
Draft

**ADVISORY BOARD ON
RADIATION AND WORKER HEALTH**

National Institute for Occupational Safety and Health

**REVIEW OF THE NIOSH EVALUATION REPORT FOR
SEC-00246 AT THE DE SOTO FACILITY (1965–1995)**

**Contract No. 211-2014-58081
SCA-TR-2018-SEC006, Revision 0**

Prepared by

Bob Barton, CHP

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

Saliant, Inc.
5579 Catholic Church Road
Jefferson, Maryland 21755

December 7, 2018

DISCLAIMER

This is a working document provided by the Centers for Disease Control and Prevention (CDC) technical support contractor, SC&A for use in discussions with the National Institute for Occupational Safety and Health (NIOSH) and the Advisory Board on Radiation and Worker Health (ABRWH), including its Working Groups or Subcommittees. Documents produced by SC&A, such as memorandum, white paper, draft or working documents are not final NIOSH or ABRWH products or positions, unless specifically marked as such. This document prepared by SC&A represents its preliminary evaluation on technical issues.

NOTICE: *This document has been reviewed to identify and redact any information that is protected by the [Privacy Act 5 U.S.C. § 552a](#) and has been cleared for distribution.*

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 2 of 75
-------------------------------------	----------------------------------	--	----------------------------

SC&A, INC.:

Technical Support for the Advisory Board on Radiation and Worker Health Review of NIOSH Dose Reconstruction Program

DOCUMENT TITLE:	Review of the NIOSH Evaluation Report for SEC-00246 at the De Soto Facility (1965–1995)
DOCUMENT NUMBER/ DESCRIPTION:	SCA-TR-2018-SEC006
REVISION NO.:	0 (Draft)
SUPERSEDES:	N/A
EFFECTIVE DATE:	December 7, 2018
TASK MANAGER	John Stiver, MS, CHP [signature on file]
PROJECT MANAGER:	John Stiver, MS, CHP [signature on file]
DOCUMENT REVIEWER(S):	John Stiver, MS, CHP [signature on file]

Record of Revisions

Revision Number	Effective Date	Description of Revision
0 (Draft)	12/7/2018	Initial issue

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 3 of 75
-------------------------------------	----------------------------------	--	----------------------------

TABLE OF CONTENTS

List of Tables	6
List of Figures	6
Abbreviations and Acronyms	7
Executive Summary	10
1 Introduction and Background	12
2 Overall Document Coverage.....	14
3 Americium-241 and Associated Internal Exposure Potential at De Soto	18
4 Thorium Operations and Internal Exposure Potential at De Soto.....	26
5 Former Worker Interviews.....	36
6 Claimant Overview	42
7 References.....	46
Attachment A: SC&A Comments on Specific Petitioner Concerns in October 2018 White paper prepared by CORE Advocacy for Nuclear & Aerospace Workers (CORE Advocacy 2018)	49
Item 3. Confirmatory Survey, B-104, DeSoto Facility (Lupo 1999).....	49
Item 4. Internal Operational Safety Unit Weekly Highlights (Heine 1971).....	49
Item 5. Inspection of Special Nuclear Material Vault Rooms at De Soto (Clow 1971).....	50
Item 6. Nuclear Fuels Committee Annual Review (Atomic International 1972)	51
Item 7. Incident Report, 1970 (Boeing Incident Report Database) (Bresson 1970).....	51
Item 8. Incident Reports (Boeing Incident Report Database) (Mooers 1959).....	52
Item 9a. DeSoto Facility Log Book (De Soto 1964–1965a).....	52
Item 9b. DeSoto Facility Log Book (De Soto 1964–1965a)	52
Item 9c. De Soto Facility Log Book (De Soto 1964–1965a).....	53
Item 9d. DeSoto Facility Log Book (De Soto 1964–1965a)	53
Item 9e. DeSoto Facility Log Book (De Soto 1964–1965a).....	53
Item 9f. DeSoto Facility Log Book (De Soto 1964–1965a).....	54
Item 9g. DeSoto Facility Log Book (De Soto 1964–1965a)	54
Item 9h. DeSoto Facility Log Book (De Soto 1964–1965a)	55
Item 9i. DeSoto Facility Log Book (De Soto 1964–1965a)	55
Item 9j. DeSoto Facility Log Book (De Soto 1964–1965a)	55
Item 9k. DeSoto Facility Log Book (De Soto 1964–1965a)	56
Item 9l. DeSoto Facility Log Book (De Soto 1964–1965a)	56
Item 9m. DeSoto Facility Log Book (De Soto 1964–1965a)	57

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Effective Date:	Revision No.	Document No./Description:	Page No.
12/7/2018	0 (Draft)	SCA-TR-2018-SEC006	4 of 75

Item 9n. DeSoto Facility Log Book (De Soto 1964–1965a)	57
Item 9o. DeSoto Facility Log Book (De Soto 1964–1965a)	57
Item 9p. DeSoto Facility Log Book (De Soto 1964–1965a)	58
Item 9q. DeSoto Facility Log Book (De Soto 1964–1965a)	58
Item 9r. DeSoto Facility Log Book (De Soto 1964–1965a).....	59
Item 9s. DeSoto Facility Log Book (De Soto 1964–1965a).....	59
Item 9t. DeSoto Facility Log Book (De Soto 1964–1965a)	59
Item 9u. DeSoto Facility Log Book (De Soto 1964–1965a)	60
Item 10. Special Nuclear Materials (SNM) Licenses for DeSoto Facility to 1995 (Atomics International & State of California 1968–1969).....	60
Item 11. Renewal Application, Broad Scope "A" R/A Material License 0015-79 (Barnes 1995)	61
Item 13. Incident Report (Boeing Incident Report Database), 1989 (Rowles 1989).....	62
Item 14. Rockwell International Correspondence, Re: Fission Product and Fissile Content of SRE Fuel, 1975 (Heine 1975).....	62
Item 15. GEN-ZR-000, Radiological Survey of SSFL Area IV Special Nuclear Materials (SNM) Vault, Building 4064, 1988 (Author Unknown 1988)	62
Item 16. Atomics International, Criteria for the SS Vault Storage (SNAP and Other Fuels) During Close-Out of the SNAP Program, 1973 (Ketzlach 1973b).....	63
Item 17. North American Rockwell, Weekly Highlights, SNAP Close Out 1973 (Ketzlach 1973a)	63
Item 18. SSFL Area IV SNAP Building 4012 Log Book, 1963 ([Name Redacted] Entries) (Santa Susana 1962–1966).....	64
Item 19. H&S Annual Review of Radiological Controls, 1977 (Hart 1980).....	64
Item 20. Incident Report, Atomics International 1962 (New Document) (De Soto 1962).....	65
Item 21a. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965– 1966)	65
Item 21b. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965– 1966)	65
Item 21c. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965– 1966)	66
Item 21d. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965– 1966)	66
Item 21e. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965– 1966)	66
Item 21f. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965– 1966)	67

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 5 of 75
-------------------------------------	----------------------------------	--	----------------------------

Item 21g. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 67

Item 21h. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 67

Item 21i. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 67

Item 21j. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 68

Item 21k. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 68

Item 21l. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 68

Item 21m. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 69

Item 21n. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 69

Item 21o. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 69

Item 21p. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 70

Item 21q. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 70

Item 21r. DeSoto Facility Building 004 Log Book, c. 1960s (New Document) (De Soto 1965–1966) 71

Item 22. Visitor Badge “Key” (no reference identified)..... 71

Item 23. Former Worker, [Redacted], Atomics International (New Document) (Former worker Affidavit 2018) 72

Attachment B: Rationale for Assuming References to “SS Vault” Refer to a De Soto Facility .. 74

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 6 of 75
-------------------------------------	----------------------------------	--	----------------------------

LIST OF TABLES

Table 1. Description of Am-241-Related Information in the Site Research Database	19
Table 2. Description of Thorium-Related Information in the Site Research Database	27
Table 3. Thirteen Interviews Containing Relevant Information on Radiological Operations at De Soto (DOE 2011).....	37
Table 4. Overview of Reported Exposure Potential Found in Reviewed Claimant CATI/DOL Files by Job Title Designation	43
Table 5. [Redacted in full]	44

LIST OF FIGURES

Figure 1. Percentage of Months by Year with Health Physics Logbooks Available for Review. 15	
Figure 2. Percentage of Months by Year with Tagged Area Entry Permits Available for Review	15
Figure 3. Percentage of Months by Year with Area Smear Survey Reports Available for Review	16
Figure 4. Percentage of Months by Year with General Area Air Monitoring Reports Available for Review.....	17
Figure 5. Health Physics Logbook Entry from October 1965 Showing a Box of Am-241 Being Monitored and Tagged in Room 11H-06 (De Soto 1964–1965b)	22
Figure 6. Excerpt Describing Previous Radiological Surveys of the Mass Spectrometry Laboratory (De Soto 1997, PDF p. 5).....	22
Figure 7. Magnified Portion of Figure 2 Showing Handwritten Edits Indicating Am-241 in a Drain Sample (De Soto 1997, PDF p. 5)	23
Figure 8. Smear Survey Report from October 1969 Indicating Thorium Work Occurring in Building 5 (names redacted) (De Soto 1969)	29
Figure 9. Smear Survey Report from October 1969 Indicating Thorium Work Occurring in Buildings 4 and 5 Related to the “Thorium (Sealed Source) Program” (names redacted) (De Soto 1969).....	30
Figure 10. [Redacted] Personnel Air Sampling Data Reports for [Redacted] Workers Involved in [Redacted] Operations in [Redacted] (names redacted) (De Soto 1969).....	31
Figure 11. Tagged Area Entry Permit Involving Inspection of Thorium Fuel Simulants (De Soto 1970a)	32
Figure 12. [Redacted] Personnel Air Sampling Data Reports for [Redacted] Workers Involved in [Redacted] Work in [Redacted] (names redacted) (De Soto 1970b)	33
Figure 13. Personnel Air Sampling Data Report for a Worker Involved in [Redacted] Machining in [Redacted] (names redacted) (De Soto 1971).....	34
Figure 14. Percentage of Claimants Reviewed by SC&A by Job Title	43
Figure B-1. Excerpts from <i>Criteria for the SS Vault Storage (SNAP and Other Fuels)</i> Referencing the “DeSoto SS Vault” (Ketzlach 1973b, pp. 6 & 8)	74
Figure B-2. Excerpt from a North American Rockwell Internal Letter that References the Building 001 SS Vault (MBA 01) (Ketzlach 1973a, p. 1).....	75

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 7 of 75
-------------------------------------	----------------------------------	--	----------------------------

ABBREVIATIONS AND ACRONYMS

AI	Atomics International
Am	americium
ATR	Advanced Test Reactor
BKGD	background
CATI	computer-aided telephone interview
Ci	curie
Cs	cesium
Cu	copper
d/m	disintegrations per minute
DOE	U.S. Department of Energy
DOL	U.S. Department of Labor
DPH	Department of Public Health, State of California
dpm	disintegrations per minute
EBR	Experimental Breeder Reactor
EE	energy employee
EEOICPA	Energy Employees Occupational Illness Compensation Program Act
EPA	U.S. Environmental Protection Agency
ER	evaluation report
ETEC	Energy Technology Engineering Center
ETR	Experimental Test Reactor
FCEL	Fast Critical Experiment Laboratory
GCR	gas-cooled reactor
HQ	Headquarters
HP	health physicist
ICC	[Unknown designation – possibly Interstate Commerce Commission]
JAERI	Japan Atomic Energy Research Institute
Kr	krypton
Li	lithium
MAGNOX	Magnesium Non-Oxidizing
MFP	mixed fission products
Mg	magnesium

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 8 of 75
-------------------------------------	----------------------------------	--	----------------------------

