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National Institute for Occupational Safety and Health

A Review of NIOSH's Program Evaluation Report DCAS-PER-070, "Nuclear Metals Inc."

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Table of Contents

Abbreviations and Acronyms 4
1 Statement of Purpose 5
2 Relevant Background Information 7
3 Subtask 1: Identify the Circumstances that Necessitated DCAS-PER-070 8
3.1 Chronology of events 8
3.2 SC&A's comments 8
4 Subtask 2: Assess NIOSH's Specific Methods for Corrective Action 9
4.1 Internal dose estimate 9
4.2 External dose estimate 10
4.3 Residual period internal dose estimate 12
4.4 Residual period external dose estimate 13
4.5 Occupational medical dose estimate 14
5 Subtask 3: Evaluate the PER's Stated Approach for Identifying the Number of DRs Requiring Reevaluation of Dose 15
5.1 NIOSH's selection criteria 15
5.2 SC&A's comments 15
6 Subtask 4: Conduct Audits of a Sample Set of Reevaluated DRs Mandated by DCAS-PER-070 16
7 References 17

Abbreviations and Acronyms

ABRWH, Board	Advisory Board on Radiation and Worker Health
Ac	actinium
DCAS	Division of Compensation Analysis and Support
DR	dose reconstruction
dpm/100 cm^2	disintegrations per minute per 100 square centimeters
dpm/day	disintegrations per minute per day
EPA	U.S. Environmental Protection Agency
FGR	Federal Guidance Report
IREP	Interactive RadioEpidemiological Program
keV	kiloelectron volt
m^{-1}	per meter
m^2/hr	square meters per hour
MDS	minimum detectable sensitivity
mR	milliroentgen
mrad	millirad
mrem	millirem
mrem/yr	millirem per year
NA	not applicable
NIOSH	National Institute for Occupational Safety and Health
NMI	Nuclear Metals Inc.
NRC	U.S. Nuclear Regulatory Commission
ORAUT	Oak Ridge Associated Universities Team
pCi/day	picocuries per day
pCi/m^2	picocuries per square meter
pCi/m^3	picocuries per cubic meter
pCi/mg	picocuries per milligram
PER	program evaluation report
POC	probability of causation
Ra	radium
SEC	special exposure cohort
SRDB	Site Research Database
TBD	technical basis document
Th	thorium

1 Statement of Purpose

To support dose reconstruction (DR), the National Institute for Occupational Safety and Health (NIOSH) and the Oak Ridge Associated Universities Team (ORAUT) assembled a large body of guidance documents, workbooks, computer codes, and tools. In recognition of the fact that all of these supporting elements in DR may be subject to revisions, provisions exist for evaluating the effect of such programmatic revisions on the outcome of previously completed DRs. Such revisions may be prompted by document revisions due to new information, misinterpretation of guidance, changes in policy, and/or programmatic improvements.

A program evaluation report (PER) provides a critical evaluation of the effects that a given issue or programmatic change may have on previously completed DRs. This includes a qualitative and quantitative assessment of potential impacts. Most important in this assessment is the potential impact on the probability of causation (POC) of previously completed DRs with POCs less than 50 percent.

During a teleconference by the Advisory Board on Radiation and Worker Health (Board) Subcommittee for Procedure Reviews on June 21, 2023, the Board tasked SC&A to review DCAS-PER-070, revision 0 (NIOSH, 2016; "PER-070"), which was issued to address the impacts on previously completed claims of issuing DCAS-TKBS-0010, revision 00 (NIOSH, 2015), the technical basis document (TBD) for Nuclear Metals Inc. (NMI). In conducting a PER review, SC&A is committed to perform the following five subtasks, each of which is discussed in this report:

- **Subtask 1:** Assess NIOSH's evaluation and characterization of the issue addressed in the PER and its potential impacts on DR. Our assessment intends to ensure that the issue was fully understood and characterized in the PER.

- **Subtask 2:** Assess NIOSH's specific methods for corrective action. When the PER involves a technical issue that is supported by documents (e.g., white papers, technical information bulletins, procedures) that have not yet been subjected to a formal SC&A review, subtask 2 will include a review of the scientific basis and/or sources of information to ensure the credibility of the corrective action and its consistency with current/consensus science. Conversely, if such technical documentation has been formalized and previously subjected to a review by SC&A, subtask 2 will simply provide a brief summary and conclusion of this review process.

