Draft

Advisory Board on Radiation and Worker Health
National Institute for Occupational Safety and Health

SC&A Evaluation of Petitioner-Supplied Material for SEC-00246 and SEC-00235

Contract No. 75D30119C04183
Document No. SCA-TR-2020-SEC005, Revision 0

Prepared by

Bob Barton, CHP

SC&A, Inc.
2200 Wilson Boulevard, Suite 300
Arlington, VA 22201-3324

October 9, 2020

SC&A, Inc. Technical Support for the Advisory Board on Radiation and Worker Health's Review of NIOSH Dose Reconstruction Program

Document Title	SC&A Evaluation of Petitioner-Supplied Material for SEC-00246 and SEC-00235
Document Number	SCA-TR-2020-SEC005
Revision Number	0 (Draft)
Supersedes	N/A
Effective Date	October 9, 2020
Task Manager	John Stiver, MS, CHP [signature on file]
Project Manager	John Stiver, MS, CHP [signature on file]
Document Reviewer(s)	Milton Gorden

Record of Revisions

Revision Number	Effective Date	Description of Revision
0 (Draft)	10/9/2020	Initial issue

Table of Contents

Abbreviations and Acronyms

ABRWH	Advisory Board on Radiation and Worker Health
AIHL	Atomics International Hot Laboratory
Area IV	Santa Susana Field Laboratory – Area IV
ATR	Advanced Test Reactor
CAM	continuous air monitor
CATI	computer-assisted telephone interview
cm^2	square centimeters
Co	cobalt
CORE Advocacy	CORE Advocacy for Nuclear and Aerospace Workers
cpm	counts per minute
Cs	cesium
DAR	Document Acquisition Request
De Soto	De Soto Avenue Facilities
DOE	U.S. Department of Energy
DOL	U.S. Department of Labor
dpm	disintegrations per minute
DTSC	Department of Toxic Substances Control
EE	energy employee
ETEC	Energy Technology Engineering Center
FP3A	fission product type 3A analysis
FP3B	fission product type 3B analysis
GA	gross alpha
GB	gross beta
H-3	tritium
HHS	U.S. Department of Health and Human Services
hour	hr
µCi/cc	microcurie per cubic centimeter
MFP	mixed fission products
mrad	millirad
mrem	millirem
NaK	sodium-potassium alloy

NIOSH	National Institute for Occupational Safety and Health
Pm	promethium
PUA	plutonium type A analysis
RIHL	Rockwell International Hot Laboratory
Sb	antimony
SEC	Special Exposure Cohort
SRDB	Site Research Database
SSFL	Santa Susana Field Laboratory
TRU	transuranic
UCLA	University of California, Los Angeles
UF	uranium fluorometric
UR	uranium radiometric
U_x	uranium isotopic composition
WBC	whole-body count
WG	Area IV of the Santa Susan Field Laboratory Work Group

1 Introduction and Background

Between May and August 2020, several document submittals were made by the Special Exposure Cohort (SEC) authorized petitioner representative, CORE Advocacy for Nuclear and Aerospace Workers (hereafter "CORE Advocacy"), to the National Institute for Occupational Safety and Health (NIOSH) in support of SEC-00235 for the Santa Susana Field Laboratory (SSFL) – Area IV (hereafter "Area IV") and SEC-00246 for the De Soto Avenue Facilities (hereafter "De Soto"). These document submittals and correspondence are summarized as follows:

1. May 19, 2020: Email from CORE Advocacy to NIOSH requesting clarification on how the identification of various radiological facilities at Area IV might affect the ability to reconstruct radiation doses

2. May 29, 2020: Agreement between the State of California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) and the U.S. Department of Energy (DOE) describing buildings slated for demolition at Area IV that were missing from the Energy Technology Engineering Center (ETEC) site description, ORAUT-TKBS-0038-2, revision 00 (NIOSH, 2006)

3. June 30, 2020: Report from CORE Advocacy that included the two previous items as well as additional documentation in support of the SEC-00246 petition evaluation (CORE Advocacy, 2020a)

4. August 9, 2020: Email from CORE Advocacy (2020b) to the Area IV of the Santa Susana Field Laboratory Work Group (WG), NIOSH, and SC&A, Inc. regarding the SC&A memorandum summarizing former worker interviews conducted between 2018 and 2019 (SC&A, 2020)

5. August 10, 2020: Resubmission of a signed affidavit by [redacted] given in October 2018 ([redacted], 2018) (note: this is a separate item than the interview summary discussed in section 3)

On July 2, 2020, the WG tasked SC&A with evaluating the ongoing petitioner concerns raised regarding the Area IV and De Soto facilities in the context of new information submitted by CORE Advocacy as described above.[1] This report presents SC&A's review and evaluation of the petitioner-submitted documentation, correspondence, and commentary. Section 2 of this report addresses the main issues raised in items 1–3 above. Section 3 addresses the questions and commentary in item 4 and discusses item 5 in the context of the subsequent interviews conducted with former workers.

In addition, CORE Advocacy submitted a parallel item to NIOSH in 2018, "Case Study: Boeing Response to the Document Acquisitions Request (DAR): A Comparison Between Original Employment Records and the DAR" (CORE Advocacy, 2018). In attachments A and B, SC&A

[1] Previous SC&A evaluations of petitioner-supplied documents and issues can be found in SC&A (2019a, 2019b, 2019c).

discusses various aspects of this case study that are relevant to the evaluation of SEC-00235 and SEC-00246.

2 Petitioner-Supplied Material (May–July 2020)

As stated in the introduction, CORE Advocacy supplied additional documentation to NIOSH related to SEC-00235 and SEC-00246 on May 19, May 29, and June 30, 2020. Section 2.1 addresses new material submitted related to SEC-00235 (Area IV), and section 2.2 addresses new material submitted related to SEC-00246 (De Soto).

2.1 Evaluation of newly supplied material for SEC-00235 (Area IV)

Two main document submissions provided by CORE Advocacy relate directly to the evaluation of SEC-00235:

- 1961 Boeing Incident Report A-0378 that confirms at least two different hot laboratories in use at Area IV (CORE Advocacy, 2020a, PDF pp. 7–8), rather than the single "hot laboratory" described in NIOSH (2006)

- 2020 agreement between DOE and DTSC describing plans to demolish radiological facilities at Area IV (CORE Advocacy, 2020a, PDF pp. 9–25)

SC&A notes that Boeing Incident Report A-0378 was dated July 13, 1961. Therefore, any internal exposure occurring during that timeframe would already be covered by SEC-00156 for Area IV, which determined that reconstruction of internal doses during this period is infeasible (ABRWH, 2010).

However, the overarching issue related to this incident report is the correct identification of radiological areas in the context of the ability to adjudicate SEC claims and/or perform sufficiently accurate dose reconstruction. CORE Advocacy (2020a) notes:

> The Building 4009 Hot Laboratory that is described in the Incident Report is not included in the Site Description or Site Profile; all associated references to hot laboratory activities at Building 4009 are missing, including the materials used, incidents and releases, and corresponding worker and environmental data. [CORE Advocacy, 2020, p. 3]

The incomplete nature of the current site description (NIOSH, 2006) is also evidenced by the 2020 agreement between DOE and DTSC noted above (CORE Advocacy, 2020a, PDF pp. 9–25). Similarly, CORE Advocacy (2020a) notes:

> Some of the facilities that are currently scheduled for demolition are not accounted for in the Site Profile; all associated references and activities, materials, incidents, and releases that were associated with these locations (and all corresponding environmental data) are missing. [CORE Advocacy, 2020a, p. 3]

The stewardship of the ETEC site profile/site description is not under SC&A's purview; therefore, it is not appropriate for SC&A to discuss its disposition. However, SC&A would note

that current methods for SEC adjudication and/or dose reconstruction methods are not building specific but rather are area specific (i.e., Area IV and/or De Soto rather than a specific building). As noted by CORE Advocacy (2020a):

> At a 2018 Workgroup Meeting NIOSH indicated that all SSFL-DeSoto radiation data is "the same," meaning that daily and undocumented worker rotation between the two sites prevents NIOSH from determining which exposures occurred at SSFL verses DeSoto, and/or which exposures may have involved americium and/or thorium and associated progeny. [CORE Advocacy, 2020a, p. 2]

The undocumented worker movement between De Soto and Area IV has previously been discussed multiple times in both WG and Advisory Board on Radiation and Worker Health (ABRWH) meetings. It must be reiterated from those meetings that the placement of covered workers in either location is under the purview of the U.S. Department of Labor (DOL) and, thus, SC&A does not necessarily have the authority to provide input into these determinations.

