIOSH's application of extreme conservatism for modeling a bounding exposure scenario for M&C's residual period prior to 1995 may not adequately account for the unavailability of sufficient and reliable information about processes and conditions affecting potential exposure of maintenance workers as required by 42 CFR Part 83.

### Issues and Implications: Use of "Extreme Conservatism" in Bounding Models

When lacking requisite site worker exposure information (e.g., monitoring, source, source term, process), EEOICPA regulatory requirements provide for two fundamental program options: (1) dose reconstruction relying on maximum dose estimates from bounding scenarios using available site information, usually from a different operational time period, or (2) designation of an SEC class reflecting the unavailability of information to support dose reconstruction with sufficient accuracy. A decision between the two options is predicated on NIOSH's and ultimately the Board's judgment regarding the feasibility of dose reconstruction. This feasibility judgment weighs the sufficient accuracy of dose reconstruction based on the sufficiency and reliability of the site information available for the worker exposures involved.<sup>3</sup> The threshold questions for the Board are:

1. what potential exposure pathways may have existed and whether they represent "plausible circumstances" under 42 CFR Part 83
2. whether available information for those exposures is sufficient and reliable to support a maximum dose estimate

Conservatism itself in exposure estimation and modeling is not the issue. The need to address the inherent uncertainties of available dose data and facility information by applying conservative assumptions and statistical margins has long been accepted as part of NIOSH's dose reconstruction methods. The degree of conservatism can be increased based on NIOSH's judgement of the corresponding degree of uncertainty to be addressed. However, *taken to its extreme*, the maximizing of modeled radiation dose estimates in the service of ensuring modeled scenarios are bounding, *without* sufficient and reliable information to back them up, would not satisfy the provisions of 42 CFR Part 83 for how the feasibility of individual dose reconstruction with sufficient accuracy is to be demonstrated. In its original definition of extreme conservatism, NIOSH made clear its intention to apply "extreme conservatism in its modeling to account for intrusive activities, high exposure conditions, uncertain facility activities, or unknown contamination sources." For M&C, some or all of these circumstances likely existed during the residual period prior to 1995, and information is lacking that would adequately inform the

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<sup>2</sup> For M&C, these include the presence of regularly discharged coagulants to the drain system of Building 10, the cutting and cleaning of pipes containing contaminated scale, and the movement and maintenance of AWE-era internally contaminated equipment and machinery.

<sup>3</sup> As well as a finding of "health endangerment" under 42 CFR 83.13(c)(3)(ii) for an SEC.

“Inside Subsurface” model scenario for these unknown or uncertain source terms and exposures during the earlier residual time periods involved.

Sufficient and reliable information, as with “sufficient accuracy,” is clearly a judgment call, but would encompass how complete and adequate the monitoring, source, source term, or process information from the site is for the time period in question. Where information to be applied in bounding scenarios is derived from different time periods, it is incumbent on NIOSH to demonstrate that the facility conditions and processes between the two time periods are similar.<sup>4</sup> For M&C, this is particularly challenging given the 27-year time span (1968–1995) of the residual period prior to the 1995 pre-D&D drainpipe sediment sampling upon which the Inside Subsurface bounding model is based. As noted by the M&C Work Group, “because of the identified differences between the two periods (residual vs. D&D era<sup>[5]</sup>), there is insufficient basis to conclude that radiological data from D&D efforts (including pre-D&D surveys) are sufficiently informative about exposures arising during the entirety of the M&C residual period to be applied in the manner proposed by NIOSH” (ABRWH, 2023, slide 15). Therefore, adopting extreme conservatism as a means to maximize the bounding dose to overcome the limitations of insufficient and unreliable information is arguably not supported by 42 CFR Part 83.