MPC	Maximum Permissible Concentration
mr/hr, mR/hr	milliroentgen per hour
mrad	millirad
MTS	Member of the Technical Staff (alternately, Mechanical Testing and Simulation)
μCi	microcurie
Na	sodium
NaK	Sodium-potassium alloy
NDA	no detectable activity
NIOSH	National Institute for Occupational Safety and Health
NOCTS	NIOSH-OCAS Claims Tracking System
NOV	Notice of Violation
OMRE	Organically Moderated Reactor Experiment
pCi/d	picocuries per day
Pm	promethium
Pu	plutonium
R&D	research and development
R/A	radioactive
RMDF	Radioactive Materials Disposal Facility
SEC	Special Exposure Cohort
SEC ER	Special Exposure Cohort petition evaluation report
SNAP	Systems for Nuclear Auxiliary Power
SNM	special nuclear material
Sr	strontium
SRDB	Site Research Database
SRE	Sodium-Cooled Reactor Experiment
SSFL	Santa Susana Field Laboratory
STIR	Shield Test and Irradiation Reactor
TAEP	tagged area entry permit
Th	thorium
ThO ₂	thorium dioxide, thorium oxide
TLD	thermoluminescent dosimeter
TRUMP-S	Transuranic Management by Propartitioning-Separation

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 9 of 75
-------------------------------------	----------------------------------	--	----------------------------

U uranium

UCLA University of California – Los Angeles

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 10 of 75
-------------------------------------	----------------------------------	--	-----------------------------

EXECUTIVE SUMMARY

As described in the Introduction and Background material in Section 1 of this report, the key questions related to Special Exposure Cohort (SEC) Petition 246 regard the ability to reconstruct potential internal exposures to americium and thorium at the De Soto Avenue Facility from 1965 through the end of 1995. To sufficiently answer these questions, SC&A performed a critical review of available documentation as well as evaluation of the interview statements provided by former workers. As noted in Section 2 of this report, the availability of primary documents, such as health physics logbooks, tagged area entry permits, contamination smear survey results, and general air sampling reports, have significant temporal limitations for some periods, including a 13-year gap in available health physics logbooks for 1968–1981 (see Finding 1).

Section 3 of this report evaluates documentation contained in the Site Research Database (SRDB) concerning americium source terms and the potential for exposure. The potential for internal exposure to americium could have resulted from four primary types of activities: handling and/or processing of decladded spent nuclear fuel, handling of unencapsulated americium for the purpose of fabricating sealed sources, activities related to the Transuranic Management by Partitioning-Separation (TRUMP-S) program, and/or exposure to the americium contained in De Soto smoke detectors. SC&A’s investigation into the available documentation did not identify activities involving decladding of spent nuclear fuel. However, SC&A did identify one document indicating a contaminated container that had been used to clean decladded fuel (see Finding 2).

Encapsulated americium source material is well documented at De Soto; however, no evidence was observed to indicate external contamination of the sealed sources (see Observation 1). A Notice of Violation (NOV) was levied on the Santa Susana Field Laboratory (SSFL) and De Soto facilities for not strictly conforming to the 6-month leak check requirement. However, the NOV did not indicate that any of the encapsulated americium sources had ever been compromised. SC&A identified a document indicating that TRUMP-S material was received at De Soto; however, the material did not contain americium (only depleted uranium and plutonium). SC&A did not identify any sources indicating the actual use of americium-241 (Am-241) via the TRUMP-S program at De Soto (see Observation 2).

Smoke detectors containing Am-241 at De Soto were not in use until 1985. While preventative maintenance work was performed at each individual smoke detector location, actual repairs that may have exposed the Am-241 source inside the smoke detectors only occurred in the electrical shop at SSFL. A radiological evaluation of regular preventative maintenance of the smoke detectors indicated little to no internal exposure potential (see Observation 3).

A radiological survey of the floor drains in the Mass Spectrometry Laboratory (Building 4) that occurred sometime in 1988 indicated the detection of americium. The available document does not provide information about what activities may have led to the americium migrating into the drain; however, the clear implication is that the unencapsulated material was handled at some time prior to 1988 in the laboratories at De Soto (see Finding 3). According to a 1977 licensing document, the only unencapsulated material handled at the De Soto facility involved isotopes of uranium (see Observation 4).

SC&A’s evaluation of thorium exposure potential at De Soto can be found in Section 4 of this report. The National Institute for Occupational Safety and Health (NIOSH) SEC evaluation report (ER)

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 11 of 75
-------------------------------------	----------------------------------	--	-----------------------------

acknowledges three distinct operations involving thorium that are of concern as potential internal exposure scenarios. These operations include the fabrication of thorium fuel capsules, analysis of fuel elements after offsite destructive testing, and the grinding of thorium fuel plates, which occurred in 1979. For the thorium-grinding operation, NIOSH has calculated coworker intake rates that can potentially be used to assign unmonitored thorium doses. While SC&A's review of available documentation did uncover additional work with thorium material that had not been discussed in the NIOSH SEC ER, SC&A did not identify any evidence of exposure situations involving thorium that were likely to exceed the internal exposure potential and derived intakes from the grinding operation in 1979 (see Observations 5 and 6).

Lastly, SC&A evaluated documented interviews with former workers at De Soto (see Section 5), as well as statements made by the Energy Employees Occupational Illness Compensation Program claimants who had covered employment the site during the period under evaluation (see Section 6). It should be noted that only two documented interviews were performed as part of the NIOSH SEC ER. One of the interviewees, who began work in [REDACTED], admitted their knowledge was primarily based on historical summations and that they had "no knowledge of historical operations." The other interviewee began work in [REDACTED] and only toured the radiological areas of operation (see Finding 4). In addition to these documented interviews, SC&A identified several former workers who might represent potential candidates for future interviews if further investigation is deemed valuable (see Observations 6 and 7).

In summation, SC&A believes that the limited available documentation supports the conclusion that exposure potential to unencapsulated americium from sealed sources, the TRUMP-S program, and radioactive smoke detectors is not probable. However, the documentation describing the presence of contaminated materials used in cleaning decladded fuel elements suggests that exposure to transuranic materials, including americium, may have existed in Building 1. Furthermore, indications of americium contamination in the Mass Spectrometry Lab drains in Building 4 suggest unencapsulated americium may have been handled at least on a bench-scale basis in those areas.

SC&A did not observe evidence of thorium operations that would result in an internal exposure potential that cannot be bounded by the intake estimates based on the documented thorium-grinding operation in 1979. However, caution must be used in these determinations, as SC&A also notes temporal deficiencies in the primary health physics documentation during the period under evaluation (as noted in Section 2). Furthermore, interviews with a sufficient number of former energy employees with process-specific knowledge of operations during the period under evaluation are limited, as noted in Sections 5 and 6. SC&A has identified several energy employees who might have valuable process and source-specific knowledge of radiological conditions at De Soto that can potentially be utilized in any future deliberations, as required.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 12 of 75
-------------------------------------	----------------------------------	--	-----------------------------

1 INTRODUCTION AND BACKGROUND

Special Exposure Cohort (SEC) Petition-00246 for the De Soto Avenue Facility was submitted to the National Institute for Occupational Safety and Health (NIOSH) on December 13, 2017, with the following proposed definition:

All workers who worked at the DeSoto Avenue Facility in Los Angeles County, CA during the period from January 1, 1965 through December 31, 1995. [NIOSH 2018, p. 1]

The original petition states the following reasons for submission:

NIOSH has determined it cannot reconstruct radiation dose for americium, thorium, or associated progeny at SSFL Area IV, 1965–1988. Based on shared contractor and operational history, shared data limitations between SSFL Area IV/DeSoto Facility, and the established presence of americium, thorium and associated progeny at DeSoto Facility until at least 1995, the following petition is submitted. [De Soto Petition 2017, p. 4]

SEC Petition-00246 was qualified for evaluation on March 1, 2018. The class evaluated by NIOSH remained virtually unchanged from the petitioner requested class:

All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the DeSoto Avenue Facility in Los Angeles County, California, from January 1, 1965 through December 31, 1995. [NIOSH 2018, p. 1]

NIOSH's SEC petition evaluation report (ER; hereafter referred to as the "NIOSH SEC ER") was submitted on July 3, 2018, and presented to the Advisory Board on Radiation Worker Health at its 124th meeting in Providence, RI, on August 23, 2018. As seen in the original petition basis shown above, the overarching rationale for SEC-00246 was twofold:

1. The inability to reconstruct internal exposures to thorium and americium that formed the basis for acceptance of SEC-00234 at the Santa Susana Field Laboratory (SSFL) for 1965–1988.
2. The contention that radiological exposure conditions (including source terms, exposure potential, and radiological controls/monitoring) were sufficiently similar between the De Soto and SSFL sites to preclude the ability to reconstruct doses with sufficient accuracy at either location.

The NIOSH SEC ER concluded the following about exposures potential to americium at the De Soto facility:

neither the documents available to NIOSH nor interviews with former workers...revealed any history of fabrication of americium sources, or work with uncontained americium at the De Soto Avenue Facility. Contrasting previous NIOSH evaluations of radiological work at Area IV of SSFL, NIOSH has found no indication that De Soto had sources of americium associated with work processes. [NIOSH 2018, pp. 37–38]

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 13 of 75
-------------------------------------	----------------------------------	--	-----------------------------

The NIOSH ER concluded the following about thorium internal dose reconstruction at De Soto facility:

NIOSH has identified detailed documentation of thorium work episodes in 1970 and 1979, providing source term, operational procedures, radiological protection protocols, names of individual operators, and dates of work. NIOSH has concluded that thorium-grinding operations in 1979 represent the bounding thorium internal exposures at the De Soto Avenue Facility during the operational period (January 1, 1965 through December 31, 1995). As presented in Section 7.2.3.1, NIOSH has sufficient personnel bioassay data (including per-work and post-work urinalysis), and job performance data, to allow it to develop a bounding dose estimate for workers with potential thorium exposures during the period from January 1, 1965 through December 31, 1995. [NIOSH 2018, p. 39]

Following discussions of the SEC-00246 ER for De Soto at the August ABRWH Meeting, SC&A, Inc. was tasked with reviewing the NIOSH SEC ER with a particular focus on the potential for internal exposure to thorium and americium. This report presents the results of SC&A's investigation and review of the SEC-00246 ER.

During its review, SC&A carefully evaluated documentation and worker interviews and statements contained in the following:

- Documentation in the Site Research Database (SRDB) maintained by NIOSH (see Sections 2–4).
- Documented interviews with former workers at the De Soto site, including (1) focused interviews conducted by SC&A and NIOSH, interviews conducted by the U.S. Department of Energy (DOE) and Environmental Protection Agency (EPA) published in 2011, and (2) computer-aided telephone interviews (CATIs) performed as part of the Energy Employees Occupational Illness Compensation Program Act (EEOICPA) dose reconstruction of claimants for the De Soto facility (see Sections 5 and 6).
- Documentation and an affidavit provided by the petitioner in both the original petition submission (De Soto Petition 2017) and a follow-up white paper submitted by CORE Advocacy for Nuclear & Aerospace Workers (CORE Advocacy 2018) clarifying several items from the petitioner's original submission (see Attachment A).

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 14 of 75
-------------------------------------	----------------------------------	--	-----------------------------

2 OVERALL DOCUMENT COVERAGE

As discussed in Sections 3 and 4, information concerning potential exposure to unencapsulated thorium and americium is contained in the following document types:

- Health physics logbooks (see Figure 5 in Section 3 for an example)
- Tagged area entry permit (TAEP) (see Figure 11 in Section 4 for an example)
- Routine smear surveys (see Figures 8 and 9 in Section 4 for examples)
- General air sampling reports¹

SC&A reviewed the available documentation from the SRDB as well as health physics logbooks provided by CORE Advocacy. Figures 1–4 show the SC&A-compiled percentage of months within each year that contained at least some documentation of each type listed above. As can be seen in the figures, there are significant gaps for each type of document. While logbooks were available for the first two years being evaluated (1965 and 1966), no TAEPs, smear surveys, or air sampling reports were identified. SC&A did not identify any health physics logbooks from 1968 through 1980. Air sampling reports were generally only available during the years 1971–1972 and 1980–1981; these periods correspond with the thorium operations identified in the NIOSH SEC ER. Area smear summaries were generally either not available or sporadic for most years, with the exception of 1968–1971, 1976, and 1980–1981. The disposition of additional documents of the four types mentioned above is not known at this time.