Nonetheless, to provide a more complete understanding of how individual claims are assigned to either De Soto or Area IV (or both), SC&A examined the full claimant population of workers at both sites (post-1964) to characterize what location based-information was available to place workers at a given location for SEC adjudication/dose reconstruction. At the time of the review, there were 409 claimants who worked at one (or both) of the sites of interest.

SC&A can confirm that in nearly all cases, worker location was established via their "timeclock" location as provided by DOE/Boeing. Of the 409 claims:

- Three hundred and six (75 percent) had covered employment at only one of the locations (Area IV or De Soto).
- Ninety-nine (24 percent) had covered employment at both locations; however, there was no overlap in employment at either site (i.e., no covered employment at both Area IV and De Soto during the same time period).
- Four (1 percent) had covered employment at both locations, and some portion of the covered employment *did* overlap between the two sites.

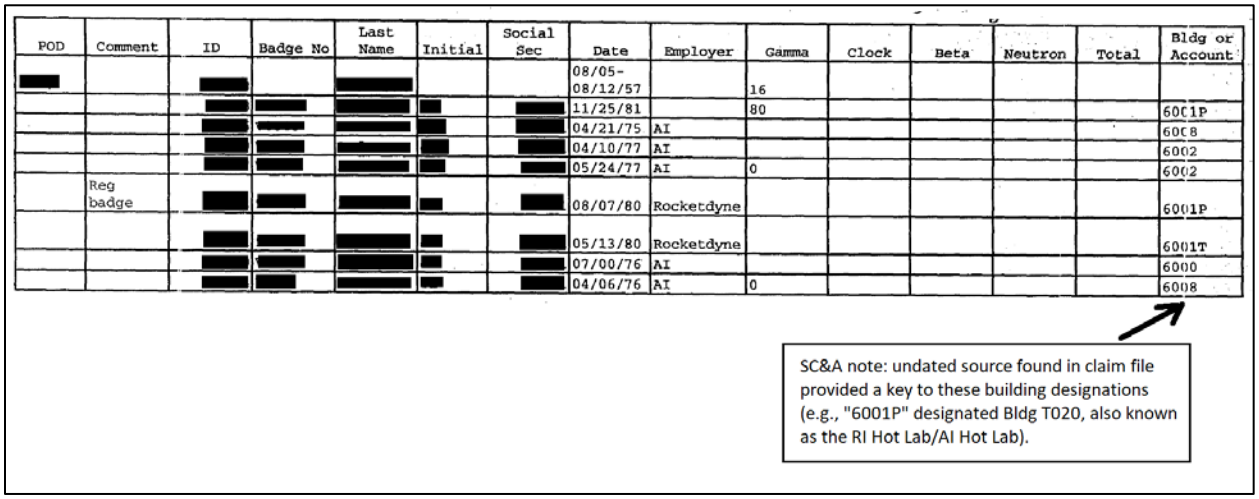
In the latter four cases, SC&A believes the overlapping employment was established by DOL via coworker affidavit that affirmed the energy employee (EE) would routinely work in both locations. Therefore, while mechanisms exist to address multiple employment locations, the onus appears to be on the claimant to provide sufficient evidence of worker rotation among the two different facilities.

In addition, SC&A examined the available claimant files to determine if alternate evidence exists (beyond the timeclock location) that might aid in clarifying actual worker locations. One such piece of evidence observed in the claim files is a "visitor log" (refer to figure 1 for an example). SC&A assumes that these visitor logs denote unusual, or nonroutine, entry into work areas where radiological hazards existed. However, only 87 (or ~21 percent) of the reviewed claimant files

contained such a record. It is unknown to SC&A whether this reflects the portion of the claimant population that rotated to other areas or represents a lack of completeness in the visitor logs themselves. SC&A's examination of these visitor logs identified 18 claimants for whom the visitor log entries contradicted the facility or time period established in the EE's covered employment. These claim numbers will be provided to NIOSH; however, it should be noted that most of these cases already qualified for the established SECs and/or had a calculated probability of causation that was greater than 50 percent.

Finally, it should be noted that the "Bldg or Account" codes that appear in the visitor logs also appear in the original external dosimetry records provided by Landauer. These original dosimetry records were observed by SC&A in the claimant monitoring histories for 112 of 222 (~50%) of claimants with external monitoring records. However, only 35 of 222 (~16%) externally monitored claims contained a complete set of Landauer external monitoring records.

Figure 1. Example of a "visitor log" sometimes contained in a claimant's dosimetry file



POD	Comment	ID	Badge No	Last Name	Initial	Social Sec	Date	Employer	Gamma	Clock	Beta	Neutron	Total	Bldg or Account
[redacted]		[redacted]		[redacted]			08/05-08/12/57		16					
		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	11/25/81		80					6001P
		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	04/21/75	AI						6008
		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	04/10/77	AI						6002
		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	05/24/77	AI	0					6002
	Reg badge	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	08/07/80	Rocketdyne						6001P
		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	05/13/80	Rocketdyne						6001T
		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	07/00/76	AI						6000
		[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	04/06/76	AI	0					6008

SC&A note: undated source found in claim file provided a key to these building designations (e.g., "6001P" designated Bldg T020, also known as the RI Hot Lab/AI Hot Lab).

2.2 Evaluation of newly supplied material for SEC-00246 (Area IV)

The petitioner submitted three additional documents in June 2020 in support of the evaluation of SEC-00246 (CORE Advocacy, 2020a), these documents are as follows:

- a 1965 internal letter from Atomics International that describes the movement of workers who had been transferred to the Hot Laboratory from other areas (CORE Advocacy, 2020a, PDF pp. 26–27) (refer to section 2.2.1 below)

- handwritten note from 1986 observing that several whole-body counts (WBCs)/in vivo records were missing from an EE's radiological file (CORE Advocacy, 2020a, PDF p. 28) (refer to section 2.2.2 below)

- a 1967 Health Physics summary report describing an incident involving a drum located on the Building 001 vault pad (De Soto) catching fire: The drum contained depleted Fermi fuel and Advanced Test Reactor (ATR) waste. Note: this incident is identified in

> the Boeing Incident Database as incident A-0617 (CORE Advocacy, 2020a, PDF p. 29) (refer to section 2.2.3).

Each of these documents is discussed in the subsections below.

2.2.1 1965 internal letter from Atomics International

This letter documents corrections made to the reported external dose totals for the Atomics International Hot Laboratory in 1964 and describes the movement of workers who had been transferred to the Hot Laboratory from other areas. The corrections to the dose totals were explained as follows in the letter, provided by CORE Advocacy (CORE Advocacy, 2020a, PDF p. 26):

> Most of the discrepancies are minor and can probably be traced to improper addition of figures, visitor film badge results not carried on the Hot Lab books, or exposures received previous to/or away from the Hot Laboratory.

The document then contains a list of EEs followed by three columns of external exposure data:

1. "Hot Lab Recorded Total mrem"
2. "Landauer Recorded Total mrem"
3. "Recommended Total Exposure"

Several of the workers in the list have an asterisk next to their name, which the document indicates:

> Denotes personnel who transferred to the Hot Lab from another unit or were relocated for temporary assignment. [CORE Advocacy, 2020a, PDF p. 27]

In each of these cases, the dose recorded in the first column (Hot Lab recorded total mrem) is lower than the dose in the second column (Landauer recorded total mrem). The "Recommended Total Dose" in the third column reflects the Landauer recorded total. This suggests that these workers accrued external dose at locations other than the Atomics International Hot Laboratory during the year 1964.