- **Subtask 3:** Evaluate the PER's stated approach for identifying the universe of potentially affected DRs and assess the criteria by which a subset of potentially affected DRs was selected for reevaluation. The second step may have important implications where the universe of previously denied DRs is very large and, for reasons of practicality, NIOSH's reevaluation is confined to a subset of DRs that, based on their scientific judgment, have the potential to be significantly affected by the PER. In behalf of subtask 3, SC&A will also evaluate the timeliness of the completion of the PER.

- **Subtask 4:** Conduct audits of DRs affected by the PER under review. The number of DRs selected for audit for a given PER will vary. (It is assumed that the Board will select the DRs and the total number of DR audits for each PER.)

- **Subtask 5:** Prepare a written report that contains the results of DR audits under subtask 4, along with our review conclusions.

2 Relevant Background Information

On October 29, 1958, NMI moved to West Concord, Massachusetts. NMI operated as an Atomic Weapons Employer facility from 1958 through 1990, with a residual period from 1991 through 2011. Beginning in 1958, NMI began producing depleted uranium products for armor-piercing ammunition. NMI also supplied copper-plated uranium billets for Savannah River's production reactors. Other work conducted at NMI included manufacturing metal powders for medical applications, photocopiers, and other applications. NMI also handled thorium and thorium oxides.

Two classes of workers were added to the Special Exposure Cohort (SEC) for NMI. SEC Petition 195 established a class of workers that covered from October 29, 1958, through December 31, 1979, and an addendum to that petition established a class from January 1, 1980, through December 31, 1990. Both classes indicated that internal dose from thorium and enriched uranium could not be estimated with sufficient accuracy.

3 Subtask 1: Identify the Circumstances that Necessitated DCAS-PER-070

3.1 Chronology of events

Dose reconstructions for claims from NMI were originally performed using site research that was eventually summarized in the SEC evaluation report for SEC Petition 195. On April 24, 2015, NIOSH issued DCAS-TKBS-0010, the TBD for NMI (NIOSH, 2015). PER-070 (NIOSH, 2016) evaluated the effects of using the TBD on all previously completed NMI claims.

3.2 SC&A's comments

Programmatic revisions that may affect the outcome of previously completed DRs and mandate the need for a PER include any revisions to guidance documents that may result in the assignment of a higher dose.

SC&A believes that the issuance of a TBD for NMI dose estimates is justification for reevaluating worker doses, as defined in PER-070. SC&A concurs with NIOSH's decision to issue PER-070 and has no findings.

4 Subtask 2: Assess NIOSH's Specific Methods for Corrective Action

Prior to the issuance of DCAS-TKBS-0010 (NIOSH, 2015), DRs for NMI were performed using site research. Since SC&A has not previously reviewed DCAS-TKBS-0010, SC&A's review of PER-070 includes an evaluation of its guidance to assess the scientific basis and sources of information to ensure the credibility of the corrective action.

4.1 Internal dose estimate

As stated in DCAS-TKBS-0010 (NIOSH, 2015), NIOSH had previously determined that the internal dose from thorium and enriched uranium and their progeny could not be estimated, but that internal dose from natural or depleted uranium could be estimated. Internal dosimetry records are believed to exist for the majority of NMI employees, which include uranium urinalyses by fluorometric technique. The TBD states that the assumed minimum detectable activity for this analysis is 0.005 milligrams per liter, and that a specific activity of 683 picocuries per milligram (pCi/mg) should be used for natural uranium (NIOSH, 2015). To determine the internal dose due to natural and depleted uranium during the operational period for workers without internal dosimetry records, the TBD indicates that the NMI internal coworker dosimetry guidance document ORAUT-OTIB-0084, revision 00 (ORAUT, 2013; "OTIB-0084"), should be used.

4.1.1 SC&A's comments

SC&A reviewed section 4.0 of DCAS-TKBS-0010. SC&A agrees with NIOSH that any available internal dosimetry records should be used for a given DR. SC&A also agrees that for unmonitored workers, OTIB-0084 should be used to assess internal dose from uranium. However, it should be noted that this document has not yet been reviewed by SC&A but is outside of the scope of this review. SC&A also notes that OTIB-0084 is a co-exposure model that has not been updated to meet the newer guidance in DCAS-IG-006, revision 00, "Criteria for the Evaluation and Use of Co-Exposure Datasets" (NIOSH, 2020).