Plausibility is a subjective attribute and can be defined as “seeming reasonable or probable” (Oxford University Press, 2023). SC&A has made the case that the circumstances are plausible by which M&C maintenance workers may have been potentially exposed during the earlier residual period to elevated radiological source terms due to coagulant effects, contaminated scale, and internally contaminated machinery. Therefore, the key question for the Board is this: Is the Inside Subsurface bounding model implausible if it does not include sufficient and reliable information related to those exposures and instead relies upon dose maximizing techniques that have no realistic basis in the actual physical circumstances at M&C during the entirety of the pre-1995 residual period? While layer upon layer of extremely conservative assumptions and statistical margins can be employed to create an ultimate upper bound for any conceivable site exposure, the bounding model needs to still have some basis in the plausible exposure circumstances for the timeframe in question.

In conclusion, radiation doses can be estimated with sufficient accuracy under 42 CFR Part 83 if the following regulatory requirements are met:

1. NIOSH needs to establish it has access to sufficient information to estimate the maximum radiation dose, for every type of cancer for which radiation doses are reconstructed, that

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<sup>4</sup> This is not explicitly addressed by 42 CFR Part 83 but is stated in the HHS designation of a SEC class for Linde Ceramics (HHS, 2011).

<sup>5</sup> NIOSH has raised an objection to use of this term (“D&D era”) because the survey samples were taken in 1995, at the end of the residual period, prior to the actual commencement of D&D activities at the M&C site (NIOSH, 2023c, slide 23). However, SC&A’s terminology reflects that these pre-D&D surveys represented the first steps of the D&D process mandated by the U.S. Nuclear Regulatory Commission (NRC) and represented sampling results taken at end of the residual period, preceded by a time period of 27 years prior to this sampling (1968–1995). SC&A has clarified in every appropriate instance that these samples were “pre-D&D” samples taken in 1995.

could have been incurred in plausible circumstances by any member of the class (42 CFR 83.13(c)(1)(i)).

*SC&A concludes that plausible circumstances exist for radiation exposures different from and potentially in excess of those addressed by NIOSH's Inside Subsurface bounding model values for M&C maintenance workers for the entirety of the residual period prior to 1995, with insufficient information to estimate those maximum dose contributions.*

2. NIOSH needs to establish that it has access to sufficient information to estimate the radiation doses of members of the class more precisely than an estimate of the maximum radiation dose (42 CFR 83.13(c)(1)(i)).

*There is no source term or radiological monitoring information for the residual period prior to 1995.*

3. NIOSH must also determine that it has information regarding monitoring, source, source term, or process from the site where the employees worked to serve as the basis for a dose reconstruction (42 CFR 83.13(c)(1)(i)).

*SC&A concludes that while NIOSH is back-applying Priority 1 pipe sediment sampling data from a 1995 pre-D&D survey for M&C facilities, the conditions and processes for the earlier M&C residual period were likely different than in 1995 and may have involved elevated source terms (e.g., contaminated scale), different processes (e.g., regular discharge of coagulants into drain pipes), and uncertain conditions (e.g., internally contaminated machinery). Sufficient and reliable site information is lacking for these source terms and processes that would enable a maximum dose to be estimated.*

4. If neither adequate worker nor workplace monitoring data are available, the dose reconstruction may rely substantially on process description information to analytically develop an exposure model (42 CFR 82.2(c)).

*SC&A concludes that there is a lack of source term and process description information for the earlier M&C residual period upon which an exposure model can be based. The only definitive process descriptions available are from the 1995 pre-D&D surveys,<sup>6</sup> which form the basis for NIOSH's Inside Subsurface bounding model, but these do not address the unknown or uncertain conditions and processes identified by SC&A previously for the earlier M&C residual period.*

SC&A concludes that however "extreme conservatism" is defined, the use of conservative assumptions and statistical margins in M&C bounding exposure models that have no plausible and demonstrable basis in the sources, source terms, processes, or conditions of the exposures

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<sup>6</sup> In the absence of documented facility monitoring, source, source term, and process information, reliance has been placed on former M&C worker interviews to recollect and describe historic facility work activities and conditions. However, these are not sufficient to characterize pre-1995 source terms for the additional exposure pathways and conditions identified by SC&A.

being addressed prior to 1995 may not be found sufficiently accurate under 42 CFR Part 83. For M&C, it is incumbent on NIOSH to demonstrate that the processes and conditions for the entirety of the residual period up to 1995 (1968–1995) are adequately addressed and encompassed by its Inside Subsurface bounding scenario. SC&A finds that there remain source terms, conditions, and exposure pathways that have yet to be so addressed.