Although this document contains data from 1964 (and thus included in either SEC-00168 or SEC-00156 for De Soto and Area IV, respectively), the document supports the position that radiation workers freely rotated among different work areas. The document does not indicate from what locations the workers were transferred; however, SC&A does not dispute that workers rotated between the different site areas. In fact, as discussed in section 2.1, under certain circumstances workers have been assigned covered employment at both De Soto and Area IV during the same time period. The reader is referred to section 2.1 for a discussion and characterization of available records to place claimants in different work areas.

2.2.2 Handwritten note concerning missing WBC records

In the June 2020 submittal, CORE Advocacy provided a portion of a handwritten note that documents a conversation between two EEs concerning the reporting of WBC results. A transcription of the note is as follows (CORE Advocacy, 2020a, PDF p. 28):

> [The EE] was surprised that the report showed only 4 in-vivo counts. Says "What about Big Rock Point and Chin Shan?" I said we didn't normally report those. (I think we should)
>
> Says "What about UCLA?"
>
> We definitely should have those,
>
> [handwritten note contains the word "None" written in the left margin with an arrow pointing in between these lines]
>
> done ~ 1964–66 for U_x on "Powder Room Workers". Can you list all the counts [the EE] has had? Some from U_x/UCLA and Helgeson, and maybe 1 for Cs-137 by Helgeson?

The origin of the word "None" written in the margin is not known to SC&A. Although SC&A observed in vivo results from 1965 in several claim files (refer to Claims [redacted], [redacted], [redacted], and [redacted]), these measurements were performed by "California Nuclear Inc." The EE described in the above quote was included in those sampled via in vivo by California Nuclear Inc. in 1965 as well as two WBCs performed by UCLA in 1968.

Nonetheless, CORE Advocacy correctly notes that this handwritten log raises questions about the completeness of WBC data for use in dose reconstruction. In support of these questions, CORE Advocacy also submitted a case study comparison to NIOSH in 2018 for the EE discussed in the above note. SC&A obtained access to the case study from CORE Advocacy and notes the following concerning internal monitoring records for the EE[2]:

- Records supplied by the EE contained 12 distinct in vivo assessments (including one thyroid count).
- Not all the in vivo measurements were associated with work at Area IV/De Soto: Two in vivo results were for San Onofre Nuclear Generating Station, one in vivo result was from River Bend Station, one result was from Big Rock Point (operated by Consumer's Power), and one result was taken at Fort Calhoun.
- SC&A identified five additional WBC results in the Site Research Database (SRDB) documentation that occurred in 1992 and 1993 that were not included in either the records supplied by the EE or the Boeing Company Document Acquisition Request response (DAR) provided by CORE Advocacy (Boeing, 2018).

[2] Attachment A discusses concerns raised by the CORE Advocacy (2018) case study regarding the reporting of incidents. In addition, attachment B briefly discusses other related issues put forth by CORE Advocacy (2018).

- The DAR contained four total body counts and/or lung scans that were performed on the EE, with all results negative. No dates of the measurements were provided in the DAR.

- The DAR further noted that 144 bioassay samples were analyzed for the EE, with all results low enough that a further dose evaluation was unwarranted. None of the actual bioassay sample dates or numerical results were included in the DAR.

Based on a comparison of the DAR provided by CORE Advocacy and records provided by the EE, it is clear that the DAR contains an incomplete set of internal monitoring records. However, SC&A would also note that the format of the records provided is inconsistent with the radiological dose records typically supplied to NIOSH for dose reconstruction and observed by SC&A in its review of the claimant population. Therefore, it is not clear to SC&A that the case study comparison necessarily reflects a systemic deficiency in internal radiological exposure records available for dose reconstruction. It may be instructive for NIOSH to request a full set of dosimetry records for the EE to determine if noted deficiencies persist in current requests for exposure information.

To gain further insight into the internal monitoring practices of De Soto/Area IV employees, SC&A characterized the available claimant population for these sites. Of the 409 claimants available for analysis, 107 (or ~26 percent) were monitored internally at some point during the period of interest (post-1964). Of those who were internally monitored:

- One (~1 percent) were monitored via WBC only.
- Seventy-five (~70 percent) were monitored via bioassay only.
- Thirty-one (~29 percent) were monitored via both WBC and urinalysis.

The distribution of internal monitoring type underscores the fact that the primary method of controlling and quantifying internal exposures at De Soto/Area IV was via bioassay sampling (i.e., urinalysis and, much more rarely, fecal analysis). It should be noted that NIOSH used the available urinalysis data in the formulation of co-exposure intake assignments for unmonitored exposures (NIOSH, 2008).

In addition, SC&A examined the computer-assisted telephone interview (CATI) files for the claimant population to identify claimants who indicated participation in the in vivo monitoring program. These claim files were then inspected to determine whether in vivo monitoring results are included in the individual's dosimetry file. Of the 409 available claims, 203 (~50 percent) did not have a CATI available for review or indicated that they did not know if they participated in the in vivo program. Table 1 summarizes the remaining 206 CATIs that provided information concerning in vivo participation. As shown in the table, most of the remaining CATIs indicated no participation in the in vivo program. Of those that indicated they had participated in the program (23 total), roughly two-thirds also had corresponding in vivo files in their individual dosimetry files.

Table 1. Summary of claims with CATIs indicating participation in the in vivo program

CATI indicated in vivo participation?	In vivo records located in claim file?	Total (%)
No	No	177 (86%)
No	Yes	6 (3%)
Yes	Yes	15 (7%)
Yes	No	8 (4%)

Further description of the eight cases in which in vivo monitoring records are potentially missing from the individual dosimetry file is as follows:

- Case 1[3] (Claim [redacted]): The CATI with the EE may be referring to employment at Hanford rather than ETEC, as the heading in the CATI report only indicates Hanford. However, the EE stated the in vivo count occurred "at the end of employment," which may correspond to ETEC.

- Case 2 (Claim [redacted]): The CATI with the survivor indicated the EE had *only* been monitored via in vivo (no urinalysis). Given the timeframe of covered employment, which ended in 1984, SC&A considers such a monitoring practice unlikely.

- Case 3 (Claim [redacted]): The EE indicated in vivo monitoring at ETEC but not while at Hanford. No evidence of in vivo monitoring was identified for ETEC, but the EE did receive in vivo monitoring at Hanford.

- Case 4 (Claim [redacted]): The EE reported participating in a single WBC during employment. The EE was monitored via urinalysis, but no WBC could be located. No further information is contained in the available DOL files for this claim.

- Case 5 (Claim [redacted]): The EE reported having urinalysis and in vivo counting during both Hanford and ETEC employment. No radiological monitoring was identified for ETEC, and no internal monitoring was available for Hanford. The EE's job title ([redacted]) would not generally be considered a radiological job.

- Case 6 (Claim [redacted]): The CATI with the EE reported in vivo counting "every couple of years" at both ETEC and Hanford. There are many in vivo measurements associated with the EE at Hanford.

- Case 7 (Claim [redacted]): The CATI with the EE states they were monitored via in vivo after work in the "hot cell" at Area IV. However, the EE goes on to state that this work was done prior to 1964 (this predates the assumed start of in vivo monitoring at ETEC, although it is unclear when in vivo counting may have started at UCLA).