Observation 1: Clarification needed on type of uranium assumed for exposures of monitored and unmonitored workers

It appears that the assumptions for what type of uranium a worker was exposed to differs whether they were monitored or not. When discussing the conversion of fluorometric uranium urinalysis data from mass units to activity units, DCAS-TKBS-0010 (NIOSH, 2015) suggests using a specific activity for natural uranium of 683 pCi/mg. However, section 3.1 of OTIB-0084 (ORAUT, 2013, p. 7) discusses how NIOSH handled urinalysis data in the development of the co-exposure model and states that NIOSH used a "uranium-specific activity" of 0.36 picocuries per microgram (or 360 pCi/mg). This is consistent with the depleted uranium value reported in bioassay data sheets from 1983 (Nuclear Metals, 1983a). SC&A requests clarification about the reasoning for the guidance that workers who were monitored are assumed to be exposed to natural uranium, and workers who were not monitored are assumed to be exposed to depleted uranium.

Additionally, SC&A noted that the specific activities of natural and depleted uranium used by NIOSH in DCAS-TKBS-0010 (NIOSH, 2015) and OTIB-0084 (ORAUT, 2013) differ from the specific activities listed in table 3.1 of Battelle-TBD-6000, revision 1 (NIOSH, 2011). SC&A

believes it would be more consistent to use the values from Battelle-TBD-6000 (NIOSH, 2011) in DCAS-TKBS-0010 (NIOSH, 2015) unless more precise site-specific enrichment values are available such as in OTIB-0084.

Observation 2: Additional information needed regarding other bioassay measurements NMI workers could have received during operations

According to the SEC 195 petition evaluation report addendum (NIOSH, 2014), the first in vivo bioassay for NMI was conducted in April 1981, after it was suspected that a worker had an overexposure to airborne depleted uranium. Beginning in 1982, NMI acquired a whole-body counter for uranium lung counting and performed over 800 lung counts from 1982 through 1990. However, section 4.0 of DCAS-TKBS-0010 (NIOSH, 2015) does not discuss any lung counting performed at NMI, nor does it include any information for how the measurements may be used in a dose reconstruction. SC&A believes that DCAS-TKBS-0010 would benefit from a discussion of all other possible bioassay techniques used at NMI during the operational period that may be included in an NMI worker's dosimetry records. This would include whether the in vivo records could potentially be used to assess internal doses in place of the urinalysis model from OTIB-0084 (ORAUT, 2013).

It should be noted that the first paragraph of DCAS-TKBS-0010, section 4.0, refers to "normal" uranium (NIOSH, 2015, p. 5). SC&A believes that NIOSH intended for this to read "natural uranium."

4.2 External dose estimate

Section 5.0 of DCAS-TKBS-0010 (NIOSH, 2015) states that the majority of NMI workers were monitored for external exposures. The TBD also includes a table detailing the dosimeter type, manufacturer, exchange frequency, and minimum detectable sensitivity (MDS) used at NMI over its operational period. The TBD states that if a DR were needed for a worker who did not have external dosimetry records, a co-exposure dose analysis could be conducted, or overestimating or underestimating assumptions should be used to estimate external dose.

4.2.1 SC&A's comments

SC&A reviewed section 5.0 of DCAS-TKBS-0010 (NIOSH, 2015). SC&A agrees with NIOSH that any available external dosimetry records should be used for a given DR. SC&A also agrees with NIOSH's position to use overestimating or underestimating assumptions to assign external dose in a DR if the worker did not have external monitoring records from NMI. However, SC&A has several concerns as discussed in the following observations.

Observation 3: Missing guidance on the energy ranges for assigned doses

SC&A noticed that DCAS-TKBS-0010 (NIOSH, 2015) does not provide guidance on the energy ranges to use for assigning doses. SC&A assumes 30–250 kiloelectron volt (keV) photons are appropriate but believes the document would benefit from the addition of this information.

Observation 4: SC&A is unable to verify the minimum detectable sensitivities in table 1 of DCAS-TKBS-0010

Table 1 of DCAS-TKBS-0010 includes dosimetry information such as providers, time periods, exchange frequency, and MDS. SC&A reviewed several Site Research Database (SRDB)

documents containing dosimetry records spanning the operational period of NMI and was not able to verify all of the MDS values listed in table 1 of DCAS-TKBS-0010 (NIOSH, 2015). Table 1 of this report compares the MDSs in DCAS-TKBS-0010, table 1, and the SRDB documents SC&A reviewed, including the minimum sensitivities given in those documents, if specified.

