

 **Memorandum**

To: Subcommittee for Procedure Reviews
From: SC&A, Inc.
Date: September 8, 2022
Subject: SC&A Comments on NIOSH's Responses to SCA-TR-2019-PR004

On January 29, 2019, SC&A submitted report SCA-TR-2019-PR004, a review of version 3.0 of the National Institute for Occupational Safety and Health's (NIOSH's) Peek Street Facility (PSF) dose reconstruction (DR) template (SC&A, 2019).¹ SC&A's review identified eight findings and three observations. On June 14, 2022, NIOSH submitted their responses to SC&A's review (NIOSH, 2022). This memorandum addresses NIOSH's responses.

Finding 1: The assumption of 100% 30–250 kiloelectron volts (keV) for the penetrating photon energy distribution is unsupported and inconsistent with assumptions used in the Hanford technical basis document.

NIOSH (2022, p. 2) responded, in part:

Because the bulk of the radioactive material at the PSF was natural and enriched uranium, most if not all PSF workers were likely externally exposed to uranium during periods of their employment. Table 6-7 in revision 4 of ORAUT-TKBS-0006-6, *Hanford Site – Occupational External Dose* [ORAUT 2010], recommends a photon energy distribution assumption of 100% 30–250 keV photons for fuel fabrication facilities, which were uranium facilities at Hanford.

SC&A does not disagree with NIOSH's reasoning. However, as stated in our DR template review, "SC&A believes NIOSH should include either the basis or a reference for the basis of the penetrating photon energy distribution" (SC&A, 2019, p. 12).

Finding 2: The assumption of an uncertainty factor of 1.3 is unsupported and inconsistent with the cited reference.

NIOSH (2022, p. 2) responded, in part:

NIOSH agrees that revision 04 of ORAUT-TKBS-0006-6 [ORAUT 2010] reduced the uncertainty factor for the years of 1947 to 1954 to 1.2. The revised

¹ SC&A notes that it has not yet been tasked to review version 4.0, the current version of the template.

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uncertainty value and technical basis document (TBD) reference will be updated as part of the next revision to the DR Template.

SC&A is requesting that it be tasked with reviewing the PSF DR template when the revisions are completed to ensure this finding is appropriately addressed.

Finding 3: SC&A was unable to verify the neutron-to-photon ratio of 1.2 using the cited references.

NIOSH (2022, pp. 3–4) responded, in part:

Instead of using the N:P ratios based on NTA film results that were adjusted with an estimated adjustment factor, the PSF evaluation focused on the measured neutron data in Table 6-18. In Table 6-18 of ORAUT [2010], the N:P ratios for the period before 1961 were based on neutron dose measurements rather than NTA film (see Peterson and Smalley [1960] for more details). Those measurements were also performed at the front faces to each of Hanford's eight production reactors. For the period before 1961 (i.e., before any additional shielding was added), the N:P ratios ranged from 0.2:1 to 1.2:1. In addition, N:P ratios based on measurements close to the reactor are more representative of the potential exposures at the PSF. At the PSF, workers with the potential to receive neutron doses from the source material, critical assembly, and/or zero pile were likely within 10 m (33 ft) of the neutron radiation source.

Based on the information at the time of the PSF DR Template development, the N:P ratios that were considered representative ranged from 0.06:1 to 1.2:1. Of those N:P ratios, the 1.2:1 ratio was selected for the PSF because it resulted in the estimates most favorable to the claimants and would ensure that the unmonitored PSF neutron doses were not underestimated.

Since the development of the PSF DR Template, the N:P ratio information in the external TBD for Hanford has changed, and Table 6-18 and its N:P ratio data are no longer in that TBD. [emphasis added] However, the neutron and photon dose measurement data in Peterson and Smalley [1960] on which N:P ratios were based are still considered to be applicable to the PSF. Therefore, NIOSH believes the 1.2:1 N:P ratio being used for the PSF is still valid.