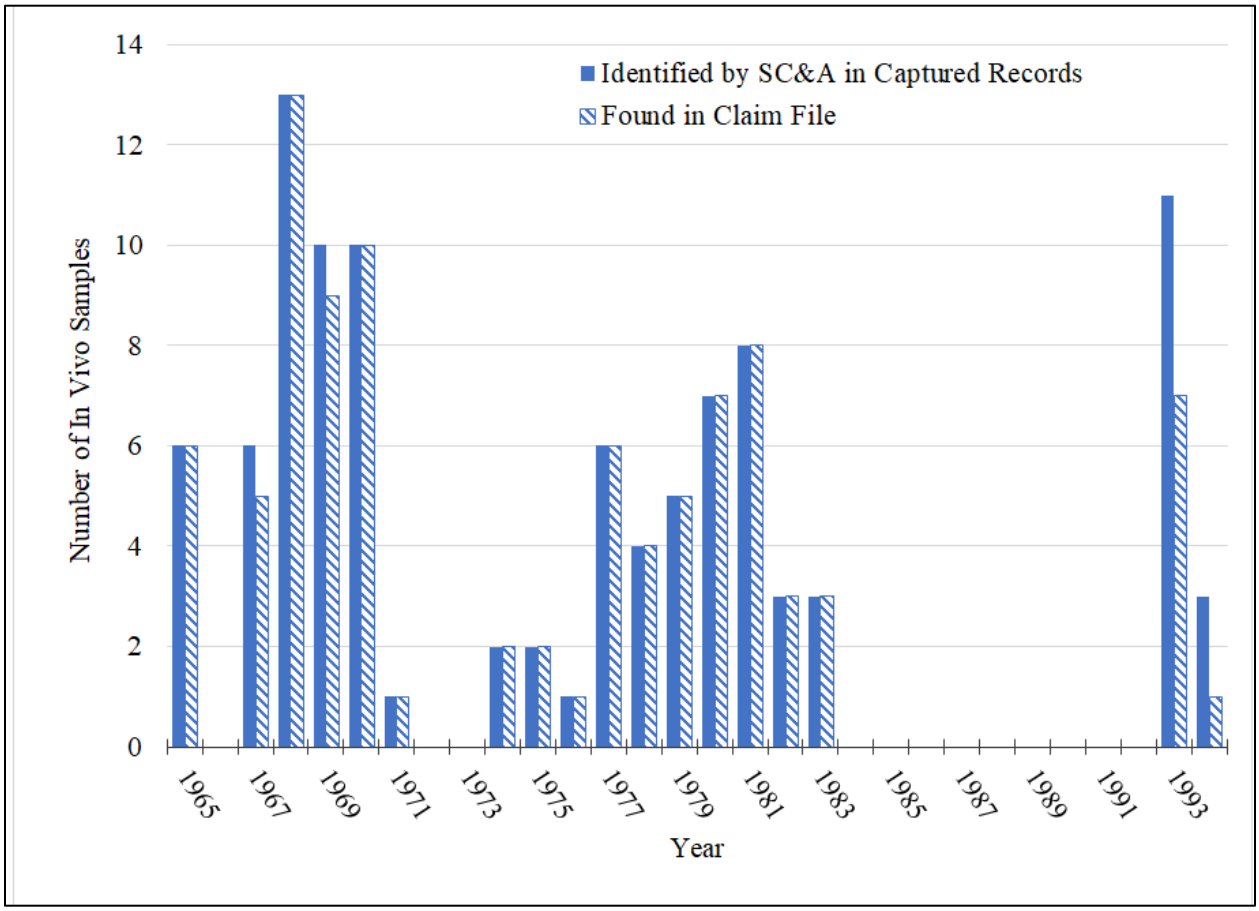
- Case 8 (Claim [redacted]): The CATI with the survivor checked all the boxes for internal monitoring (i.e., urinalysis, fecal, in vivo, and breath monitoring). The survivor did not know what frequency this sampling may have occurred or other specific information on

[3] Case numbers are an arbitrary designation assigned by SC&A for the purpose of discussion in this report and do not represent any personal identifying information.

internal monitoring. The CATI was only in "Summary Draft" form and has not been finalized.

In addition to comparing statements in the CATI report to the individual dosimetry files for ETEC, SC&A examined the captured in vivo reports available in the SRDB[4] and cross-referenced the names in those reports to the claimant population. SC&A was able to positively identify 30 claimants, representing 101 total in vivo samples, among the captured records. SC&A's comparison of these captured records to the 30 individual claimant dosimetry records found that 93 of the 101 (~92 percent) identified in vivo results correctly appeared in the individual dosimetry records. Figure 2 shows a distribution of the identified in vivo samples by year as well as the number correctly attributed to the individual dosimetry file.

Figure 2. Comparison of captured in vivo records to individual claim file.



Based on the totality of evidence and analysis presented in this section, SC&A agrees that there is the potential for in vivo monitoring records to be inadvertently omitted from an individual claimant's dosimetry file used for dose reconstruction. However, SC&A believes the issues

[4] SC&A assumes the captured in vivo records in the SRDB do not represent the full set of available records but rather a subset of records available for capture.

related to the completeness of WBC records are not widespread, and their occurrence is likely infrequent.

It is also important to remember that NIOSH has developed co-exposure models to handle situations in which workers were unmonitored (and should have been) or were monitored and the records are incomplete/unavailable. As stated in section 2.2.2, the co-exposure models are based on urinalysis data and, therefore, would not be affected by completeness issues related to the identification and attribution of WBC results.

2.2.3 1967 drum fire incident on Building 001 vault pad

This reference provided by CORE Advocacy (2020a, PDF p. 29) documents a radiological incident in which a 55-gallon drum containing depleted Fermi fuel and ATR waste caught fire, causing the lid of the drum to blow off the top of the drum. Given the date of the incident (May 17, 1967), SC&A assumes the "Fermi fuel" refers to reactor fuel for the Fermi 1 Fast-Breeder Reactor prototype, which used 26 percent enriched uranium.

The use of the term "depleted" fuel in the incident description is curious, as this term is typically applied to uranium material that is the byproduct of fuel enrichment (i.e., it is depleted in uranium-235 due to the enrichment of other material). This can be compared to the term "spent fuel," which is the result of fuel burnup inside a reactor. In the former case, transuranic material (e.g., americium) would not likely be present, where in the latter case transuranic material would be expected to be present. Similarly, it is not clear what "ATR waste" specifically refers to, but it may simply mean this was material byproduct of that fuel fabrication process because De Soto was involved in ATR fuel production. Such byproduct waste material would not be expected to contain transuranic material.

Nonetheless, it is well established that transuranic material, including spent fuel, would sometimes be stored at the De Soto site before being transferred to Area IV or other offsite locations. Nuclear material entering or leaving ETEC would be routed through De Soto (which served as headquarters for the complex). Therefore, this 1967 incident is of interest for potential exposures to transuranic material at De Soto. The incident itself lasted just under an hour and involved air sampling, surface contamination surveys, and nasal swabs. The incident report concludes:

> no significant release of radioactive material, area contamination or internal contamination of personnel occurred as a result of the fire. [CORE Advocacy, PDF p. 29]

In summary, the incident prompted appropriate radiological monitoring and precautions, and bioassays were not required, presumably because the field indicators indicated a minimal potential for intake (i.e., nasal swabs, the lack of evidence of contamination spread and airborne radioactivity per the air sampling utilized). Internal exposures were determined to be insignificant. Presumably, had the field indicators shown elevated contamination spread as a result of the fire, then followup bioassays may have been required.

It is noteworthy that the incident described on the same record concerning a release of promethium-147 (Pm-147) did require that followup urinalysis and fecal sampling be performed.

During that instance, maximum airborne concentrations were nearly 2 orders of magnitude lower than the Radiological Control Guide for Pm-147, although nasal swabs were positive for contamination.

3 Clarifications Related to Petitioner Commentary on Former Worker Interviews (August 2020)

In 2018 and 2019, SC&A (in conjunction with NIOSH and the WG) conducted telephone interviews with six former employees of the De Soto/Area IV work sites. These interviews were summarized in SC&A's July 14, 2020, memorandum: "Summary of Worker Interviews Conducted in 2018 and 2019 in Support of the SEC-00246 Evaluation" (SC&A, 2020). On August 9, 2020, CORE Advocacy provided, via email, several observations and questions regarding this memorandum (CORE Advocacy, 2020b). This section is intended to help clarify some of the questions and observations from that email. This section does not present the viewpoints or determinations of the WG but rather intends to aid future discussions about the 2018–2019 interviews and the public documentation associated with each.