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## **Attachment A: Response to NIOSH Presentation Regarding “Extreme Conservatism” (December 6, 2023)**

NIOSH made a presentation, “Discussion of Metals and Controls Remaining Issues,” before the M&C Work Group on December 6, 2023 (NIOSH, 2023c). This was in response to SC&A’s November 22, 2023, response paper, “SC&A Review of Overall NIOSH Response to SC&A’s Supplemental Review of M&C Work Group Issues as of November 2023” (SC&A, 2023b). Within that presentation, NIOSH responded to SC&A’s review of “extreme conservatism” in slides 24–31. The following is a review of and response to NIOSH’s comments.

### *“Extreme Conservatism (1 of 8),” slide 24*

- NIOSH has specified what it meant by extreme conservatism – “conservative assumptions appropriate for a bounding scenario.”
- SC&A’s inaccurate representation of NIOSH’s use of this phrase are based on its unsubstantiated assertions regarding confined spaces, green lube, and the applicability of sampling data from late in the maintenance period to the preceding years – a practice consistent with 20 years of program precedent.

[NIOSH, 2023c, slide 24]

### SC&A response

NIOSH seemingly has moved away from its definition of extreme conservatism detailed in its January 2023 response paper (NIOSH, 2023a, p. 17). This January 2023 definition is the one for which SC&A and the Work Group have earlier expressed concerns. As SC&A noted in its own December 6 presentation to the work group:

- SC&A has cited NIOSH’s defined application and scope of “extreme conservatism” precisely as given and in the context it was given by NIOSH in its January 2023 response paper. Its application is manifest in the substantial conservative assumptions and statistical margins relied upon in M&C bounding models. [SC&A, 2023c, slide 23]

Regarding NIOSH’s claim about SC&A’s “unsubstantiated assertions” regarding “confined spaces” and “green lube” (the ‘coagulants’ in SC&A’s review), these conditions and processes (SC&A also includes contaminated scale and internally contaminated machinery) were all originally identified or acknowledged by NIOSH in its various M&C reviews<sup>7</sup> but are not addressed in its Inside Subsurface bounding model. SC&A considers such potential exposure pathways to be credible and plausible exposure circumstances that would have been present during the earlier M&C residual period. Pursuant to 42 CFR Part 83, NIOSH needs to demonstrate that “it has access to sufficient information to estimate the maximum radiation dose . . . that could have been incurred in plausible circumstances by any member of the class” (42 CFR 83.13(c)(1)(i)), which would include these exposure pathways.

*“Extreme Conservatism (2 of 8),” slide 25*

- SC&A selectively quoted former Board Member Melius, “carried to an extreme, we could take any site . . . and we could come up with what we think is the highest possible exposure at that site that would occur, and that would be bounding, and apply that to everybody that ever worked at the site” (ABRWH, 2011, p. 129). However, the essential questions, as the former Board Chair put it, are “is that a plausible bound? And then, who are we trying to characterize?” (ABRWH, 2011, p. 129).

[NIOSH, 2023c, slide 25]

SC&A response

As noted in its supplemental review (SC&A, 2022, pp. 28–30), SC&A was responding to NIOSH’s own quotes from Dr. Melius to support NIOSH’s position that a guiding principle NIOSH follows for addressing the work performed (“e.g., one person doing all the maintenance work”) is that it is “NOT an issue when the bounding doses are very low, and specifically, during AWE residual periods such as at M&C” (NIOSH, 2020, slide 14). SC&A only provided other

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<sup>7</sup> For confined spaces, NIOSH acknowledged that “there were confined spaces at M&C,” but the “concern within the EEOICPA program is only for those with a radiological hazard” (NIOSH, 2023b, p. 17). NIOSH committed that it will need to review “recent suggestions to upgrade its dust loading models including enhancement factors and confined spaces and will consider incorporating methods suggested by SC&A in their supplemental review” (NIOSH, 2023b, p. 24).