SC&A reviewed ORAUT-TKBS-0006-6, revision 03 (ORAUT, 2007) and revision 04 (ORAUT, 2010), and Peterson and Smalley (1960). While SC&A agrees with NIOSH's reasoning, the PSF DR template SC&A reviewed (version 3.0) does not reflect the basis described in NIOSH's response. As identified in SC&A's (2019) review, the DR template states the neutron-to-photon (N:P) ratio to be used for the PSF was determined from facilities with similar neutron-producing activities:

The technical basis documents for the following reactor and critical assembly sites were reviewed to determine an appropriate neutron-to-photon ratio for the Peek Street Facility: Hanford, Savannah River Site, Oak Ridge National Laboratory, Idaho National Engineering Laboratory, Los Alamos National

Laboratory, Argonne National Laboratory East, Brookhaven National Laboratory, and the Energy Technology Engineering Center Based on the information provided in these technical basis documents, a neutron-to-photon ratio of 1.2:1 is likely claimant-favorable for facilities with critical assemblies and small-scale research reactors. It should also be noted that the technical basis documents for the following sites did not provide any neutron-to-photon ratios: Idaho National Engineering Laboratory, Argonne National Laboratory East, Brookhaven National Laboratory, and the Energy Technology Engineering Center. [quoted in SC&A, 2019, pp. 14–15]

SC&A suggests replacing the current DR template wording with the N:P ratio technical basis given in NIOSH’s response.

Finding 4: The dosimeter LOD used in the DR Template is not specified in the template, and the value of 0.050 rem assumed based on NIOSH’s calculation is not consistent with the Hanford dosimeter information.

NIOSH (2022, p. 4) responded:

As noted in the response to Finding 2, the “0.050 rem” value in the DR Template is a placeholder value and is designed to be updated during the development of the dose reconstruction. NIOSH identified that PSF used a Hanford-type dosimeter throughout its entire operating period. Therefore, the dosimeter information from ORAUT [2010], including limits of detection (LOD), will be referenced as defaults as part of the next revision to the DR Template.

SC&A is requesting that it be tasked with reviewing the PSF DR template when the revisions are completed to ensure this finding is appropriately addressed.

Finding 5: SC&A was unable to verify the PSF annual maximum ambient dose value using the cited reference.

NIOSH (2022, pp. 4–5) responded:

NIOSH identified that an incorrect value of 1.550 rem was originally used for the 1949 ORNL dose when the average maximum annual ambient dose value was originally calculated. The 1949 ORNL dose value should have been 1.555 rem. Correcting that results in an updated average value of 0.433 rem, versus the 0.423 rem in the DR Template, which matches SC&A’s calculated value. However, NIOSH plans on reevaluating and revising this section with more current information in order to provide a more accurate estimate of onsite ambient dose as part of the next revision to the DR Template.

SC&A is requesting that it be tasked with reviewing the PSF DR template when the revisions are completed to ensure this finding is appropriately addressed.

Finding 6: The DR Template occupational medical dose basis contains incorrect information and outdated references.

NIOSH (2022, p. 5) responded:

NIOSH will investigate if occupational medical X-rays for the PSF workers were performed offsite. The Occupational Medical Dose Section of the DR Template will be updated based on the outcome of this investigation and guidance in ORAUT-OTIB-0006, *Dose Reconstruction from Occupational Medical X-Ray Procedures* [ORAUT 2019] and ORAUT-OTIB-0079, *Guidance on Assigning Occupational X-ray Dose Under EEOICPA for X-rays Administered Off Site* [ORAUT 2017].

SC&A is requesting that it be tasked with reviewing the PSF DR template when the revisions are completed to ensure this finding is appropriately addressed.

Finding 7: The fission product information in the DR Template is not consistent with current guidance in ORAUT-OTIB-0054, revision 04.

NIOSH (2022, p. 5) responded:

NIOSH agrees that guidance associated with the current version of ORAUT-OTIB-0054, *Fission and Activation Product Assignment for Internal Dose-related Gross Beta and Gross Gamma Analyses* [ORAUT 2015], needs to be incorporated into the DR Template. This will be done as part of the next revision to the DR Template.

SC&A is requesting that it be tasked with reviewing the PSF DR template when the revisions are completed to ensure this finding is appropriately addressed.

Finding 8: No basis or reference is cited for the recycled uranium activity fractions in table 5 of the DR Template.

NIOSH (2022, p. 5) responded:

NIOSH agrees that the section on the recycled uranium activity fractions should be updated. NIOSH will revise the DR Template based on guidance in Battelle-TBD-6000, *Site Profiles for Atomic Weapons Employers that Worked Uranium Metals* [NIOSH 2011].

SC&A is requesting that it be tasked with reviewing the PSF DR template when the revisions are completed to ensure this finding is appropriately addressed.

Observation 1: SC&A did not locate a PSF-specific tool containing the preprogrammed plutonium DCFs.

NIOSH (2022, p. 6) responded:

Given the limited number of claims for PSF, no site-specific tool has been created for PSF. For sites without a site-specific tool, the complex-wide generic “SM Calculation Workbook” is used.