Although not labelled as such in the original email, SC&A has attached a comment number to each of CORE Advocacy's statements to aid in tracking and documenting any future discussions.

3.1 CORE Advocacy comment 1

> The title of the Summary suggests that it was created to address evaluation of the petition for DeSoto Facility (SEC-00246). However, the Summary then specifies a shared focus with SSFL Area IV (SEC-00235).
>
> I believe that the dual focus underscores the relevance of evidence related to both worksites, based on problems we have all acknowledged: shared workers, site practices, radioactive materials, and radiation data likely to translate to shared data limitations that compromise accuracy in dose reconstruction.
>
> NIOSH appears to be applying a selective approach, at times considering SSFL / DeSoto to be "the same site," while at other times insisting that they are "separate." This creates challenges in defending both of the SEC Petitions simultaneously. Moreover, by combining the information and clearly acknowledging how the sites are related, we simply must acknowledge the need for consistent SEC Classes that exist at both facilities. If NIOSH cannot conduct dose reconstruction with sufficient accuracy at SSFL Area IV, NIOSH cannot do it for the workers of DeSoto Facility — by virtue of undocumented worker rotation, and radiation data that cannot be differentiated between the sites.

3.1.1 SC&A clarification/response

Although the interviews summarized in SC&A (2020) were tasked to SC&A as part of the review of the De Soto SEC-00246, the opportunity was taken to gain information germane to the evaluation of SEC-00235 where appropriate. SC&A recognizes and acknowledges that there is significant worker rotation between De Soto and Area IV; this topic is discussed in section 2.1 of this report.

3.2 CORE Advocacy comment 2

The Summary of EE Interviews was heavily redacted, posing some difficulty in providing a Petitioner Response.

3.2.1 SC&A clarification/response

Decisions on the redaction of work products for public release are not under SC&A's purview. Such decisions are made by the U.S. Department of Health and Human Services (HHS). The Advisory Board and WG use the unredacted versions of all SC&A products in their deliberations and decisions.

3.3 CORE Advocacy comment 3

Missing EE Interview — [redacted], Health Physicist at SSFL Area IV / DeSoto, 1962-1965

Is there a reason that Mr. [redacted]' interview was excluded from the Summary?

3.3.1 SC&A clarification/response

The EE described in CORE Advocacy comment 3 is also the subject of a signed affidavit ([redacted] 2018) that was resubmitted by CORE Advocacy in August 2020 (CORE Advocacy, 2020b) (noted as item 5 in section 1 of this report). Based on the information contained in the original signed affidavit, namely, the potential existence of americium-241 and thorium material at De Soto, SC&A conducted a telephone interview with the EE in conjunction with NIOSH, the WG, and CORE Advocacy in November 2018. A DOE-cleared summary of the interview was sent to the EE in December 2019. SC&A did not receive the return confirmation with either affirmation of the accuracy of the interview summary or, alternately, directions by the EE to alter, add, or delete material in the interview summary. In addition to the formal mailing, SC&A unsuccessfully attempted to contact the EE on several occasions via a telephone number supplied by CORE Advocacy. HHS determined that, absent direct confirmation from the EE, it would be inappropriate to assume the EE wished to continue to participate in the interview process and thus redacted the interview from the publicly released version in its entirety. HHS also refrains from publicly releasing statements that have not been verified for accuracy by interviewees. This practice is consistent with the Advisory Board's policy. Per paragraph 5.5.1 of ABRWH-PROC-010, "Data Access and Interview Procedures," a response from an interviewee is required in order to include the interview information in the master interview summary. The unconfirmed interview summary is available to the WG members for review and consideration, including any clarifying statements concerning exposure potential to americium and/or thorium.

3.4 CORE Advocacy comment 4

EE-1, Employed 1959 / 1960-62 / 1963-1978. Site Affiliation is Unknown / No Job Title Provided

The EE indicated [the EE] was neither exposed to radioactive materials, nor tasked with working with them. Given activities at SSFL Area IV / DeSoto Hot Laboratories, this detail may call into question the EE's ability to authoritatively opine about hot lab activities — particularly the transport of irradiated fuel

specimens between the sites for further analysis at the DeSoto Mass Spec Lab. This activity has been well documented and is supported through corroborative evidence. SC&A found americium contamination in DeSoto Mass Spec Lab drain lines, consistent with 1995 NIOSH stack emissions data that confirms americium and thorium. These findings strongly support a determination that the materials were used in an operational capacity, and that their presence was not only in the form of a "sealed source."

3.4.1 SC&A clarification/response

Each of the interview subjects included in SC&A (2020) was selected based on the likelihood of obtaining pertinent information for the evaluation of SEC-00246 (and as a secondary concern SEC-00235) as well as the subject's availability and willingness to be interviewed. The relative merits of each interviewee's qualifications, stated activities, and direct knowledge is necessarily a matter of judgment. SC&A acknowledges the petitioner's frustrations regarding the redaction of publicly available documents which, in this case, includes the job title and work facilities. However, SC&A notes that the WG members, as well as the ABRWH as a whole, have access to the unredacted information as well as the original interview summaries that were confirmed by the interviewees.

Further discussion of the americium found in the Mass Spec Lab drain lines, as well as the measurements of thorium and americium in stack emissions, is discussed in NIOSH (2019). These items are still under consideration by the WG.

3.5 CORE Advocacy comment 5

EE-3, Employed at SSFL / DeSoto 1981-2006. No Job Title Provided

The EE indicated that only remediation activities occurred at DeSoto but did not specify a timeframe. This statement, left without clarification, may downplay the scope of operations at the site. It should be noted that SEC-00246 was written to honor Ms. [redacted], whose participation in ATR Fuel Fabrication at DeSoto lasted well into 1983. Worker records indicate radiation monitoring and related activities at DeSoto well into 1989; workers continued to rotate between Area IV / DeSoto on an undocumented basis and without changes in badging until the end of the evaluation period (1995) and beyond. DeSoto is specified in all renewals of Special Nuclear Materials (SNM) Licenses and Materials Use Authorizations through 1995 — which were modified based on DeSoto's role in storing SSFL Area IV materials related to Site Remediation.

3.5.1 SC&A clarification/response

During the interview process, SC&A made every effort to elicit accurate and germane information for the purposes of evaluating SEC-00246 (and SEC-00235 where appropriate). However, SC&A also took great care not to "correct" or otherwise "lead" the interviewee when statements are made that might contradict known activities. All EEs were given the opportunity to review the summary of the interview prior to its finalization and inclusion in SC&A (2020) (which is itself a summary of the interview summary).

As with comment 4, the relative merits of each interviewee's qualifications, stated activities, and direct knowledge is necessarily a matter of judgment. The WG members, as well as the ABRWH as a whole, have access to the unredacted information as well as the original interview summaries that were affirmed by the interviewees.

3.6 CORE Advocacy comment 6

> **EE-5: Redacted in its entirety. No Information is given about the date of the Interview, Job Title, or Site Affiliation**
>
> Why was this interview redacted in its entirety? How does preventing a Petitioner's response help us understand the worksites, or get through this process?
>
> I respectfully request that this interview is stricken in its entirety.

3.6.1 SC&A clarification/response

Refer to SC&A response to CORE Advocacy comment 3 (section 3.3); the interview indicated as EE-5 was with Mr. [redacted].

3.7 CORE Advocacy comment 7

> **EE-6, Employed at SSFL / DeSoto in 1983. No Job Title indicated.**
>
> References to the Health Physics Log Books describing bags of Thorium in Building 004 (DeSoto) are made — the EE had no recollection.
>
> Initially, the EE stated that there was americium at DeSoto, but then modified [their] position and stated that [the EE] would get back to NIOSH about the specifics.