Table 1. Comparison of dosimetry data in TBD table 1 and SRDB documents

TBD table 1 period of use	TBD table 1 MDS (mrem)	Reviewed SRDB document numbers	Time period covered in SRDB document	MDS listed in SRDB document	Minimum reported dose in SRDB document
10/1/1958–10/26/1959	10 mrem (deep)	25035	1958–1959	10 mR (not specified deep or shallow)	10 mR (gamma); 10 mrad (beta)
10/26/1959–5/1/1961	10 mrem (skin); 5 mrem (deep)	25028; 28468	1960–1961	10 mR (gamma); 10 mrad (beta)	10 mR (gamma); 10 mrad (beta)
5/1/1961–2/7/1968	10 mrem (deep)	25038; 25037; 25045	1961–1962; 1963–1965; 1966–1967	5 mrem for gamma <175 keV and 10 mrem for “hard” gamma and beta	5 mrem (gamma); 10 mrem (beta)
2/7/1968–12/31/1983	10 mrem (skin); 40 mrem (deep)	25040, 25093	1968–1969; 1983	10 mrem (gamma); 40 mrem (beta)	10 mrem (gamma); 40 mrem (beta)
1/1/1984–12/31/1990	10 mrem (skin); 10 mrem (deep)	25042; 113140	10–12/1984; 1–6/1988	10 mrem (gamma); 40 mrem (beta)	10 mrem (deep); 10 mrem (shallow)

Observation 5: Additional clarification needed regarding shallow and deep dose for post-1983 dosimetry records

In 2019, SC&A reviewed a DR for a former NMI employee as part of the 25th set of dose reconstruction reviews (Tab 503). SC&A noted that starting in 1983, the reported shallow dose included deep dose in the dosimetry records. As part of the issue resolution for this case, NIOSH indicated that SC&A correctly assumed that the deep dose was reported with the shallow dose in dosimetry records beginning in 1983, and that NIOSH would provide additional instructions to health physicists conducting DRs for NMI. SC&A recognizes that the TBD was written before the DR was reviewed but reiterates our concern again to ensure that the issue is not lost following the Cybersecurity Modernization Initiative. SC&A believes the TBD would benefit from the inclusion of this information.

Section 5.2.2.3 of the petition evaluation report for SEC 195 (NIOSH, 2012) states that neutron monitoring was not performed at NMI, but that the potential for neutron exposure from α,n reactions with light elements, interactions with oxides, and spontaneous fission existed. The petition evaluation report further states in section 7.3.1.1 that if unmonitored neutron dose needs to be assigned for a given DR, ORAUT-OTIB-0024, revision 00 (ORAUT, 2005), should be

used. However, SC&A did not identify any discussion of external neutron dose in DCAS-TKBS-0010 (NIOSH, 2015). This issue has been discussed at length with the Board for other facilities. Since the potential neutron doses are small in comparison to the photon dose and photon assumptions are overestimating, additional consideration of neutron doses may not be needed. However, SC&A maintains that the issue of neutron dose, even if negligible, should be included in the TBD.

Observation 6: Discussion needed on the presence of industrial radiography at the site and potential doses to workers

SC&A reviewed an SRDB document containing registration information for two industrial x-ray machines that were kept at the site (Nuclear Metals, 1955–1966, PDF p. 46). According to the document, they were used at the site for "x-ray of metal specimens and parts." SC&A believes the TBD would benefit from a discussion of the potential external extremity dose to workers from industrial radiography used at the site.

4.3 Residual period internal dose estimate

Section 6.0 of DCAS-TKBS-0010 (NIOSH, 2015) discusses the potential worker internal exposure to residual contamination after U.S. Department of Energy operations ended. NIOSH used the highest uranium intake rate from OTIB-0084 (ORAUT, 2013) of 574 picocuries per day (pCi/day) along with the guidance of Battelle-TBD-6000 (NIOSH, 2011) to calculate a uranium surface contamination value of 169,700 picocuries per square meter (pCi/m^2). NIOSH then used this surface contamination value with a resuspension factor of 1E-05 per meter (m^{-1}) to derive the estimated resuspended airborne uranium concentration of 1.7 picocuries per cubic meter (pCi/m^3), which results in a uranium inhalation intake rate of 11.2 pCi/day at the beginning of the residual period. NIOSH did not calculate uranium ingestion because the uranium contamination values from OTIB-0084 came from urinalysis samples.