The PSF DR template SC&A reviewed (version 3.0) contains the following wording about a site-specific DR tool:

(NOTE: For the <30 keV photons energy group, the organ DCFs [dose conversion factors] in Table 4.1a of IG-001 [i.e., for the <20 keV Pu photons] should be used instead of the App B organ DCFs. Because Table 4.1a does not provide 20 keV photon organ DCF values for the esophagus or the ovaries, the <30 keV photon DCFs should be used, in accordance with the Table 4.1a recommendations. **It should also be noted that the Table 4.1a based values for the <30 keV photon energy group have been programmed into the tool that was created for the PSF.**) [emphasis added] [quoted in SC&A, 2019, p. 13]

SC&A suggests removing the reference to a PSF-specific tool.

Observation 2: The natural uranium PSL in the DR Template is not consistent with information in ORAUT 1997 and is not referenced.

NIOSH (2022, p. 6) responded:

The color coding in the DR Template indicates that claim-specific PSL values are a placeholder value to be updated during the dose reconstruction process. This is why they do not match what is in “ORAUT 1997” [GE 1997]. Additionally, “ORAUT 1997” is not the primary reference for the PSL values that are used in the PSF dose reconstructions, as the claim-specific information takes precedence over generic programmatic information.

The “5 µg uranium/day” in the template is actually based on the PSLs for natural uranium in urine that were reported in Claims [identifying information redacted]. Those [redacted] claims were the only known PSF claims with natural uranium urine bioassay data at the time that the DR Template was created. Therefore, NIOSH believes that there is value in maintaining the “5 µg uranium/day” in the DR Template.

SC&A is not familiar with PSF bioassay data and reporting practices. As such, SC&A would like to review the bioassay information and application for the claims cited.

Observation 3: The plutonium composition information is correct. However, the reference cited is outdated and needs updating.

NIOSH (2022, p. 6) responded:

NIOSH agrees that the reference for the plutonium composition information is outdated and needs updating. NIOSH will update the reference as part of the next revision to the DR Template.

SC&A is requesting that it be tasked with reviewing the PSF DR template when the revisions are completed to ensure this finding is appropriately addressed.

References

General Electric Company (GE), Knolls Atomic Power Laboratory (KAPL). (1997). Excerpts from KAPL radiological history report. Peek Street Facility, Schenectady, NY. SRDB Ref. ID 34947 [previously referenced as “ORAUT 1997”]

National Institute for Occupational Safety and Health. (2007). *External dose reconstruction implementation guideline* (OCAS-IG-001, rev. 3). <https://www.cdc.gov/niosh/ocas/pdfs/dr/oc-ig-001-r3.pdf>

National Institute for Occupational Safety and Health. (2011). *Site profiles for Atomic Weapons Employers that worked uranium metals* (Battelle-TBD-6000, rev. 1). SRDB Ref ID 101251

National Institute for Occupational Safety and Health. (2022). *Responses to SCA-TR-2019-PR004, revision 0, Dose reconstruction template review for the Peek Street Facility, Schenectady, New York* [Response paper].

Oak Ridge Associated Universities Team (ORAUT). (2007). *Hanford Site – Occupational external dose* (ORAUT-TKBS-0006-6, rev. 03). <https://www.cdc.gov/niosh/ocas/pdfs/arch/hanford6-r3.pdf>

Oak Ridge Associated Universities Team. (2010). *Hanford Site – Occupational external dose* (ORAUT-TKBS-0006-6, rev. 04). <https://www.cdc.gov/niosh/ocas/pdfs/tbd/hanford6-r4.pdf>

Oak Ridge Associated Universities Team. (2015). *Fission and activation product assignment for internal dose-related gross beta and gross gamma analyses* (ORAUT-OTIB-0054, rev. 04). <https://www.cdc.gov/niosh/ocas/pdfs/tibs/or-t54-r4.pdf>

Oak Ridge Associated Universities Team. (2017). *Guidance on assigning occupational x-ray dose under EEOICPA for x-rays administered off site* (ORAUT-OTIB-0079, rev. 02). SRDB Ref. ID 166967

Oak Ridge Associated Universities Team. (2019). *Dose reconstruction from occupational medical x-ray procedures* (ORAUT-OTIB-0006, rev. 06). SRDB Ref. ID 178310

Peterson, E. G., & Smalley, W. L. (1960). *Proposed procedure for reducing reactor front face dose rates* (HW-66117). General Electric, Hanford Atomic Products Operation, Richland, WA. SRDB Ref. ID 15200

SC&A, Inc. (2019). *Dose reconstruction template review for the Peek Street Facility, Schenectady, New York* (SCA-TR-2019-PR004, rev. 0). <https://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-peekstdrtemp-r0-508.pdf>