3.7.1 SC&A clarification/response

The interview in question involved six different interviewers, and notes were taken by four of these interviewers. These interview notes are then consolidated into a single interview summary that is sent to the interviewee to confirm, modify, delete, or add to as the interviewee sees fit. No further information was provided by the interviewee during this step, and the interview was confirmed as written.

3.8 CORE Advocacy comment 8

> [CORE Advocacy question 1.] It does not appear that the EE Interviews were vetted for accuracy. Therefore, I am curious about the purpose that the EE Interviews serve, if they are not held to the same standard as evidence submitted by the Petitioner.

3.8.1 SC&A clarification/response

Refer to SC&A's clarification/response to CORE Advocacy comments 4 and 5 (sections 3.4.1 and 3.5.1).

3.9 CORE Advocacy comment 9

[CORE Advocacy question 2.] Has SC&A / NIOSH followed-up with Interview EE-6, regarding the bags of Thorium referenced in the DeSoto Facility Log Books?

3.9.1 SC&A clarification/response

In this instance, the EE was chosen specifically because of the potential connection to bags of thorium indicated in captured logbook files. However, the interviewee had no recollection of finding bags of thorium nor of any such event being recorded in the De Soto health physics logbooks. The interviewee was provided with the summary of the collective interview notes taken during the initial interview, including the statements made by the EE that the they did not recall finding bags of thorium. The interviewee confirmed the interview summary as written.

3.10 CORE Advocacy comment 10

[CORE Advocacy question 3.] Are any of the EE Interviewees currently employed by Boeing, or under contract with DOE / Boeing to provide services in a consulting capacity?

[CORE Advocacy question 4.] If any of the EE's are employed or contracted by DOE / Boeing — and particularly if their Interview has been redacted in its entirety — I respectfully ask that NIOSH provide its rationale regarding a potential conflict of interest.

3.10.1 SC&A clarification/response

SC&A cannot release any personal information about the interviewees beyond what has been approved by HHS for public release in SC&A (2020). The work history, as provided by the interviewee, is available to the WG and ABRWH (as a whole) via the original interview summaries. Regarding the redaction process and associated policies, the reader is referred to SC&A's clarification/response to CORE Advocacy comment 2 (section 3.2.1). SC&A is not in a position to comment on potential conflicts of interest among the interviewees but would reiterate that the relative merit of each interview is a matter of judgment that is under the purview of the WG.

4 References

Advisory Board on Radiation Worker Health (ABRWH). (2010, March 5). Advisory Board recommendation on SEC Petition-00156 [Letter from the ABRWH to Kathleen Sebelius, Secretary, Department of Health and Human Services]. https://www.cdc.gov/niosh/ocas/pdfs/abrwh/secrecs/bdrecssfl_156.pdf

Boeing Company (Boeing). (2018). Response to a Document Acquisitions Request under the Energy Employees Occupational Illness Compensation Program Act for energy employee Richard E. Cutting.

CORE Advocacy for Nuclear & Aerospace Workers (CORE Advocacy). (2018). *Case study: Boeing response to the document acquisitions request (DAR): A comparison between original employment records and the DAR*. SRDB Ref. ID 171859.

CORE Advocacy for Nuclear & Aerospace Workers (CORE Advocacy). (2020a, June 30). *Special Exposure Cohort (SEC) petitioner input re: ABRWH / NIOSH conference call on 6/24/2020*.

Core Advocacy for Nuclear & Aerospace Workers (CORE Advocacy). (2020b, August 9). *Re: SEC Petitions 00235 & 00246* [Email communication from CORE Advocacy to the Area IV of the Santa Susana Field Laboratory Work Group, NIOSH, and SC&A].

Core Advocacy for Nuclear & Aerospace Workers (CORE Advocacy). (2020c, May 19). *SSFL question* [Email communication from CORE Advocacy to NIOSH].

National Institute for Occupational Safety and Health (NIOSH). (2006). *Energy Technology Engineering Center – Site description* (ORAUT-TKBS-0038-2, rev. 00). https://www.cdc.gov/niosh/ocas/pdfs/tbd/etec2.pdf

National Institute for Occupational Safety and Health (NIOSH). (2008). *Internal coworker dosimetry data for Area IV of the Santa Susana Field Laboratory and the De Soto Avenue facility* (ORAUT-OTIB-0080, rev. 00). https://www.cdc.gov/niosh/ocas/pdfs/tibs/or-t80-r0.pdf

National Institute for Occupational Safety and Health (NIOSH). (2018). *Internal dose reconstruction* (ORAUT-OTIB-0060, rev. 02). https://www.cdc.gov/niosh/ocas/pdfs/tibs/or-t60-r2-508.pdf

National Institute for Occupational Safety and Health (NIOSH). (2019). *NIOSH response to SC&A review of SEC-00246 De Soto Avenue Facility evaluation report: Response to findings and observations* [Response paper]. https://www.cdc.gov/niosh/ocas/pdfs/dps/dc-desotosec246-051319-508.pdf

[redacted] (2020). *Special Exposure Cohort (SEC) Petition 00246 – DeSoto Facility – Worker affidavit.*

SC&A, Inc. (2019a, June 10). *Review and characterization of Boeing incident database for SEC-00246* [Memorandum to the Santa Susana Field Laboratory Work Group]. https://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-desotossflsec246-061019-508.pdf

SC&A, Inc. (2019b, July 25). *Evaluation of petitioner-specific concerns regarding SEC-00235* [Memorandum to the Santa Susana Field Laboratory Work Group]. https://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-ssflsec235-072519-508.pdf

SC&A, Inc. (2019c). *Review of documentation provided by CORE Advocacy related to the evaluation of SEC-00235 at the Santa Susana Field Laboratory* (SCA-TR-2019-SEC006, rev. 0). https://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-ssflsec235core-r0-508.pdf

SC&A, Inc. (2020, July 14). *Summary of worker interviews conducted in 2018 and 2019 in support of the SEC-00246 evaluation* [Memorandum to the Area IV of the Santa Susana Field Laboratory Work Group]. https://ftp.cdc.gov/pub/FOIAREQ/182698_red-508.pdf

Attachment A: Evaluation of Incidents Provided in CORE Advocacy Case Study (CORE Advocacy, 2018)

In addition to petitioner concerns related to the availability and completeness of WBC records presented by CORE Advocacy (2018, 2020) (refer to section 2.2.2 of this report), CORE Advocacy (2018) expressed concern over the redaction of incident reports found in a DAR provided by Boeing (2018) when compared to similar documents supplied by the EE. Specifically, CORE Advocacy (2018) stated:

> Boeing supplied numerous Incident Reports but selectively redacted the Employee's name and radiation exposures from most of them. Boeing's redactions rendered the Incident Reports useless; now they cannot be compared to radiation data to verify a work location. They cannot be used to establish work processes or job duties. Most importantly, they cannot be used to assess the Employee's acute radiation exposures while employed by a DOE contractor inside the "covered area." For a non-SEC claimant requiring a dose reconstruction, this omission could be disastrous to ensuring NIOSH has access to relevant information, to conduct dose reconstruction with sufficient accuracy. [CORE Advocacy, 2018, p. 16]

SC&A examined the incident reports in both the DAR and claimant-supplied records with a focus on the potential effect on the ability to reconstruct doses to the EE. Specifically, SC&A noted (1) whether followup bioassay was required (and to what extent it was performed) and (2) the potential effect on the reconstruction of exposure to localized skin contamination.