Finding 1: SC&A identified significant temporal gaps in four key types of documents available in the SRDB: health physics logbooks, tagged area entry permits, routine smear surveys, and general air sampling reports. The disposition of additional documents of this type is not known at this time.

¹ SCA did not compile information on individual worker lapel samplers, also known as personnel air samplers.

Figure 1. Percentage of Months by Year with Health Physics Logbooks Available for Review

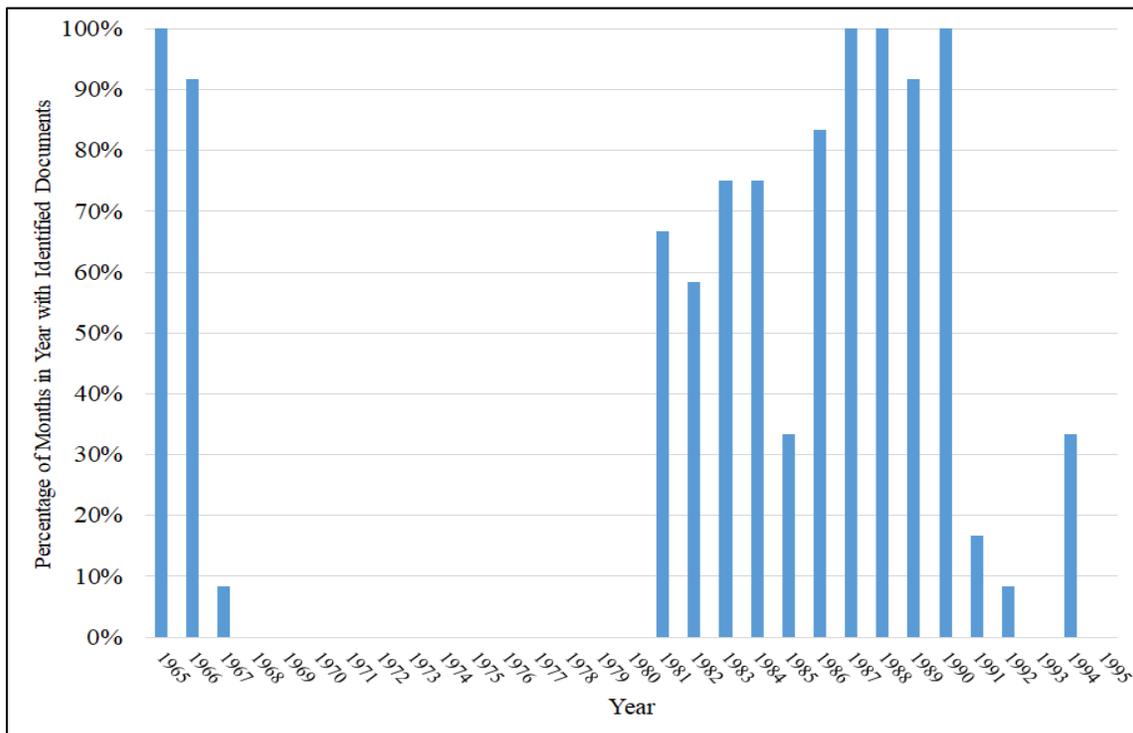
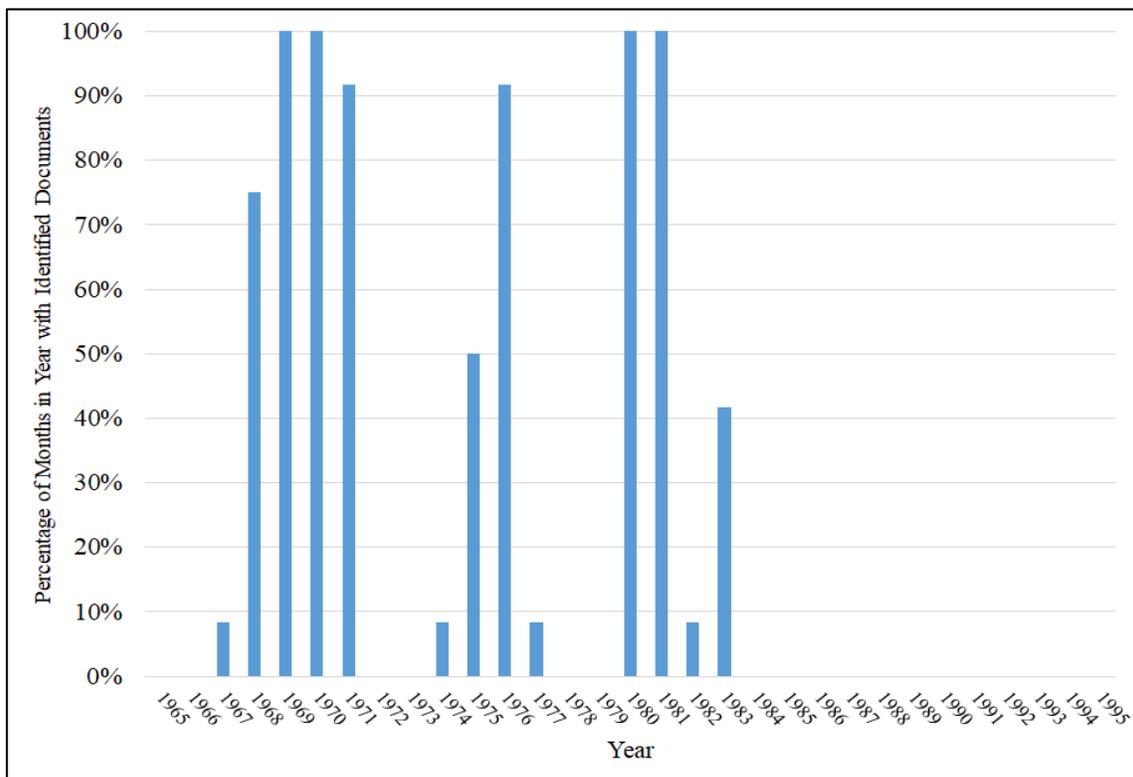


Figure 2. Percentage of Months by Year with Tagged Area Entry Permits Available for Review



NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Figure 3. Percentage of Months by Year with Area Smear Survey Reports Available for Review

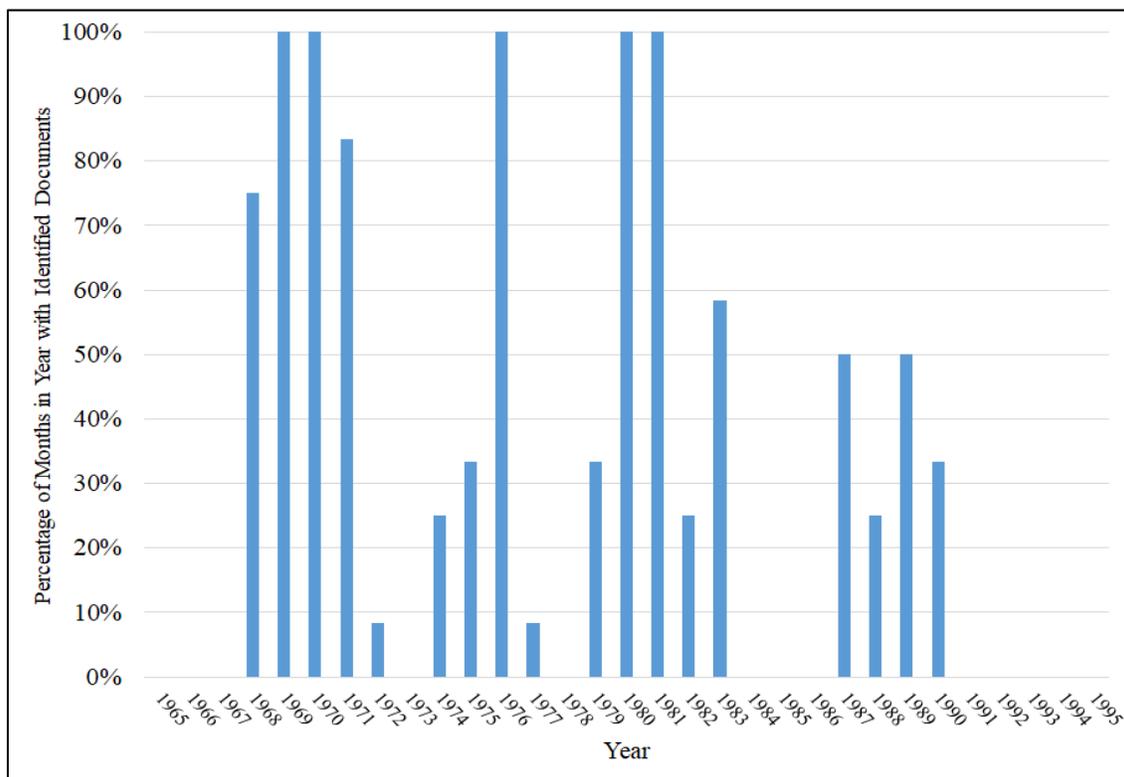
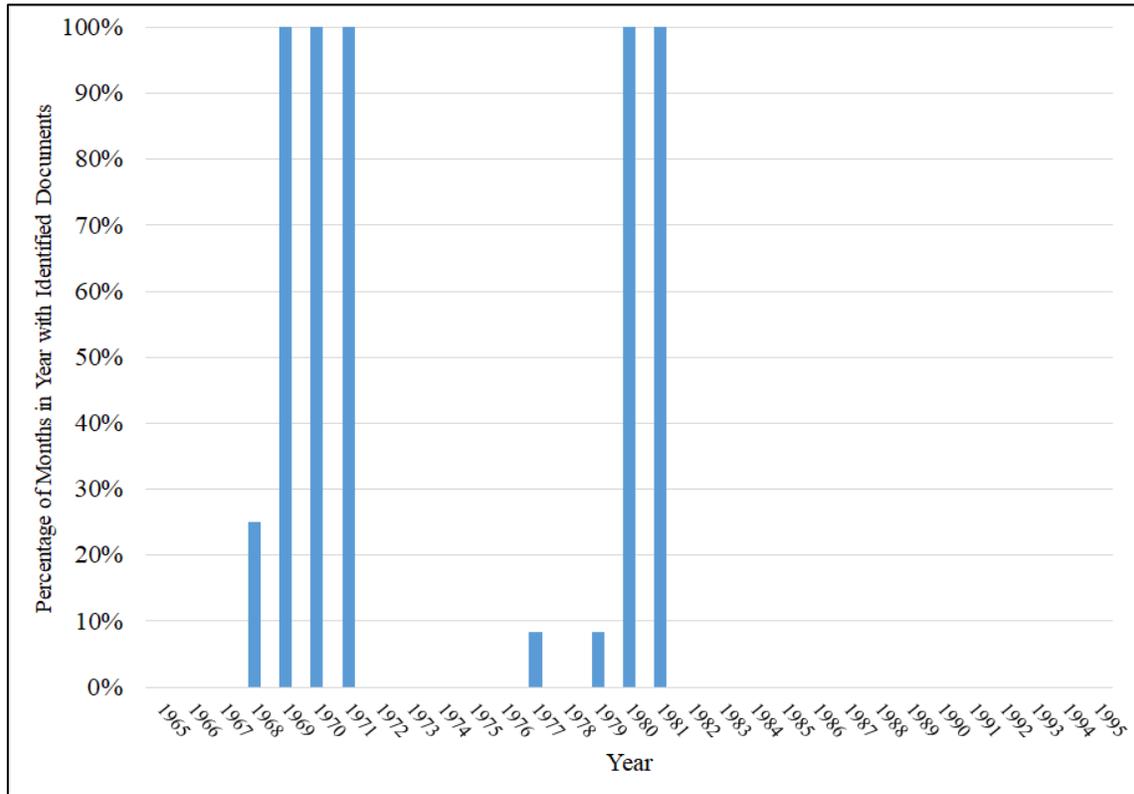


Figure 4. Percentage of Months by Year with General Area Air Monitoring Reports Available for Review