To estimate thorium intake during the residual period, NIOSH used NMI's thorium contamination guideline of 5,000 disintegrations per minute per 100 square centimeters ($dpm/100\ cm^2$) total alpha activity, as NIOSH did not have thorium contamination or bioassay data. This value was divided by 3 to account for the other alpha-emitting radionuclides in the thorium (Th)-232 decay chain. NIOSH calculated the resuspended airborne concentration and then a Th-232 inhalation rate of 11 disintegrations per minute per day (dpm/day). The Th-232 ingestion rate of 100.5 dpm/day was calculated using the surface contamination value and a rate of 1.1E-4 square meters per hour (m^2/hr). The inhalation and ingestion intakes are assigned for each of the five radionuclides in the decay series (Th-232, radium (Ra)-226, actinium (Ac)-228, Th-228, and Ra-224).

The intake rates from uranium inhalation, thorium inhalation, and thorium ingestion were decreased each year of the residual period to account for depletion of the contamination using ORAUT-OTIB-0070, revision 01 (ORAUT, 2012).

4.3.1 SC&A's comments

SC&A reviewed the calculations in section 6.0 of DCAS-TKBS-0010 (NIOSH, 2015) for internal dose from residual contamination. SC&A agrees with NIOSH using the highest uranium intake rate from OTIB-0084 (ORAUT, 2013), but we did not review NIOSH's analyses and

calculations to generate that intake rate. SC&A confirmed NIOSH's calculation of an airborne uranium concentration of 87.3 pCi/m^3 for the start of the residual period, assuming the intake rate of 574 pCi/day is from inhalation for 2,000 hours per year, normalized per calendar day. Using the assumed uranium air concentration of 87.3 pCi/m^3 and the methodology from Battelle-TBD-6000, SC&A also calculated a uranium surface contamination level of 169,711 pCi/m^2, which closely matches NIOSH's value. Assuming a resuspension rate of 1E-05 m^{-1}, SC&A calculated the airborne uranium concentration to be 1.7 pCi/m^3. Assuming inhalation for 2,000 hours per year and normalized over 365 days per year, SC&A calculated a uranium inhalation intake rate for the start of the residual period to be 11.2 pCi/day, which matches NIOSH's calculations. SC&A agrees that since these calculations were based on urinalysis data, uranium ingestion does not need to be calculated separately.

SC&A agrees that in the absence of thorium bioassay data, using the site's thorium contamination limit of 5,000 dpm/100 cm^2 for residual period internal dose calculations is reasonable. SC&A also agrees with dividing this value by 3 since the thorium contamination limit is for total alpha, and there are three alpha decays in the thorium decay chain. Assuming a resuspension rate of 1E-05 m^{-1}, 2,000 hours per year of exposure, and normalizing over 365 days per year, SC&A calculated a thorium inhalation intake rate of 11 dpm/day at the beginning of the residual period, which matches NIOSH's value. Using the ingestion rate of 1.1E-4 m^2/hr from NUREG/CR-5512 (NRC, 2001), SC&A also matched NIOSH's calculated thorium ingestion rate at the beginning of the residual period of 100.5 dpm/day. The inhalation and ingestion intakes should be assigned for each of the five radionuclides in the decay series.

SC&A also confirmed the values in DCAS-TKBS-0010, table 3 (NIOSH, 2015), using table 4-2 of ORAUT-OTIB-0070 (ORAUT, 2012) to account for source term depletion over time during the residual period for uranium inhalation, thorium inhalation, and thorium ingestion.

Observation 7: Discussion needed on the potential for overtime at the site

SC&A notes that the calculations for internal and external dose during the residual period are based on the assumption that workers may have been exposed for 2,000 hours per year. If workers may have routinely worked in excess of 40 hours per week, it may be appropriate to adjust the residual period internal and external dose estimate calculations accordingly.

4.4 Residual period external dose estimate

NIOSH used the calculated uranium surface contamination value of 169,700 pCi/m^2 with the uranium dose conversion factors from Battelle-TBD-6000 (NIOSH, 2011) to estimate the external dose rates from residual uranium contamination. Assuming workers were exposed for 2,000 hours per year, this resulted in dose rates of 0.3 millirem per year (mrem/yr) photon and 28.8 mrem/yr beta.

NIOSH also estimated the external dose rate from residual thorium contamination using the assumed thorium total alpha activity surface contamination level of 5,000 dpm/100 cm^2 and the dose conversion factors in U.S. Environmental Protection Agency (EPA) Federal Guidance Report (FGR) No. 12 (EPA, 1993). Assuming workers were exposed for 2,000 hours per year, this resulted in dose rates of 1.9 mrem/yr photon and 9.6 mrem/yr beta.