In the case of followup bioassay, it is SC&A's understanding that the date of the incident would be sufficient for NIOSH to reconstruct any acute exposure based on subsequent bioassay taken in a reasonable timeframe. This is regardless of whether the EE's name is redacted or not. In essence, the presence of the incident report in the claimant's dosimetry record would a priori be indicative of involvement in the incident. This would allow NIOSH dose reconstructors to evaluate the subsequent bioassay on both an acute basis (i.e., based on the dates of prior incidents) and chronic basis (i.e., assuming the EE was chronically exposed for the entire period between the evaluated bioassay result and previous monitoring results or the start of employment). However, SC&A requests that NIOSH clarify the process in which redacted incident reports are routinely evaluated during the course of typical dose reconstructions.

SC&A's evaluation of incident reports provided in the EE-supplied records is summarized in table A-1 below. As shown in the table, 12 incidents were identified in documentation supplied by the EE as part of the CORE Advocacy (2018) case study (all 12 incidents are also included in the DAR). Bioassay followup was required in 6 of the 12 documented incidents, including 2 incidents in which nasal smears were measured at background levels. As seen in the table, bioassay followup occurred in a timely manner for use in dose reconstruction for all 12 incidents identified in CORE Advocacy (2018).[5] Therefore, SC&A concludes that internal dose

[5] Per dose reconstruction guidance in ORAUT-OTIB-0060, revision 02 (NIOSH, 2018), internal monitoring data can be used for periods up to 2 years post-intake. Such sampling timeframes are valid even for short-lived/short-retained nuclides, with the possible exception of tritium (NIOSH, 2018, p. 25).

reconstruction of these incidents is likely feasible for the EE under consideration despite the redaction of the EE's name from the provided dosimetry records.

However, in the case of exposure consideration (i.e., localized skin contamination), redaction of the EE's name from incident reports would render acute external exposure to a given location on the skin problematic. This would be of particular import for cases in which cancer of the skin was in a similar location as the localized contamination. One claimant-favorable assumption would be to assume the highest skin contamination related to an associated incident was applicable to the EE being evaluated. However, SC&A is not aware of such a dose reconstruction process being codified in any official NIOSH procedures or documentation. Further clarification from NIOSH appears warranted in this circumstance. SC&A noted that 4 of the 12 incidents under evaluation contained indications of localized skin contamination in which names were redacted, making specific evaluation of the localized exposure problematic.

It should be further noted that any whole-body external exposure accrued as a result of these incidents would presumably be measured via external dosimetry. Measurements of area contamination (i.e., other than noted skin contamination) and/or area airborne contamination would not be considered in this instance due to the preponderance of usable bioassay data and external dosimetry for this EE. However, SC&A acknowledges that the DAR did not contain *any* internal monitoring data for the EE (including both in vivo and in vitro measurements). It would be inappropriate for SC&A to speculate about the reason why internal dosimetry results were omitted from the DAR; however, SC&A did note that the records in the DAR were generally inconsistent with observed records available to NIOSH in the evaluated claimant population (refer to section 2.2.2 of this report for further discussion of internal monitoring at Area IV/De Soto).

Table A-1. Evaluation of case study incidents in relation to skin contamination issues and subsequent bioassay monitoring

Date	Location	Brief description of incident	Airborne contamination/area contamination	Nasal smears/ bioassay requirement?	Subsequent bioassay for the EE	Localized skin contamination issue?	SC&A additional comments
7/23/1964	Component Development Hot Cell, Cell 4	In-cell cleanup resulted in mixed fission products (MFP) contamination.	No airborne contamination indicated. 270 dpm on the knees of the EE (0.3 mrad/hr).	No nasal smears indicated. Bioassay was not required.	7/28/1964 uranium radiometric (UR), uranium fluorometric (UF), and MFP.	Yes, 270 dpm on the knees of the EE.	Nature of hazard given was described as MFP contamination up to 25 rad/hr. The DAR- and EE-supplied documents are essentially identical.
7/16/1965	Atomics International Hot Laboratory (AIHL) Cell 2	Fuel "waffer" [sic] disintegrated, causing buildup of MFP on a vacuum filter. A high dose rate was discovered, and the filter was to be removed. During filter removal, contamination spread to surrounding area (in addition to creating a localized external radiation field).	Continuous air monitor (CAM) increased to 1,000 cpm, at which point a high-volume sampler was started. Fixed air sampler located near the filter measured 1.3×10^{-6} µCi/cc (beta-gamma). Over 1,300 area smears were taken and showed a maximum of 3 mrad/hr.	Yes, the EE's nasal smears showed up to 200 dpm. The rest of the individuals smeared were at background levels. Bioassay required for the EE.	7/17/1965 (MFP), 7/19/1965 (MFP), 7/26/1965 (UR, MFP)	Yes, 10,000 cpm on the hand of the EE.	"[The EE's] bioassay specimens indicated small and insignificant quantity of MFP . . . other than [the EE's] hand, no personnel contamination resulted. [The EE] successfully decontaminated [their] hand on the first effort." The DAR entry does not contain the actual contamination measurements on the hand of the EE. The DAR report predates the EE-supplied incident report, which was labelled as the "final" report of the incident.
5/19/1971	Decontamination cell in AIHL	Fire involving a tank containing 100 gallons of sodium-potassium alloy (NaK) (50 millicuries of Cs-137). It was estimated that approximately 25 gallons burned.	Yes, 6.2×10^{-11} µCi/cc indicated over 4-day period including the fire. A high-volume air sample showed a maximum of 2.8×10^{-10} µCi/cc in the Service Gallery on 5/20. Highest area contamination measured was 26,000 dpm/100cm^2 in the Service Gallery on 5/22.	No nasal smears were indicated. Bioassay for MFP and gross beta (GB) were required.	6/1/1971 (MFP, GB), note also had routine bioassay on 5/17/1971 (MFP, GB)	None indicated.	This was a very well-documented incident at the AIHL (appears in several claim files). The incident report notes: "There were no radiation exposures to any individual, and releases of radioactive material have all been significantly less than the concentration limits." MFP analysis via gamma spectroscopy was performed on the NaK samples. Essential information for dose reconstruction was contained in both the DAR and case study files.

Date	Location	Brief description of incident	Airborne contamination/area contamination	Nasal smears/ bioassay requirement?	Subsequent bioassay for the EE	Localized skin contamination issue?	SC&A additional comments
7/29/1975	AIHL Cell 2	An irradiated Sodium Reactor Experiment Core I fuel slug ignited, resulting in release of airborne radioactivity to the operating gallery.	CAM "stabilized" at 6,000 cpm. (refer to additional comments). No spread of area contamination as indicated.	Nasal smears indicated a maximum of 160 dpm. Bioassay required for all individuals involved (all results were not detectable).	7/30/1975 (fission product type 3A (FP3A), fission product type 3B (FP3B), gross alpha/gross beta (GA/GB)), 8/4/1975 and 8/18/1975 (same analytes as 7/30/1975)	Not indicated.	"The incident did not result in any overexposure or constitute a reportable incident." Stack air concentrations at the time of the incident indicated 6.5×10^{-6} µCi/cc (700 cpm). Case study and DAR submissions are essentially identical.
5/3/1978	AIHL, Decontamination Room 2	Alcohol evaporator caught on fire.	Neither airborne contamination nor the spread of contamination as a result of the incident area were indicated.	Neither nasal smears nor special bioassay requirements were indicated.	8/7/1978 (FP3A, FP3B) [prior bioassay on 3/18/1978]	None indicated.	Alcohol was from the sodium digester (Hall fuel bonding); the fire occurred in a decontamination room that was sealed. The incident report notes: "No personal injury, exposure or facility damage resulted." DAR incident record is essentially identical to CORE submission.
5/28/1981	Building T-022 High-Bay	Spill of contaminated liquid containing a failed pressurized-water reactor fuel element	No indication of airborne contamination was documented. However, external dose rates of up to 25 rad/hr were detected on contact with a floor spot (17 roentgen/hr detected at 2 inches from the same hot spot).	All nasal smears were negative; however, bioassay followup was required.	5/29/1981 (FP3A, FP3B, and tritium (H-3)), 6/1/1981 (FP3A, FP3B, H-3), 6/18/1981 (FP3A, FP3B, H-3), 6/22/1981 (FP3A, FP3B)	Yes, records indicate personnel contaminated from 3,000–5,000 cpm found on shoes.	Neither the DAR- nor EE-supplied incident report directly indicate the EE's involvement. Both records are essentially identical.
3/22/1982	Building T-020 Cell 1	Explosion of zirconium fines during a decladding demonstration run for Fermi fuel.	1.3×10^{-8} µCi/cc was detected in unoccupied areas of the basement and 3.4×10^{-9} µCi/cc detected in occupied areas. Area contamination smears were negative; however, the vacuum line filter was found to be contaminated to 30,000 cpm.	Nasal smears were performed but found to be negative, no bioassay follow-up was indicated.	4/14/1982 (FP3A, FP3B)	None indicated.	Contamination was predominantly Cs-137 with possible Sb-125 contamination also present (no other isotopes identified). CORE Advocacy records contain the final report dated 4/2/1982; both DAR and CORE Advocacy contain the initial incident report from 3/29/1982. Additional information that was omitted from the DAR is the measured contamination of the vacuum line filter (30,000 cpm). However, such information would not typically be relevant to dose reconstruction.