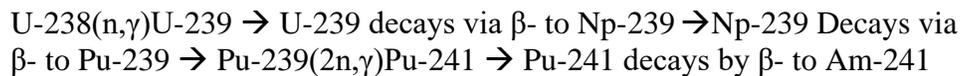
Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 18 of 75
-------------------------------------	----------------------------------	--	-----------------------------

3 AMERICIUM-241 AND ASSOCIATED INTERNAL EXPOSURE POTENTIAL AT DE SOTO

As noted in the introduction, part of the rationale for extending the SEC class at SSFL was the inability to reconstruct internal dose to americium-241 (Am-241) due to a lack of adequate monitoring data. NIOSH 2018 concludes the following about Am-241 exposure at De Soto:

neither the documents available to NIOSH nor interviews with former workers...revealed any history of fabrication of americium sources, or work with uncontained americium at the De Soto Avenue Facility. Contrasting previous NIOSH evaluations of radiological work at Area IV of SSFL, NIOSH has found no indication that De Soto had sources of americium associated with work processes. [p. 39]

Am-241 is not a naturally occurring isotope and is generally produced via the irradiation of nuclear fuel by the following reaction steps:



At SSFL, it was well documented that irradiated/spent nuclear fuel was decladded in Building 20, which created a situation where internal exposure potential to Am-241 existed that was unmonitored and not deemed reconstructable with sufficient accuracy. Therefore, one of the central questions regarding SEC-00246 is whether unencapsulated spent nuclear fuel was handled in a manner that created a similar internal exposure potential at the De Soto facility. In addition to exposure to spent nuclear fuel, Am-241 also existed at De Soto as radioactive source material. Radioactive Material Licensing documents issued by the State of California allowed the De Soto/SSFL sites to possess as much as 10 curies (Ci) of Am-241 for the purpose of "Fabrication of sealed sources and transfer to authorized recipients" (DPH 1969, PDF p. 6).

Such fabrication of Am-241 sources could certainly constitute an internal exposure potential. Americium might have also been used at the De Soto facility as part of the Transuranic Management by Propartitioning-Separation (TRUMP-S) program, which utilized americium, among other alpha-emitting material, in research studies on the disposal of spent nuclear fuel.

Finally, americium was used for a period of time in the De Soto facility's smoke detectors. While this in itself is not likely to be an internal exposure hazard, any maintenance activities or loss of integrity of the Am-241 contained in the smoke detectors could have resulted in internal exposures.

SC&A performed an extensive review of available documentation in the SRDB to determine whether evidence exists that such exposures to Am-241 occurred at De Soto. Table 1 lists and discusses relevant documents. The entries in the table have been assigned an arbitrary designation in the first column for ease of reference and discussion.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 19 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Table 1. Description of Am-241-Related Information in the Site Research Database

Ref.	SRDB ID (Page #)	Description of Americium Documentation	SC&A Comments
Am-1	169514 (60)	Logbook entry on 3/5/1965 states: <i>“Monitored & tagged 3 birdcages containing ~50 mc of irradiated classified material to be shipped to [name redacted] at CDHC, SS. Maximum surface dose rate was 100 mrad/hr.”</i>	No further information is provided to indicate whether the irradiated material was unencapsulated or in a form that would allow for internal exposure. It is noteworthy that the process of monitoring and tagging the birdcages only consisted of an external dose rate measurement. This is indicative of a material for which no external contamination was likely to be expected (such as an encapsulated fuel source with no evidence the cladding was compromised).
Am-2	169514 (72)	Logbook entry on 3/11/1965 reads <i>“Smear survey of hood in the NW corner of 1110-80 indicated a maximum of 1.8×10^3 dpm/100cm² α and 6×10^3 dpm/100cm² $\beta\gamma$ in a long thin tray used to clean Na from decladded fuel. This is a blue tag area!”</i>	It is unknown if the fuel had been decladded and cleaned at De Soto, nor if it had actually been irradiated and thus would have contained transuranic material. The exact location of “1110-80” is not known; however, “1110-62” is part of the fuel fabrication Section of Building 1 (also known as the powder room). The surrounding logbook entries refer to locations associated with Building 1, so SC&A assumes the contaminated tray was also found in Building 1. It is notable that the contaminated tray was located in a hood, which would mitigate airborne radioactivity available for resuspension. The reference to a “blue tag area” is not clear; however, it seems likely, given the tone of the logbook entry, that this represented an area that was supposed to be relatively clean of radioactive material.
Am-3	169514 (114)	Logbook entry on 4/15/1965: <i>“Monitored & tagged a container of Am²⁴¹ crystals. 0.2 mr/hr @ surface. Container is going to Bldg 4 from 11H-02.”</i>	As the logbook notes, the Am-241 material was in a container that was only monitored for an external dose rate. The fact that no contamination surveys were performed on the container likely indicates that the material was encapsulated and no external contamination was likely. Note: this reference was also identified in CORE Advocacy 2018 (see Item 9i in Attachment A).
Am-4	169514 (175, 176)	Logbook entry on 6/24/1965: <i>“A spent element was moved to D/789 clean machine shop for machining. Prior approval had been obtained since the clad element would not be exposed. Surface Dose rate 1 mr/hr”</i>	While the entry clearly involves a spent fuel element that was to undergo a machining operation, the key part of the entry notes that the actual clad element would not be exposed; thus, internal exposure potential to the actual fuel containing transuranic material would not have occurred unless there was an unforeseen incident with the operation.
Am-5	169514 (183)	Logbook entry on 7/1/1965: <i>“Signed off irradiated assembly of special nuclear material to Chalk River, Ontario, Canada. Dose rate at truck exterior - 0.05 mr/hr, Cab dose rate 0.02 mr/hr, Backgroun[sic] 0.02 mr/hr”</i>	This entry involves the transfer of a spent fuel element off site from the De Soto facility. There is no indication that the fuel elements had been decladded. In addition, no external contamination surveys were performed on the assembly; thus, the material was likely still encapsulated and no external contamination by the fuel was deemed probable.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 20 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Ref.	SRDB ID (Page #)	Description of Americium Documentation	SC&A Comments
Am-6	169514 (188)	Logbook entry on 7/12/1965: <i>"Called to 11H-06. Monitored & tagged capsule containing Am²⁴¹ going to Bldg. 4, <1 mr/hr @ surface; smoke detector going to S.S., < 1 mr/hr @ surface, filed copy of shipper; ... No surface contamination detected."</i>	Similar to previous entries, the Am-241 was contained in a capsule and both an external dose and external contamination survey was performed with no external contamination detected. The entry also indicates a radioactive smoke detector being shipped to "S.S." Evidence suggests that smoke detectors containing Am-241 were not used at De Soto until 1985 (See entry Am-9 below). Furthermore, the entry notes <i>"filed copy of shipper,"</i> which may indicate the smoke detector arrived at De Soto but was intended to be transferred on to SSFL.
Am-7	169514 (250)	Logbook entry on 9/15/1965: <i>"Monitored & tagged package containing Am²⁴¹ going to Bldg. 4 from 11H-06. 0.1 mrad/hr @ surface. No external contamination."</i>	Similar to other entries in this table, the Am-241 material was packaged, and no external contamination was detected.
Am-8	169514 (270)	Logbook entry on 10/8/1965: <i>"Monitored and tagged in 11H-06: ... 3. cardboard box - Am²⁴¹"</i> The entry also includes two items identified as enriched uranium. The entry states that no contamination was detected. See Figure 5 for a screenshot of the logbook record.	The Am-241 is described as being contained in a <i>"cardboard box,"</i> which would not be considered a dependable means of containing loose radioactive material. However, it is possible the box actually contained Am-241 that was already encapsulated. No other information was located in the surrounding logbook entries to indicate the provenance of the Am-241 nor what future activities were planned for the material. In any case, the external survey of the box indicated there was no detectable contamination.
Am-9	170501 (54,75, 194)	An internal memo dated 4/20/1985 indicates that all Building 100 Am-241 smoke detectors were installed during April 1985; prior to this time, all the smoke detectors were heat based. Authorization 141, which covers the Am-241 smoke detectors, notes that preventative maintenance is performed at each smoke detector location but any actual repairs are performed at SSFL. A 1988 study of the exposure potential during preventative maintenance indicates that contamination on all cleaning materials was less than the allowable U.S. Nuclear Regulatory Commission levels for release to uncontrolled areas. The four electricians performing the preventative maintenance underwent subsequent bioassay, with no detectable activity.	It is important to note that the source of Am-241 in smoke detectors does not appear to be present at De Soto until 1985. Furthermore, actual repair of the smoke detectors (which may necessarily result in exposing the Am-241 material) did not occur at De Soto. The preventative maintenance activities on the smoke detectors at De Soto were evaluated by the De Soto HPs for radiological implications and resulted in the conclusion of little to no internal exposure potential.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 21 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Ref.	SRDB ID (Page #)	Description of Americium Documentation	SC&A Comments
Am-10	170493 (14, 15, 17)	An incident report from May 1989 documents the shipment of material for the TRUMP-S program to De Soto that was not appropriately surveyed by Radiation and Nuclear Safety in a timely manner as required by the Code of Federal Regulations (10 CFR 20.205).	The incident investigation timeline notes that the package in question contained 5 grams of plutonium and 75 grams of depleted uranium (i.e., no americium was included in the shipment). Furthermore, the incident investigation concluded: <i>“There was no “lost shipment”. [New Brunswick Laboratories] shipped correctly, the Shipper transported properly, and we received correctly. What failed to work was the paperwork of transmittal, a telephone call, and absence of feedback mechanisms.”</i> The package was eventually located in the appropriate radioactive material locker at the De Soto shipping dock and was surveyed and found intact with no detectable external contamination.
Am-11	78222 (62, 66, 169)	This document from January 1994 describes a Notice of Violation (NOV) of the 6-month source leak-check requirement. Specifically, the document states on page 62: <i>“Fifty-nine California-regulated sources require leak testing on a six monthly interval. A detailed review of the source leak test dates indicated that 47 were 1 day late... and 12 sources were 8 days late.”</i> The document further notes that this was a repeat of a violation that occurred in May 1991.	Sources at De Soto and SSFL were required to be leak-checked as a part of the material license. Although the NOV notes that the leak-checks were late by 1–8 days of the 6-month requirement, the NOV does not indicate that any of the sources actually had leaked and released contamination that might be available for intake by workers handling the sources.
Am-12	170416 (5)	The cited document (from 1997) describes a 1988 survey of the industrial waste drains in the Mass Spectrometry Lab that may indicate the presence of unencapsulated Am-241. See Figures 6 and 7 for screenshots of the document in question.	The 1997 document appears to have undergone internal editing, as it contains red strike-through marks with additional sentences and existing sentence edits. One of the added sentences appears to have read originally as <i>“The presence of 400 pCi in 49 gm of scal [sic] Am-241 in a drain sample was unexplained. There was no recorded release of plutonium or americium.”</i> However, parts of the added sentence were then crossed out to read <i>“The presence of 00 pCi in 49 gm of scal [sic] of Am-241 was in a drain sample. No recorded release of plutonium or americium.”</i> No further information was provided about what activities may have occurred at the Mass Spectrometry Lab that may have resulted in Am-241 being found in the drain.

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 22 of 75
------------------------------	---------------------------	---	----------------------

Figure 5. Health Physics Logbook Entry from October 1965 Showing a Box of Am-241 Being Monitored and Tagged in Room 11H-06 (De Soto 1964–1965b)

10/9/65

0830 Monitored & Tagged in 11H-06:

1. Fission Counter - FWR U - 0.1 mcp/hr @ surface - ~1 mc.
2. Cardboard Box - FWR U - 1.2 mcp/hr @ surface - ~10 mc
3. " " - Am²⁴¹ - <0.1 mcp/hr @ surface.