4.4.1 SC&A's comments

SC&A reviewed the calculations in section 6.0 of DCAS-TKBS-0010 (NIOSH, 2015) for external dose from residual uranium contamination. SC&A was able to match NIOSH's calculated external photon and beta dose from residual uranium contamination using the dose conversion factors from table 3.10 of Battelle-TBD-6000 (NIOSH, 2011), the uranium surface contamination value of 169,700 pCi/m^2, and assuming exposure for 2,000 hours per year.

SC&A noted that NIOSH used the dose conversion factors from Battelle-TBD-6000 (NIOSH, 2011) for surface contamination from natural uranium. DCAS-TKBS-0010 (NIOSH, 2015) states that NMI used depleted uranium in addition to nature uranium toward the end of operations. Although NIOSH did not consider depleted uranium during the residual period, SC&A considers the use of natural uranium throughout the residual period to be an efficiency measure, which results in a higher dose.

The residual Th-232 concentration is assumed to be 1,666.67 dpm/100 cm^2 and is assumed to be equal to the residual concentration for Ra-226, Ac-228, Th-228, and Ra-224. SC&A verified that NIOSH used the contaminated ground surface effective and skin dose coefficients from FGR 12 (EPA, 1993) and assumed an exposure of 2,000 hours per year. SC&A was able to match NIOSH's calculated external photon and beta dose rates from residual thorium contamination.

4.5 Occupational medical dose estimate

No site-specific guidance for NMI occupational medical dose exists; therefore, the TBD (NIOSH, 2015) says to use the guidance in ORAUT-OTIB-0006, revision 04 (ORAUT, 2011), for assigning occupational medical dose in DRs. It is assumed that employees received pre-employment, annual, and termination x-rays during NMI's operational years. No occupational medical dose is assigned during the residual period. Organ doses due to occupational medical exposure are entered in the Interactive RadioEpidemiological Program (IREP) as 30–250 keV photons as a normal distribution with a standard deviation of 30 percent.

4.5.1 SC&A's comments

SC&A reviewed section 7.0 of DCAS-TKBS-0010 (NIOSH, 2015) and agrees with the guidance to use ORAUT-OTIB-0006, revision 04 (ORAUT, 2011), and the assumed x-ray frequency to calculate occupational medical doses.[1]

[1] SC&A notes that this version of ORAUT-OTIB-0006 has since been superseded by revision 06 (ORAUT, 2019).

5 Subtask 3: Evaluate the PER's Stated Approach for Identifying the Number of DRs Requiring Reevaluation of Dose

5.1 NIOSH's selection criteria

Section 3.0 of DCAS-PER-070 (NIOSH, 2016) described the following criteria NIOSH used to identify previously completed claims requiring reevaluation using DCAS-TKBS-0010 (NIOSH, 2015).

- NIOSH identified all previously completed claims with verified employment at NMI that had a POC of less than 50 percent. This identified 21 claims.
- Three of these claims had already been completed using DCAS-TKBS-0010 (NIOSH, 2015) and were removed from further evaluation.
- The remaining 18 claims have been reevaluated by NIOSH using DCAS-TKBS-0010 (NIOSH, 2015), as well as other applicable approved DR methods.

Following reevaluation, 16 claims had a new POC below 45 percent, and 2 claims had a new POC between 45 percent and 50 percent. NIOSH ran IREP 30 times at 10,000 iterations for these two claims, and the resulting POC was still below 50 percent for both claims.

5.2 SC&A's comments

SC&A finds NIOSH's selection criteria for defining the 18 claims requiring reevaluation of dose to be sufficient to identify all impacted claims. Additionally, SC&A believes the PER was conducted in a timely manner, as the TBD was issued in April 2015, and DCAS-PER-070 was issued in April 2016. There are no findings associated with subtask 3.

6 Subtask 4: Conduct Audits of a Sample Set of Reevaluated DRs Mandated by DCAS-PER-070

Previous sections of this report described the issuance of DCAS-TKBS-0010 (NIOSH, 2015), the TBD for NMI. SC&A previously reviewed Tab 503 as part of the 25th set of DR reviews. SC&A confirmed with NIOSH that this case was among the 16 claims reevaluated with a revised POC less than 45 percent.[2] SC&A recommends that the Board select one case from the remaining cases evaluated by NIOSH. SC&A believes one of the claims that resulted in a POC between 45 and 50 percent would be appropriate for evaluation.

[2] SC&A reviewed a subsequent revision of the claim with a higher POC.

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