For coagulants, NIOSH identified the regular discharge of coagulant oils in its 2017 former worker interviews (NIOSH, 2017a, p. 6) and identifies the Beckett (“aka Beckhart”) line in Building 10 as a “major source of coagulants to Area 9 drain lines” (NIOSH, 2023b, p. 4).

For contaminated scale, NIOSH acknowledged the presence of interior pipe contamination in M&C drain pipes in a 2021 response to an Advisory Board inquiry (NIOSH, 2021, pp. 6–7) regarding a “1,000,000 dpm/100 cm<sup>2</sup>” reported interior pipe surface measurement based on a 1995 pre-D&D survey of Priority 1 drain pipes (Weston, 1996, PDF pp. 10–11).

For internally contaminated machinery, NIOSH originally identified this potential exposure pathway based on 2017 former worker interviews and found that it had not been addressed by the ER resuspension models based on OTIB-0070 and involved “repurposing M&C equipment (e.g., removing and replacing mill units)” (NIOSH, 2017b, p. 1).

quotes from Dr. Melius from the same Linde Ceramics SEC deliberations and SEC work group discussions to provide a more balanced and complete recitation of his viewpoints.

*“Extreme Conservatism” (3, 4, 5, 6, and 7 of 8), slides 26–30*

NIOSH presented selected quotes from past and current Board members opining on the question of sufficient accuracy and applying conservatism in establishing bounding values for Linde Ceramics. NIOSH questioned why SC&A had not cited them as well.

SC&A response

SC&A does not dispute (1) that there were and are a spectrum of opinions and interpretations of how conservatism should be reflected in bounding scenarios and (2) that it is helpful to review that commentary for background. However, as noted in SC&A’s response to slide 25, reference to such citations began with NIOSH’s selective use of Dr. Melius’ statement from the Linde Ceramics proceedings to substantiate its position for bounding M&C potential doses. SC&A only offered its particular citations to balance the record regarding what Dr. Melius more broadly had to say on the subject. As for the comments made by other Board members, including the additional ones cited for Dr. Melius, care should be taken regarding the context of the Board’s discussion containing those quotes to match the issue at hand. In other words, concern over maximizing bounding doses for their own sake, without relating those doses to actual workers and realistic exposure pathways, may prove to be implausible and lead to values that are not sufficiently accurate.

*“Extreme Conservatism (8 of 8),” slide 31*

- Clearly, the Board questioned whether **high** bounding doses were sufficiently accurate.
- 71 mrem is very low and comparable to natural background. Sufficient accuracy is not an issue at this low dose.
- Board previously accepted 100 mrem bounding dose at Sandia.
- In fact, doses <100 mrem are below NRC and DOE’s threshold for required monitoring! How can this be high enough to present sufficient accuracy concerns?

[NIOSH, 2023c, slide 31]

SC&A response

In its final slide on extreme conservatism for its December 6, 2023, presentation, NIOSH misinterprets SC&A’s and the work group’s position as questioning “whether **high** bounding doses were sufficiently accurate” and notes that 71 mrem as a bounding dose is “very low,” and “sufficiency accuracy is not an issue at this low dose” (NIOSH, 2023c, slide 31).

What the Board and SC&A are actually questioning (not “whether **high** bounding doses were sufficiently accurate”) has previously been detailed by SC&A (2023b, p. 46):

The application of “extreme conservatism” in formulating the proposed upper bound concentration to account for “intrusive activities, high exposure conditions,

uncertain facility activities, or unknown contamination sources” may not be a plausible approach to compensate for inadequate or insufficient information.