No external contamination. LHC

Figure 6. Excerpt Describing Previous Radiological Surveys of the Mass Spectrometry Laboratory (De Soto 1997, PDF p. 5)

Radiological Assessment

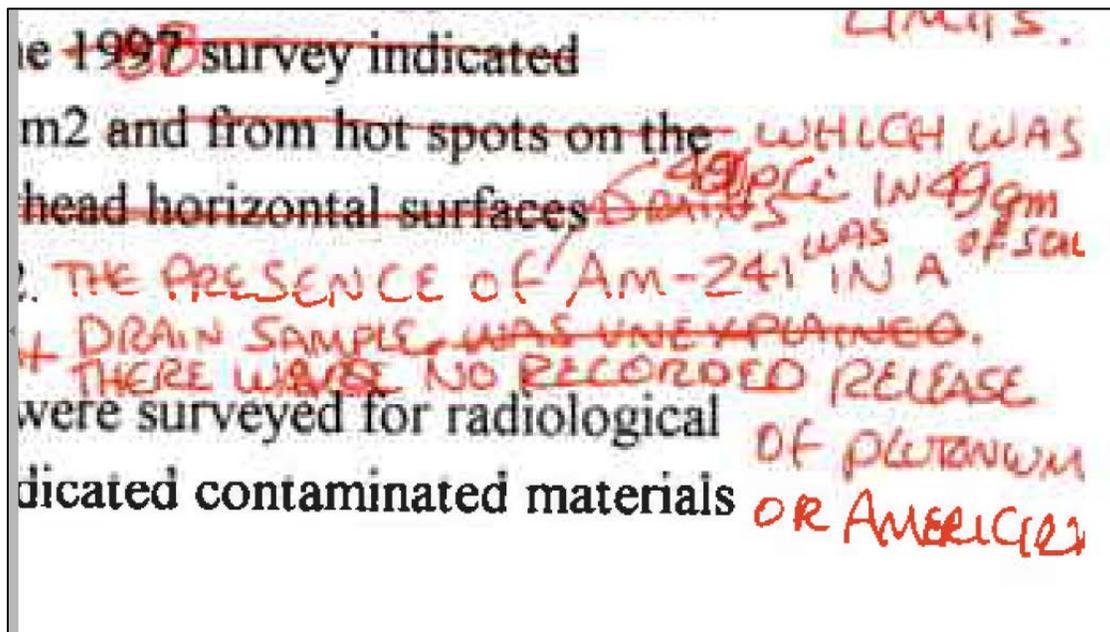
Results from previously conducted radiological surveys revealed that the Mass Spectrometer Laboratory was contaminated with radioactive materials. In July 1984, during the course of removing stored equipment from the laboratory, Cs-137 contamination was detected on the floor. A more detailed survey conducted in 1988 revealed additional radioactive contamination on the industrial waste drains such as uranium, cobalt, cesium, barium, Nubium, and on the overhead horizontal surfaces, such as ducting, piping and light fixtures. Gamma spectrometry results of wall scrapings indicated the presence of Cs-137, low-enrichment uranium (2.75%), and Sr-90 activity. This information and review of past work records suggest that this activity resulted from piping that discharged to a holding tank. The 1997 survey indicated detectable activity on the floor area ranging from ? dpm beta/100cm² and from hot spots on the east wall ranged from ? dpm beta/100cm². Contamination on overhead horizontal surfaces (piping, ducts, light fixtures, etc.) ranged from ? dpm beta/100cm². THE PRESENCE OF AM-241 IN A DRAIN SAMPLE WAS UNEXPLAINED. THERE WAS NO RECORDED RELEASE OF PLUTONIUM OR AMERICIUM.

TO THE COOLING WATER SUPPLY LINE
ALL OF WHICH WERE DECONTAMINATED
WAS WELL BELOW DETECTABLE RELEASE LIMITS.
WHICH WAS 49 dpm OF SAL
5.6E-8 uCi/ml
420 ALPHA

THE MAXIMUM ACTIVITY WAS 420 dpm/cm² BELOW THE 5000 dpm/cm² OR U-235.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 23 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Figure 7. Magnified Portion of Figure 2 Showing Handwritten Edits Indicating Am-241 in a Drain Sample (De Soto 1997, PDF p. 5)



As Table 1 shows, indications of spent or irradiated fuel at De Soto are generally restricted to health physics logbook entries (see entries Am-1, Am-2, Am-4, and Am-5). In entries Am-1, Am-4, and Am-5, the spent fuel appears to be still encapsulated, as there are no indications of external surveys being performed to check for contamination that might have been available for inhalation or ingestion. In entry Am-4, the spent fuel rod was to be machined; however, the work could be done in a clean area because the process would not penetrate the existing cladding.

Entry Am-2 refers to a piece of contaminated equipment found in a hood in area “1110-80” that had been used to clean sodium off of decladded fuel rods. It is not clear from the logbook entry whether the decladding and/or the cleaning of the decladded fuel rods was performed at De Soto. Nor is it clear whether the fuel rods had actually been irradiated, which would have produced transuranic material such as Am-241. It is possible the fuel in question represented fresh fuel that was to undergo testing or recladding. However, the fact that sodium used as a reactor moderator material had to be cleaned off of the fuel likely indicates its use in a reactor.

Finding 2: SC&A did not identify any activities involving the handling of decladded spent nuclear fuel that may have presented an internal exposure potential to Am-241. However, at least one reference indicates that a contaminated container used to clean sodium from decladded fuel had been discovered in a hood area in Building 1 at De Soto. Unless the decladded fuel was fresh fuel undergoing decladding, the fuel would be expected to have been irradiated and thus would likely contain americium.

Table 1 entries Am-3, Am-6, Am-7, and Am-8 describe the movement of americium source material in various containers at De Soto. However, none of the entries indicated external contamination on the packaging, nor was there indication of prior or future uses of the americium that would involve handling it in unencapsulated form. It is important to remember that sources located at De Soto were required to be leak-checked every 6 months when in use to assure that no material was escaping the containment and might become available for inhalation or ingestion. Sources that were not in use (i.e., contained in

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 24 of 75
-------------------------------------	----------------------------------	--	-----------------------------

storage) were to be leak-checked upon the commencement of any future work. Entry Am-11 indicates an NOV from the U.S. Nuclear Regulatory Commission for not strictly abiding by the 6-month leak-check requirement. Further, the NOV indicates it was a repeat violation of the leak-check requirement. However, the documentation also indicates the majority of leak checks were late by only a single day, with the others by 8 days or less. No evidence was identified in available SRDB documentation of americium sources leaking.

Observation 1: SC&A found examples of Am-241 source material being transferred to different locations at the De Soto site; however, no evidence of the fabrication of new Am-241 sources, as allowed by Radioactive Material License 0015-59, was identified.

Table 1 entry Am-10 describes a shipment of TRUMP-S material arriving at De Soto that was part of a documented incident in which the shipment was believed to have been “lost.” However, the underlying documentation suggests that only depleted uranium and plutonium were present in the shipment (no americium). Furthermore, the package was eventually located in an appropriate storage location, and the package had not been compromised, with no external contamination detected. The incident was essentially a series of administrative errors, and no indications of internal exposure potential were identified.

Observation 2: Documentation confirms that TRUMP-S material was shipped to the De Soto site. However, SC&A did not find any indication of TRUMP-S operations occurring at the site that could have involved unencapsulated Am-241.

Per Table 1 entry Am-9, smoke detectors containing americium were not in use at De Soto until 1985. Prior to this time, standard heat sensing smoke detectors were used. A 1988 characterization of typical preventative maintenance activities (such as cleaning) occurring with the americium smoke detectors indicated little to no internal exposure potential. Any actual repairs of americium-containing smoke detectors were performed in the electrical shop at SSFL and not at De Soto, where only preventative maintenance occurred.

Observation 3: Smoke detectors containing Am-241 were in use at De Soto beginning in 1985; however, radiological exposure characterization of routine preventative maintenance of the detectors indicated little to no internal exposure potential. Actual repair of the radioactive smoke detectors, which may involve exposing the Am-241 source material, occurred at SSFL and not De Soto.

SC&A identified one document describing a survey of the floor drains in the Mass Spectrometry Lab occurring sometime in 1988 that appears to indicate that unencapsulated Am-241 was discovered (De Soto 1997). The document does not expand on what activities may have occurred in the laboratory areas involving unencapsulated Am-241, which could have migrated into the floor drains. The document merely appears to state that there were no documented releases of americium or plutonium at De Soto.

Finding 3: While SC&A did not observe any documentation directly indicating the handling of unencapsulated americium source material, evidence from at least one document suggests that a 1988 survey of floor drains in the laboratory area identified Am-241 contamination. **Such contamination would not be expected unless unencapsulated americium was used at some point during laboratory activities.**

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 25 of 75
-------------------------------------	----------------------------------	--	-----------------------------

In addition to the examples in Table 1, a 1977 document, *Technical Information in Support of the Atomics International Application for Broad Nuclear Materials License* (Atomics International 1977, p. 232), states:

Nuclear fuel material handled in unencapsulated form at Headquarters buildings contains the uranium isotopes U^{234} , U^{235} , U^{236} , and U^{238} . Radioactive material handled in unencapsulated form at Santa Susana Building 020 contains the following radionuclides: Th^{232} , U^{233} , U^{234} , U^{235} , U^{236} , and U^{238} as constituents in the various nuclear fuel materials; and Cs^{137} , Sr^{90} , Kr^{85} , and Pm^{147} as mixed fission products. Building 055 nuclear fuel materials contain the following radionuclides: U^{234} , U^{235} , U^{236} , U^{238} , Pu^{238} , Pu^{239} , Pu^{240} , Pu^{241} , and Am^{241} in depleted and enriched uranium and in plutonium. [Emphasis added.]

This indicates that, at least in 1977, the only unencapsulated fuel material handled at the De Soto site consisted of isotopes of uranium and not transuranic material. It is noteworthy that uranium-236 (U-236) would not be present in freshly fabricated fuel, as it is produced via the nuclear reaction of neutron absorption by U-235 ($U-235(n,\gamma)U-236$). This is often found in irradiated and/or spent fuel, which would be expected to contain Am-241. However, if a portion of the uranium material for fuel fabrication was received at De Soto as reprocessed fuel (the goal of which is to remove transuranic/actinide and fission product contaminants), the existence of significant quantities of U-236 would be expected.

Observation 4: A 1977 licensing document states that the handling of unencapsulated material at the De Soto facility only involves isotopes of uranium.

CORE Advocacy for Nuclear & Aerospace Workers identified several references in their recently supplied white paper (CORE Advocacy 2018) that may have implications related to americium exposure. SC&A discusses each of these references in Attachment A (see Items 3, 7, 9b, 9i–9k, 9s, 10, 11, 13, 15, 17-19, 21a–21d, 21g–21r, and 23). SC&A did not identify any additional evidence in the petitioner-supplied references that directly indicates internal exposure potential to unencapsulated materials containing Am-241.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 26 of 75
-------------------------------------	----------------------------------	--	-----------------------------

4 THORIUM OPERATIONS AND INTERNAL EXPOSURE POTENTIAL AT DE SOTO

In addition to potential americium exposure, the recommended SEC class for the SSFL site was due to the inability to reconstruct internal dose to thorium. It has been established that the De Soto facility's health physics program operated under the same general organization and guidelines as the SSFL site. Therefore, the ability to characterize all potential thorium operations and adequately estimate a bounding dose to any thorium handled at De Soto is fundamental to the evaluation of SEC-00246.

NIOSH 2018 describes three primary thorium-processing activities at De Soto during the period under evaluation. These activities occurred in 1970 and 1979 and can generally be described as follows:

1. Fabrication of fuel-simulant discs involving approximately 5 kg of thorium dioxide (ThO₂) powder. Per the NIOSH SEC ER, this operation occurred in June 1970.
2. Post-test analysis of thorium capsules that had undergone destructive testing, including impact, fragmentation, overpressure, and fire testing at Sandia National Laboratories. Per the NIOSH SEC ER, this operation occurred from June 15, 1970, through July 30, 1970.
3. Grinding of the corners of approximately 540 plates of thorium metal. Per the NIOSH SEC ER, this operation occurred from February 28, 1979, through March 12, 1979.