Date	Location	Brief description of incident	Airborne contamination/area contamination	Nasal smears/ bioassay requirement?	Subsequent bioassay for the EE	Localized skin contamination issue?	SC&A additional comments
7/13/1982	Rockwell International Hot Laboratory (RIHL) - T020	Fuel pin was crushed and loaded into transfer tube, which was found to be leaking.	No significant airborne contamination was detected; however, associated equipment was found to be contaminated with an unspecified amount of radioactivity.	Nasal smears were performed but all were negative for contamination. However, blood and fecal sampling was required as a result of the incident.	7/14/1982 (2 samples, FP3A, FP3B), 7/14/1982 (fecal, FP3A, FP3B), 7/15/1982 (FP3A, FP3B), 7/18/1982 (plutonium type A analysis (PUA))	Yes, up to 350,000 dpm alpha on hands, elbows, shoulders, shirt, pants, shoe covers, and shoes.	EE had 50,000 cpm alpha contamination, but the location is not stated. DAR redacts all names involved in the incident and includes redaction of the EE's name with 50,000 cpm alpha via survey meter and the requirement for blood and fecal sampling. Documentation supplied by the EE does show the names of the individuals involved.
10/11/1983	T020 Cell 3 Face	Back siphoning of contamination into clean distilled water. Contaminated water subsequently spilled in the shop area.	No significant airborne radioactivity was detected; however, area contamination rates ranged from 6,000 dpm/15cm^2 to greater than 450,000 dpm/15cm^2.	Nasal smears were performed; however, all were negative for contamination. Bioassay followup was required for workers with detectable skin contamination.	10/31/1983 (PUA), 4/16/1984 (PUA, FP3A, FP3B)	Yes, personnel contamination of workers' hands ranged up to 100,000 cpm.	Nature of hazardous material given as Cs-137, Co-60, Trace TRU. Area smears indicated ~0.01% alpha activity (trace americium-241 found). DAR- and EE-supplied document submissions are essentially identical.
10/15/1984	T020 Cell 3	Alcohol fire containing MFP during decontamination operations prior to servicing a laser. No nuclear fuel was present.	No airborne contamination was indicated, and no surveys or smears of personnel are mentioned in the incident report.	No nasal smears or followup bioassay were required as a result of this incident.	10/15/1984 (FP3A, FP3B), 11/16/1984 (PUA)	No.	Report indicates no release to the environment (i.e., no increase in stack monitor activity was detected). DAR and CORE Advocacy incident documents are essentially identical.

Date	Location	Brief description of incident	Airborne contamination/area contamination	Nasal smears/ bioassay requirement?	Subsequent bioassay for the EE	Localized skin contamination issue?	SC&A additional comments
8/29/1986	T055, Nuclear Materials Development Facility, SSFL	Water overflowed from Radioactive Material Disposal Facility transfer tank.	No airborne contamination was indicated, and no surveys or smears of personnel indicated measurable contamination (refer to additional comments).	No nasal smears or followup bioassay were required as a result of this incident.	9/3/1986 (FP3A, FP3B), 11/24/1986 (FP3A, FP3B, (refer to comments))	No.	The incident report notes: "No beta activity was found. The wet area was outlined with yellow paint. An alpha survey was done after the asphalt dried. The meter acted sometimes as though there was activity, but a gamma scan of the debris found the asphalt to be clean . . . the relatively clean water slowly filled to the top of the transfer tank, and that is what spilled out on the asphalt . . . got our hands wet during the containment of the water. At first we thought [the EE's] hands were contaminated and [the EE] was instructed to wash. Later we realized the meter was faulty. My hands did not become contaminated." Bioassay results on 11/24 appear to have something listed as "900," but no extra result is apparent. The DAR redacts the names of workers involved, where documentation supplied by CORE Advocacy indicates the EE was involved. Otherwise, the incident reports are essentially identical.
8/26/1991	RIHL Operating Gallery	Sandblasting during decontamination and decommissioning caused contamination barrier plugs to "blow out." Dry grit was discharged into the Operating Gallery, which is a non-controlled area.	Area CAMs did not detect any elevated levels of airborne activity. Area contamination surveys indicated 1,000 dpm/100cm^2 in spill area and 300–500 dpm/100cm^2 in the Operating Gallery.	No nasal smears or followup bioassay were required as a result of this incident.	No bioassay results are available for the EE; however, the EE was counted via WBC for MFP/activation products in January 1992.	None indicated.	Under "Personnel Radiation Protection" in the Occurrence Report, none of the options are checked (options include Radiation Exposure, Personnel Contamination, and Internal Uptake). The incident documentation notes: "Radiological Significance: Initial large area Masslinn wipes in area showed contamination levels of approximately 1000 dpm/100cm^2 in the spill area, and 300-500 dpm/100cm^2 on the entire floor of the operating gallery. The continuous air monitor was in service and did not alarm or show any indication of increased airborne radioactivity." DAR redacts name of workers involved; however, documentation supplied by the EE does show the EE's name.

Attachment B: Discussion of Other Deficiencies Identified in the "Case Study" as Presented in CORE Advocacy (2018)

One of the most significant findings made by CORE Advocacy (2018) in its case study comparison was the fact that the DAR did *not* include any actual internal monitoring results beyond a summary listing the total number of bioassay results taken over the course of the EE's employment. Without a date of the sample and a viable result, reconstruction of internal exposures based solely on such summary information is not feasible. However, as SC&A noted in section 2.2.2 and attachment A of this report, the dosimetry records in the DAR were generally inconsistent with what SC&A observed in claimant dosimetry files available to NIOSH for dose reconstruction. Therefore, it is unclear at this time whether the same dosimetry files would be sent to NIOSH in the required event of a dose reconstruction for the EE in question.

Another pertinent finding in CORE Advocacy (2018) concerns the fact that the external dosimetry record supplied for the EE appeared to be a database record of exposure information rather than images of the original hardcopy dosimetry reports provided by Landauer. The key facet of this finding was that the original Landauer reports contain location codes that more accurately reflect the EE's work location than the time-clock location data discussed in section 2.1 of this report. Omission of such documentation would hinder the accurate placement of the worker for potential SEC adjudication. However, similar to the issue of internal dosimetry records in the previous paragraph, SC&A observes that the format of external dosimetry records noted in the 2018 case study is generally inconsistent with what has been supplied to NIOSH for the individual claims reviewed in sections 2.1 and 2.2.2 of this report.

Finally, the 2018 case study correctly points out that the external dosimetry summary record provided in the DAR omitted exposures from 1987–1990 when compared to the EE's updated version of the document. Given SC&A-noted irregularities between the DAR-supplied records and what was typically observed by SC&A in the claimant files, it may be prudent for NIOSH to request the records for the EE evaluated in the 2018 case study to determine if such irregularities are systemic to the records retrieval process.