Regarding “sufficient accuracy” not being an issue when a bounding dose is “very low,” SC&A believes NIOSH’s stated position is at odds with the requirements of 42 CFR Part 83. As established by statute, regulation, and precedent for EEIOCPA, the level of dose involved is not, a priori, a reason to preempt establishing the “sufficient accuracy” of dose estimation for an SEC evaluation as asserted by NIOSH (2023c, slide 31). There is no de minimis dose level at which an SEC evaluation would not evaluate “sufficient accuracy.”<sup>8</sup> As stressed by SC&A in previous reports to the work group, both NIOSH and the Board have recommended SEC classes for workers at sites (e.g., Pantex, Sandia, other uranium processing AWEs) that involved relatively low dose levels. The threshold question for SEC evaluations is whether dose reconstruction with sufficient accuracy is feasible based on available site information.

The Board accepted a 100 mrem bounding dose for Sandia in that SEC review because laboratory-wide implementation of 10 CFR Part 835 requirements for internal exposure monitoring was found to adequately support a 100 mrem committed effective dose equivalent (CEDE) annual monitoring requirement as the bounding value in the proposed co-exposure model. Supporting that position were SC&A’s findings that security guards who had access to higher exposure areas were not potentially exposed to unmonitored intakes in excess of 100 mrem CEDE per year. Additionally, actual worker monitoring data in the form of breathing zone measurements and bioassay data were available for the entire time period of interest for Sandia. The program circumstances, processes, and conditions at each covered site undergoing SEC review are typically unique and have been addressed as such in the past. There is little equivalency or comparison between Sandia and M&C in terms of the bounding values developed, the exposure pathways involved, and the facility information available.

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<sup>8</sup> While “sufficient accuracy” represents a prescribed threshold criterion under 42 CFR Part 83 for deciding the feasibility of dose reconstruction under EEIOCPA, SC&A believes NIOSH may be conflating this statutory-based judgment with a guiding principle that has been previously discussed in Board proceedings. For example, as noted by both SC&A and NIOSH, Dr. Melius made an observation during a meeting of the SEC Work Group in 2013:

If the absolute value of the exposure is relatively low, then we’re willing to accept more variability in the dose if it’s being calculated for an individual. And if the exposure’s absolute values are higher, then we’re looking for a more accurate dose reconstruction method. (ABRWH, 2013, p. 19).

However, as pointed out by SC&A in its supplemental review, his comment speaks to the relative precision sought, not the statutory and regulatory “sufficient accuracy” determination that is required for SEC evaluations. SC&A (2022, p. 30) commented:

The preceding [Melius quotes cited by NIOSH (ABRWH, 2011, p. 144; ABRWH, 2013, p. 19) and SC&A (ABRWH, 2011, pp. 121–124; ABRWH, 2013, pp. 37–38), as provided in SC&A 2022, pp. 28–29] suggests that while less precision or accuracy could be tolerated if the exposure of a worker cohort is relatively low, the use of a high exposure or concentration value based on a set of specific workplace data to bound or represent that of other workers in a facility or on a site, particularly over a lengthy time period, would not be appropriate if their exposure potential could be higher, work conditions were different, or if there is lack of information upon which to make that judgment.

Finally, NIOSH concludes that because M&C's bounding dose level is below 100 mrem/year (CEDE), the NRC and DOE regulatory threshold for radiological monitoring, the Board should accept that there are no "sufficiency accuracy" issues with its bounding value. First, as pointed out previously, there is no recognized de minimis dose level under EEOICPA or its enabling regulations. Second, SC&A has repeatedly stressed that there is insufficient information available to account for the exposure contribution of contaminated pipe scale, coagulant effects, and internally contaminated AWE-era machinery in a workplace not controlled as a radiation environment, unlike that of the later D&D era at M&C from which NIOSH draws its data. This lack of information constitutes an unresolved uncertainty in the proposed bounding source term over the 27 years of the residual period in question. This dose contribution represents a potential exposure not accounted for in NIOSH's Inside Subsurface bounding value and may have led to higher dose levels for M&C workers than those modelled.