The NIOSH SEC ER concludes that the 1979 grinding operation likely involved the greatest exposure potential to thorium; this activity was also the only operation of the three identified in which thorium bioassays of the workers involved are available for analysis. Based on the thorium bioassay data, NIOSH calculates an internal thorium intake rate of 729 picocuries per day (pCi/d) (solubility Type M) and 419 pCi/d (Type S). For reference, 729 pCi/d would correlate to a breathable air contamination level of 7.59×10^{-12} microcuries per cubic centimeter ($\mu\text{Ci}/\text{cm}^3$) assuming a typical 8-hour work day with a breathing rate of 1.2 m³/hr. The NIOSH SEC ER concludes at the end of Section 7.2.3.1:

NIOSH has sufficient data to assign comparable thorium intake rates to De Soto Avenue workers, as appropriate for given job descriptions and potential exposure scenarios.
[NIOSH 2018, p. 38]

Therefore, the central question from an SEC context is whether evidence suggests that other thorium-related activities occurred at De Soto, which would not be bounded by the monitored grinding operation in 1979. Table 2 summarizes SC&A's review of available documentation in the SRDB related to thorium exposure potential. The entries in Table 2 are assigned an arbitrary designation in the first column for ease of reference.

In some of the entries, air sampling results are provided in units of $\mu\text{Ci}\text{-hr}/\text{cm}^3$ which indicates that they have been normalized by the number of hours spent on a specific job. Unfortunately, many of these reports do not appear to list the exposure time to allow direct comparison with ambient air concentrations. It is not clear if these results can be meaningfully converted for comparison to the calculated air concentration of 7.59×10^{-12} $\mu\text{Ci}/\text{cm}^3$ associated with the thorium-grinding operation.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 27 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Table 2. Description of Thorium-Related Information in the Site Research Database

Ref.	SRDB ID (Page #)	Description of Thorium Documentation	SC&A Comments
Th-1	169514 (72)	Logbook entry on 3/11/1965 states: <i>“Smear survey of hood in the Na corner of 1110-80 indicated a maximum of 1.8×10^3 dpm/100cm² [alpha] and 6×10^3 dpm/100cm² [beta-gamma] in a long thin tray used to clean Na from decladded fuel. This is a blue tag area!!”</i>	It is unknown if the fuel that had been decladded and cleaned was potentially thorium-bearing fuel or if this operation actually occurred at De Soto. The exact location of “1110-80” is not known; however, “1110-62” is part of the fuel fabrication Section of Building 1 (also known as the powder room). The surrounding logbook entries refer to locations associated with Building 1, so SC&A assumes the contaminated tray was also found in Building 1. It is notable that the contaminated tray was located in a hood, which would mitigate airborne radioactivity available for resuspension. The reference to a “blue tag area” is not clear; however, it seems likely, given the tone of the logbook entry, that this represented an area that was supposed to be relatively clean of radioactive material.
Th-2	169514 (146)	Logbook entry from May 1965 notes the smearing of ThO ₂ in the SS Vault.	Based on SC&A’s review of available documentation, it appears the “SS Vault” often refers to the fuel vault located in Building 1 at the De Soto facility (see Attachment B for additional information). No other information is provided in the logbooks about where the ThO ₂ came from nor what future processes were planned other than storage in the vault. No detectable contamination was reported.
Th-3	169514 (147)	Logbook entry on 5/21/1965 states: <i>“Checked out 12 R/A barrels of 4.29% U-235 going to SS - and 1 Box of Thorium oxide going to an outside contractor.”</i>	No other information is provided in the logbooks about where the box of thorium originated or what it had been used for. The logbook entry does not indicate there was contamination found on the exterior of the box.
Th-4	170379 (48)	A smear sample report from 10/20/1969 in Building-005 indicates that <i>“Follow up smears at conclusion of thorium program at B-005.”</i> See Figure 8 for a screenshot of the smear report.	Smears were taken from a fume hood, lathe, floor, lab bench, and shipping container. The highest result was in the fume hood, which measured 6 dpm alpha (assumed to be a standard smear covering 100 cm ²). As indicated in another logbook entry on the same day, it was likely part of the “Thorium (Sealed Source) Program” (see entry Th-5 below).
Th-5	170379 (91)	A second smear sample report from B-004 and B-005 on 10/20/1969 states: <i>“These smears were taken in support of the thorium (sealed source) program.”</i> See Figure 9 for a screenshot of the smear report.	Similar to the previous entry, smears were taken inside an electron beam welder chamber, a lab bench top, floor, and general work area in Building 4. Additional smears were taken in the fume hood, lathe, floor, lab bench, and the exhaust duct outside. The maximum smear read 16 dpm alpha (assumed to be standard smear covering 100 cm ²).
Th-6	170379 (117, 123)	Personnel air sampling reports for two individuals from mid-October into November 1969 in Room 11H36 (Building 1). See Figure 10 for a screenshot of two personnel air sampling reports.	As seen in Figure 10, air sampling results are given in time-weighted units of dpm-hr/cm ³ with μ Ci-hr/cm ³ in the results column. The time-weighted air samples indicate a maximum level of 1.7×10^{-10} μ Ci-hr/cm ³ . Based on the original record, it appears that no respiratory protection was used during the operation.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 28 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Ref.	SRDB ID (Page #)	Description of Thorium Documentation	SC&A Comments
Th-7	170475 (57)	Personnel air sampling report from 3/30/1970 to 4/2/1970 involving thorium “spraying.”	The time-weighted air samples indicate a cumulative exposure of 1×10^{-12} $\mu\text{Ci-hr/cm}^3$. This value includes a respiratory protection correction factor of 10.
Th-8	170475 (278)	A TAEP describes thorium occurring on 3/6/1970 in Room 11H04 as follows: “ <i>Dimensionally inspect O.D. of Co-Th-Mo Fuel Simulants used in transit capsules.</i> ” See Figure 11 for a screenshot of the TAEP report.	The “contamination level” section of the TAEP indicates “controlled.” The requirements for the job included a beta-gamma film badge, tool survey, and personal survey. Note that thorium transit-capsule operation is described in the NIOSH SEC ER as occurring in June and July 1970, while this TAEP is dated as early as March 1970.
Th-9	170475 (288)	A smear sample report from 3/30/1970 in Building 400, Room 416-51, states: “ <i>Th samples are being sprayed (by plasma).</i> ”	Smear samples were taken in the down draft hood where the thorium spraying occurred, the floor, and the work bench area. The highest reading was on the floor of the down draft hood at 12 dpm alpha (assumed to be a standard smear covering 100 cm^2).
Th-10	170475 (291)	A smear sample report from 3/27/1970 of 14 thorium cans to be shipped. The comment section states: “ <i>Decon all prior to acceptance.</i> ”	A handwritten note at the top of the report might indicate the cans were to be shipped to Sandia National Laboratories. Contamination ranged from 20 to 169 dpm/50 cm^2 .
Th-11	170475 (34)	Personnel air sampling report for 5/18/1970–5/21/1970 in Room 119-62 in Building 1 during a thorium-compressing operation.	This is likely related to the fuel simulant disc fabrication described in the NIOSH SEC ER; however, this air sampling report predates the assumed thorium campaign, which is restricted to June 1970. The time-weighted air samples resulted in a cumulative exposure of $<1.2 \times 10^{-12}$ $\mu\text{Ci-hr/cm}^3$.
Th-12	170476 (222, 233, 234)	Personnel air sampling reports for [redacted] workers involved in the thorium capsule operation from July, August, and September 1970. See Figure 12 for a screenshot of the personnel air sampling reports.	These likely reflect the post-testing of thorium capsules described in the NIOSH SEC ER; however, the operation appears to have extended beyond July 1970. The highest time-weighted personnel sampler resulted in a cumulative exposure of 8.6×10^{-11} $\mu\text{Ci-hr/cm}^3$.
Th-13	170494 (184)	Personnel air sampling datasheet indicating ThO_2 machining on 3/23/1971. See Figure 13 for a screenshot of the personnel air sampling report.	The location on the report appears to read “11H28” (Building 1 at De Soto). The time-weighted personnel sampling resulted in a cumulative exposure of 3.1×10^{-11} $\mu\text{Ci-hr/cm}^3$. The machining of ThO_2 between July 1970 and February 1979 is not identified or discussed in the NIOSH SEC ER.
Th-14	170457 (7, 8)	Logbook entry from 4/17/1984 states: “[Name redacted] started survey of 413-29 and found a contaminated cart and thorium.” Additional logbook entry on 4/19/1984 states: “ <i>Completed survey of 413-29. Had approximately two 30-gal bags of thorium, and one radioactive cart. Completed survey of furniture in 421-34; found thorium pellets and a uranium contaminated scoop.</i> ”	No further information is provided in the logbook entry related to the presence of thorium contamination or indications of how the thorium had been used in the laboratory areas 413-29 and 413-34.

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 29 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Ref.	SRDB ID (Page #)	Description of Thorium Documentation	SC&A Comments
Th-15	170457 (64)	Health physics logbook entry on 2/11/1987 states: "Continued surveying equipment and material in room 413-68. Found a few boxes of ceramic furnace parts that had a small amount of detectable activity, probably from natural thorium but not provable. Disposed of as R/A. Everything else was NDA."	The area in Building 4 was being surveyed for "free release and excess" [sic]. No information about the actual activity levels is provided in the original logbook entry or surrounding entries.

Figure 8. Smear Survey Report from October 1969 Indicating Thorium Work Occurring in Building 5 (names redacted) (De Soto 1969)

ANALYZED BY: [REDACTED]		ATOMICS INTERNATIONAL A DIVISION OF NORTH AMERICAN ROCKWELL CORPORATION		SUBMITTED BY: [REDACTED]	
DATE ANALYZED: 11-20-69		HEALTH AND SAFETY ANALYSIS REPORT		DATE SAMPLED: 10-20-69	
FILM NO. (DO NOT WRITE IN THIS BOX)				BLDG. AND ROOM NO.	
SAMPLE NUMBER	DESCRIPTION AND LOCATION			VOLUME OR SIZE	RESULTS
1	Fume Hood	Bldg -005	576-08		6
2	"	"	"		4
3	LATHE	"	"		2
4	FLOOR	"	"		<1
5	"	"	"		<1
6	LAB BENCH	"	"		<1
7	SHIPPING CONTAINER	"	"		<1
COMMENTS: Follow up SMEARS AT CONCLUSION OF THORIUM PROGRAM AT B-005				TYPE OF SAMPLE: SOIL ___ WATER ___ AIR ___ SMEAR <input checked="" type="checkbox"/> OTHER ___ IDENTIFY: ___ TYPE OF ANALYSIS: <input checked="" type="checkbox"/> RADIOMETRIC ___ α ___ β ___ γ ___	

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Figure 9. Smear Survey Report from October 1969 Indicating Thorium Work Occurring in Buildings 4 and 5 Related to the "Thorium (Sealed Source) Program" (names redacted) (De Soto 1969)

ANALYZED BY [REDACTED]		ATOMICS INTERNATIONAL A DIVISION OF NORTH AMERICAN ROCKWELL CORPORATION		SUBMITTED BY [REDACTED]	
DATE ANALYZED <u>10-20-69</u>		HEALTH AND SAFETY ANALYSIS REPORT		DATE SAMPLED <u>10-20-69</u>	
FILM NO. (DO NOT WRITE IN THIS BOX)				BLDG. AND ROOM NO.	
SAMPLE NUMBER	DESCRIPTION AND LOCATION	VOLUME OR SIZE	α RESULTS D/M		
1	INSIDE CHAMBER OF E. B. WELDER B-004		12		
2	" " " " "		16		
3	" " " " "		4		
4	LAB BENCH TOP		<1		
5	" " " " "		<1		
6	FLOOR		<1		
7	WORK AREA OF E. B. WELDER		<1		
8	FUME HOOD IN B-005 516-08		<1		
9	" " " " "		<1		
10	LATHE " " " "		<1		
11	FLOOR " " " "		<1		
12	LAB BENCH " " " "		<1		
13	EXHAUST DUCT OUTSIDE " " " "		<1		
14	" " " " "				
15					
COMMENTS: THESE SMEARS WERE TAKEN IN SUPPORT OF THE THORIUM (SEALED SOURCE) PROGRAM.				TYPE OF SAMPLE: SOIL ___ WATER ___ AIR ___	
				SMEAR <input checked="" type="checkbox"/> OTHER <input type="checkbox"/> IDENTIFY <input type="checkbox"/>	
				TYPE OF ANALYSIS: <input checked="" type="checkbox"/> RADIOMETRIC <input type="checkbox"/> α ___ β, γ ___	

Figure 10. [Redacted] Personnel Air Sampling Data Reports for [Redacted] Workers Involved in [Redacted] Operations in [Redacted] (names redacted) (De Soto 1969)

ATOMICS INTERNATIONAL CUMULATIVE PERSONNEL AIR SAMPLING DATA

Name and Serial Number: [Redacted]

Date	Operation	DPM	DPM/ft ³ (5)	Resp Factor	Adjusted Exposure dpm-hr/ft ³	Accumulated Exposure dpm-hr/ft ³	Entry By	Checked By	Remarks
[Redacted]	[Redacted]	8	1.6	—	1.6	1.6	[Redacted]	[Redacted]	
[Redacted]	4	20	4.0	—	4.0	5.6	[Redacted]	[Redacted]	8.6 X 10 ⁻¹¹
[Redacted]	[Redacted]	8	1.6	—	1.6	1.6	[Redacted]	[Redacted]	2.5 X 10 ⁻¹¹

ATOMICS INTERNATIONAL CUMULATIVE PERSONNEL AIR SAMPLING DATA

Name and Serial Number: [Redacted]

Date	Operation	DPM	DPM/ft ³ (5)	Resp Factor	Adjusted Exposure dpm-hr/ft ³	Accumulated Exposure dpm-hr/ft ³	Entry	Checked	Remarks
[Redacted]	[Redacted]	8	1.6	—	1.6	1.6	[Redacted]	[Redacted]	
[Redacted]	"	12	2.4	—	2.4	4.0	[Redacted]	[Redacted]	6.2 X 10 ⁻¹¹
[Redacted]	"	16	3.2	—	3.2	3.2	[Redacted]	[Redacted]	
[Redacted]	"	8	1.6	—	1.6	4.8	[Redacted]	[Redacted]	7.8 X 10 ⁻¹¹
[Redacted]	"	8	1.6	—	1.6	1.6	[Redacted]	[Redacted]	
[Redacted]	"	0	—	—	—	1.6	[Redacted]	[Redacted]	
[Redacted]	"	16	3.2	—	3.2	4.8	[Redacted]	[Redacted]	
[Redacted]	"	8	1.6	—	1.6	6.4	[Redacted]	[Redacted]	
[Redacted]	"	8	1.6	—	1.6	8.0	[Redacted]	[Redacted]	
[Redacted]	"	16	3.2	—	3.2	11.2	[Redacted]	[Redacted]	1.7 X 10 ⁻¹⁰
[Redacted]	"	16	3.2	—	3.2	3.2	[Redacted]	[Redacted]	
[Redacted]	"	0	—	—	—	3.2	[Redacted]	[Redacted]	
[Redacted]	"	0	—	—	—	3.2	[Redacted]	[Redacted]	4.0 X 10 ⁻¹¹
[Redacted]	"	0	—	—	—	0	[Redacted]	[Redacted]	

Figure 11. Tagged Area Entry Permit Involving Inspection of Thorium Fuel Simulants (De Soto 1970a)

ATOMICS INTERNATIONAL
A DIVISION OF NORTH AMERICAN AVIATION, INC. Nº 15279

TAGGED AREA ENTRY PERMIT

GROUP AUTHORIZING WORK	REQUESTED BY: [REDACTED]	DEPT. <u>755</u>	BEFORE STARTING WORK, HEALTH & SAFETY, SUPERVISION OF GROUP AUTHORIZING OR PERFORMING WORK, AND SUPERVISION OF WORK AREA MUST BE NOTIFIED	
	NON-AT CONTRACTOR: <u>Morsano's Research Corp., DUNNO LAB</u>	JOB DESCRIPTION: <u>Dimensionally Inspect 00 of Ca-Th-100 Fuel Simulants used in TRANSIT Capsules.</u>		
JOB LOCATION: <u>11H04</u>		REFERENCE PROCEDURE, WORK REQUEST, JOB ORDER, ETC.		
DATE OF REQUEST _____		WORK TO BEGIN _____		WORK TO END _____

HEALTH & SAFETY AND ORIGINATOR	NAME AND IDENTIFICATION NUMBER OF ALL PERSONS COVERED BY THIS FORM									
	NAME	CLOCK NO.	TIME LIMIT	EST. DOSE	INITIAL	NAME	CLOCK NO.	TIME LIMIT	EST. DOSE	INITIAL
	[REDACTED]		<u>4:30</u>							
			<u>4:30</u>							

HEALTH AND SAFETY	PROTECTIVE EQUIPMENT REQUIRED			
	HANDS <input type="checkbox"/> CANVAS GLOVES <input checked="" type="checkbox"/> RUBBERIZED GLOVES <input type="checkbox"/> PVC GLOVES <input type="checkbox"/> SURGEON'S GLOVES <input type="checkbox"/> LEATHER GLOVES <input type="checkbox"/> GAUNTLETS	BODY <input type="checkbox"/> COVERALLS <input checked="" type="checkbox"/> GOGGLES <input type="checkbox"/> SURGEON'S CAP <input type="checkbox"/> HOOD <input type="checkbox"/> JONES GOGGLES <input type="checkbox"/> HARD HAT <input type="checkbox"/> FACE SHIELD <input type="checkbox"/> ACID APRON <input type="checkbox"/> GONAD SHIELD	FEET <input type="checkbox"/> CANVAS COVERS <input checked="" type="checkbox"/> PLASTIC COVERS <input type="checkbox"/> TIE RUBBERS <input type="checkbox"/> BOOTS <input type="checkbox"/> BOGGIES	PROTECTIVE BREATHING EQUIPMENT <input type="checkbox"/> SELF-CONTAINED DEMAND MASK <input type="checkbox"/> DEMAND WORK MASK <input type="checkbox"/> AIR-SUPPLIED RESPIRATOR <input type="checkbox"/> FULL-FACE RESPIRATOR <input type="checkbox"/> ULTRA FILTER <input type="checkbox"/> COMBINATION CARTRIDGE <input type="checkbox"/> DUST-FACE RESPIRATOR <input type="checkbox"/> ULTRA FILTER <input type="checkbox"/> CHEMICAL CARTRIDGE
	PERSONAL MONITORING EQUIPMENT — <input checked="" type="checkbox"/> BETA-GAMMA FILM BADGE <input type="checkbox"/> NEUTRON FILM BADGE <input type="checkbox"/> BETA-GAMMA DOSEMETER <input type="checkbox"/> NEUTRON DOSEMETER <input type="checkbox"/> FINGER FILM BADGE <input type="checkbox"/> INTEGRATING SURVEY METER	SPECIAL REQUIREMENTS — <input type="checkbox"/> FIRE PROTECTION <input checked="" type="checkbox"/> TOXIC SURVEY <input type="checkbox"/> HAND & FOOT COUNT <input checked="" type="checkbox"/> PERSONAL SURVEY <input type="checkbox"/> OXY. DEFICIENCY TEST <input type="checkbox"/> PERCENT OXYGEN <input type="checkbox"/> EXPLOSIVE VAPOR TEST <input type="checkbox"/> PERCENT L.E.L.	RADIATION MEASUREMENTS BETA _____ rads/hr GAMMA _____ rads/hr NEUTRONS μ _____ rads/hr NEUTRONS α _____ rads/hr TOTAL _____ rads/hr CONTAMINATION LEVEL <u>Controlled</u>	
SPECIAL INSTRUCTIONS _____				

OVALS	APPROVALS FOR PERFORMING WORK	
	SUPERVISOR OF AREA WHERE WORK WILL BE PERFORMED _____	DATE _____
	SUPERVISOR OF HEALTH AND SAFETY [REDACTED]	DATE _____
	PERMIT EXPIRES _____	

ALL PERSONS COVERED BY THIS PERMIT MUST INITIAL AFTER HEALTH AND SAFETY INSTRUCTIONS HAVE BEEN GIVEN

FORM 718-L HEALTH & SAFETY

Figure 12. [Redacted] Personnel Air Sampling Data Reports for [Redacted] Workers Involved in [Redacted] Work in [Redacted] (names redacted) (De Soto 1970b)

ESTIMATED PERSONNEL AIR SAMPLING DATA

Name and Serial Number: [Redacted]

Date	Operation	DEH	DEH/Ft ³ (DEH) (5)	Resp Factor	Adjusted Exposure 3 dpm-hr/ft ³	Accumulated Exposure 3 dpm-hr/ft ³	Entry to	Checked by	Remarks
[Redacted]	[Redacted]	8	1.6	1	1.6	1.6	[Redacted]	[Redacted]	2.5 x 10 ⁻¹¹
"	"	0	-	1	-	-	[Redacted]	[Redacted]	
"	"	8	-	-	-	8	[Redacted]	[Redacted]	
"	"	8	1.6	-	1.6	1.6	[Redacted]	[Redacted]	
"	"	8	1.6	-	1.6	3.2	[Redacted]	[Redacted]	5.0 x 10 ⁻¹¹
"	"	8	1.6	-	1.6	1.6	[Redacted]	[Redacted]	
"	"	5	1.0	-	1.0	1.0	[Redacted]	[Redacted]	

ESTIMATED PERSONNEL AIR SAMPLING DATA

Name and Serial Number: [Redacted]

Date	Operation	DEH	DEH/Ft ³ (DEH) (5)	Resp Factor	Adjusted Exposure 3 dpm-hr/ft ³	Accumulated Exposure 3 dpm-hr/ft ³	Entry to	Checked by	Remarks
[Redacted]	[Redacted]	1	0.2	1	0.2	0.2	[Redacted]	[Redacted]	3.1 x 10 ⁻¹²
"	"	0	-	1	-	-	[Redacted]	[Redacted]	
"	"	10	2	1	2.0	2.0	[Redacted]	[Redacted]	
"	"	10	2	1	2.0	4.0	[Redacted]	[Redacted]	6.2 x 10 ⁻¹¹

ESTIMATED PERSONNEL AIR SAMPLING DATA

Name and Serial Number: [Redacted]

Date	Operation	DEH	DEH/Ft ³ (DEH) (5)	Resp Factor	Adjusted Exposure 3 dpm-hr/ft ³	Accumulated Exposure 3 dpm-hr/ft ³	Entry to	Checked by	Remarks
[Redacted]	[Redacted]	8	1.6	1	1.6	1.6	[Redacted]	[Redacted]	
"	"	10	2.0	1	2.0	3.6	[Redacted]	[Redacted]	
"	"	10	2.0	1	2.0	5.6	[Redacted]	[Redacted]	8.6 x 10 ⁻¹¹
"	"	8	1.6	1	1.6	1.6	[Redacted]	[Redacted]	
"	"	8	-	-	-	1.6	[Redacted]	[Redacted]	
"	"	1	0.2	1	0.2	1.8	[Redacted]	[Redacted]	2.9 x 10 ⁻¹¹
"	"	8	0.4	1	0.4	0.4	[Redacted]	[Redacted]	
"	"	16	3.2	1	3.2	3.6	[Redacted]	[Redacted]	5.5 x 10 ⁻¹¹

Figure 13. Personnel Air Sampling Data Report for a Worker Involved in [Redacted] Machining in [Redacted] (names redacted) (De Soto 1971)

ATOMICS INTERNATIONAL CUMULATIVE PERSONNEL AIR SAMPLING DATA								
NAME [Redacted]		SERIAL NUMBER [Redacted]		DEPT. 766				
Date	NAME + Operation	DPM	Resp. Factor	Adjusted DPM	Cumulative DPM	Cumulative Exposure uCi hr/cc	Entry By	Remarks
[Redacted]	[Redacted]	64	100	.64	.64	<1.0x10 ⁻¹¹		
[Redacted]	[Redacted]	4	1	.4	.4	2.1x10 ⁻¹¹		
[Redacted]	[Redacted]	16	100	.16	.16	<1x10 ⁻¹¹		
[Redacted]	[Redacted]	28	100	.28	.28	<1x10 ⁻¹¹		
[Redacted]	[Redacted]	32	1	.32	.32	9.9x10 ⁻¹¹		
[Redacted]	[Redacted]	8	1	.8	.8	3.1x10 ⁻¹¹		[Redacted]

Indicates [Redacted]

The evidence of thorium in Table 2 suggests that the assumed dates of operation for the three thorium campaigns identified in the NIOSH SEC ER likely need to be expanded (see Table 2 entries Th-8, Th-11, and Th-12). In three cases, evidence of thorium operations in 1969, 1970, and 1971 were indicated that were not identified in the NIOSH SEC ER (see entries Th-4, Th-5, Th-6, Th-7, and Th-13). SC&A identified two examples from the 1980s in which thorium was discovered in Building 4 laboratory locations (see entries Th-14 and Th-15).

Several entries in Table 2 indicate situations in which the thorium was packaged and not necessarily in a material condition that might result in an internal exposure potential (see entries Th-2–Th-5). In addition to these examples, a 1977 document, *Technical Information in Support of the Atomics International Application for Broad Nuclear Materials License* (Atomics International 1977, p. 232), states that only isotopes of uranium were handled in unencapsulated form at the Headquarters (De Soto) buildings (see Section 3 for full quote).

This indicates that, at least in 1997, the only unencapsulated fuel material handled at the De Soto site was isotopes of uranium and did not include thorium.

Observation 5: The NIOSH SEC ER provides calculated intake rates for thorium based on bioassay data related to the 1979 grinding operation. NIOSH notes that such intakes can be assigned to De Soto workers “as appropriate,” although it does not indicate what criteria would need to be satisfied for an unmonitored worker to be assigned the derived coworker intake rate. However, it must be noted that establishing policies concerning coworker application are generally considered site profile issues rather than SEC issues.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 35 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Observation 6: SC&A identified evidence in SRDB documentation indicating spraying, cutting, and laboratory-specific operations involving thorium that were not identified or discussed in the NIOSH SEC ER. However, SC&A did not identify evidence associated with these operations/processes to suggest they would not be bounded by the grinding operation in 1979 for which NIOSH has developed coworker intake rates of thorium. NIOSH should consider these additional operations when assigning unmonitored thorium intakes to workers at the De Soto facility.

CORE Advocacy for Nuclear & Aerospace Workers identified several additional references in its recently supplied white paper (CORE Advocacy 2018) that may have implications related to thorium exposure. SC&A discusses each of these references in Attachment A (see Items 3–6, 8, 9e–9h, 9k, 9m, 9o–9q, 9t, 9u, 10, 11, 14–17, and 21g). SC&A did not identify any additional evidence in the petitioner-supplied references that indicates the fabrication or other processing of nuclear fuels containing thorium that would not be bounded by the intake analysis of the 1979 thorium-grinding operation.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 36 of 75
-------------------------------------	----------------------------------	--	-----------------------------

5 FORMER WORKER INTERVIEWS

SC&A located seven former worker interviews in the SRDB that occurred prior to the submission of SEC-00246. However, five of the seven interview summaries do not appear relevant to the SEC period under evaluation for the following reasons:

- Two interviewees ceased work at De Soto prior to [REDACTED].
- One interview was performed with the [REDACTED], who did not have any information on radiological activities other than to note the [REDACTED] originally worked in the [REDACTED] department at De Soto from [REDACTED] to [REDACTED].
- One interviewee indicated work at the De Soto site from [REDACTED] to [REDACTED]; however, the interview focused solely on work in the [REDACTED] of the Canoga Facility.
- In one interview, the energy employee (EE) reports working at the [REDACTED] Building from [REDACTED] to [REDACTED] but was also involved with the [REDACTED] Facility. It is not clear from the interview summary if the work at [REDACTED] was during the SEC period under evaluation.

One of the two remaining interviews performed prior to the submission of SEC-00246 described work at [REDACTED] from [REDACTED] until [REDACTED] that involved taking [REDACTED]. Although the interview contains extensive and detailed descriptions of the uranium fuel fabrication activities, there was no mention of thorium activities or work with irradiated/spent fuel (Personal Communication 2008). The other interview involved a manager in [REDACTED] who was involved in [REDACTED] activities beginning in [REDACTED]; however, the interview focused on SSFL (Personal Communication 2017). De Soto is not mentioned in that interview, though the individual was re-interviewed in 2018 as part of the NIOSH SEC-00246 evaluation (Personal Communication 2018a).

During that interview, the EE indicated working at De Soto beginning in [REDACTED] as a member of the [REDACTED] staff but was not directly involved in radiological operations until the move to [REDACTED] in the [REDACTED]s. The EE indicated that their individual entry into radiological areas at De Soto was restricted to a single guided tour of the fuel fabrication facilities. The EE was unaware of any use of Am-241 at the De Soto facility other than use in smoke detectors and as check sources. Specific to thorium, the EE stated:

Looking at the timelines and scope, the SEC-00246 allegation of thorium fuel onsite at DeSoto from 1965-1995 is incorrect. Thorium manufacturing ceased in Bldg. 001 in early 1970. Extending SEC-00246 beyond that date would be inappropriate. (Personal Communication 2018a)

The interview does not discuss, or indicate any knowledge of, the documented 1979 thorium-grinding operation.

Only one other EE was interviewed as part of NIOSH's SEC evaluation. However, that individual did not start work at the site until [REDACTED] and all knowledge is based on retrospective dosimetry and historical records. The EE states that they have no direct knowledge of nuclear activities. The EE believes that there may have been historical incidents involving Am-241 but that they are believed to have occurred at

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 37 of 75
-------------------------------------	----------------------------------	--	-----------------------------

SSFL. The only information specific to thorium was that the EE recalled seeing occasional thorium bioassays that were likely in the [REDACTED] timeframe (Personal Communication 2018b).

Finding 4: Only two interviews are documented in the SRDB as a result of NIOSH’s SEC-00246 evaluation, and only one of those two interviews involves a worker at De Soto prior to 1991. A third interview occurred in November 2018 after NIOSH issued its evaluation of SEC-00246 and was performed by SC&A in conjunction with NIOSH and CORE Advocacy. This interview has not yet been finalized.

In addition to the interviews performed by NIOSH, 121 interviews were conducted with Energy Technology Engineering Center (ETEC) workers by EPA and DOE in 2010 and 2011 (DOE 2011). Although the interviews generally focused on operations and work performed at SSFL, 41 of the 121 interviews also mentioned work at the De Soto facility during the SEC period under evaluation. Of those 41 interviews, 13 contained information that SC&A considered relevant to radiological operations at De Soto. Table 3 summarizes those 13 interviews.

Table 3. Thirteen Interviews Containing Relevant Information on Radiological Operations at De Soto (DOE 2011)

Interview #	Information and Quotes Relevant to De Soto
85	<p>The EE worked for Atomics International from [REDACTED] to [REDACTED].</p> <p>From the interview (pp. 170–171):</p> <p><i>“I worked on [REDACTED] for a short period of time but I spent most of my time with [REDACTED] at the Desoto facility. I did not have an office on the [REDACTED] although I went to work there on a daily basis.</i></p> <p><i>At the Desoto plant radioactive materials were handled pretty well. In the field it was a little different. People hired to work at SSFL did not have the right background. They should have had experience with radiological materials. The company did provide training for them out in the field, but the Desoto plant was much stricter in comparison...</i></p> <p><i>There was a spillage at the DeSoto plant when we worked with fuels there.</i></p> <p>[REDACTED]</p> <p><i>Like everyone else, I had to document my work activities. I wrote up reports and turned them in. I don’t know what was supposed to happen with the reports, but I know that it seemed like they were laying all over the place. It didn’t seem to me that they were stored properly. There was documentation about what we did in the lab on a daily basis. I should point out that I am talking about what went on at [REDACTED], since that was where [REDACTED].”</i></p> <p>The date of the incident in which the EE [REDACTED] was not provided, and is not clear what type of fuel was involved nor whether it was irradiated/spent fuel.</p>
106	<p>From the interview (p. 192):</p> <p><i>“Work was done at both SSFL and DeSoto because it was easier to move the piece to the needed tooling rather than the tooling to the work.”</i></p> <p>While this interview confirms the transfer of material between the De Soto and SSFL sites, the interview did not provide specific information about what was processed at De Soto versus SSFL.</p>

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 38 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Interview #	Information and Quotes Relevant to De Soto
107	<p>The EE worked at SSFL from [REDACTED] to [REDACTED]. The only mentions of De Soto are as follows (pp. 74–75):</p> <p><i>“There were no real reactor incidents during my work at AI. If reactor instrumentation showed unusual results we would scram the reactor and operate in safe mode. Procedures dictated that an incident report would have to be written up. The incident report would be distributed throughout the organization and used as a ‘lessons learned’ tool. An outside team from DeSoto would come to critique operations and review the incident report to prevent similar incidents from occurring in the future and ensure issues are handled the same way across the site...</i></p> <p><i>Lab activities at AI used radiological sources and chemicals handled under a hood. Radioisotopes for calibration units were stored in the floor vault and when the STIR [Shield Test and Irradiation Reactor] facility was decommissioned the calibration sources were sent to DeSoto, but I am not sure how they were ultimately disposed.”</i></p> <p>While the interview confirms that calibration sources were sent from SSFL to De Soto, there is no indication that the sources were to be opened or otherwise processed at the site. It is possible the sources were sent to De Soto simply for storage purposes.</p>
110	<p>From the interview (p. 197):</p> <p><i>At DeSoto I participated in [REDACTED].”</i></p> <p>The interview specifically mentions fabrication activities involving uranium but does not discuss any potential decladding activities involving irradiated/spent fuel that would have contained transuranic material.</p>
125	<p>From the interview (pp. 78–79):</p> <p><i>“We dissected the fuels that came out of the reactors in the hot cell and would run tests on them. We would take the fuel out of its casing, cut it apart, and take various measurements as our work dictated. I also worked in [REDACTED] down at the DeSoto facility. I worked at [REDACTED] in DeSoto. I am not completely sure of the numbers, but I think I worked in [REDACTED].”</i></p> <p><i>I didn’t machine any fuel at DeSoto, but we would [REDACTED]. I think the machine shop handled beryllium. Safety rules dictated that we report any movement of fuel from building to building. We had to have movement of fuel authorized and they had to keep track of how much fuel was in any one location to prevent potential danger. We knew we couldn’t have more than a specified amount of fuel in any particular location at a time...</i></p> <p><i>At DeSoto, we were just one line in the [REDACTED] process. We ran tests and collected measurements on the fuel which had been cut into various lengths before we received it. This was done to collect baseline data for comparison with fuel that came out of a reactor after use. There were records associated with each fuel rod and they were numbered on the end. We would take measurements on each segment of the fuel that would later be assembled to form the fuel rods.”</i></p> <p>The EE was involved in [REDACTED] fuel; however, the EE also indicates they took place in [REDACTED], which is located at SSFL.</p>
155	<p>The EE worked for [REDACTED] at De Soto in approximately [REDACTED] to monitor [REDACTED]. These [REDACTED] were composed of low-enriched uranium. No indication of work with spent/irradiated fuels or thorium was provided by the interviewee.</p>
157	<p>The EE worked at the De Soto Facility from [REDACTED] to [REDACTED] in the [REDACTED]. The EE confirms that Advanced Test Reactor (ATR) fuel was fabricated using enriched uranium at De Soto. The EE does not mention any work with spent/irradiated fuel nor thorium at De Soto.</p>

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 39 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Interview #	Information and Quotes Relevant to De Soto
195	<p>From the interview (pp. 243–244): “I started working in 1965 at DeSoto in [REDACTED]. At the [REDACTED] down at DeSoto, we used to make the powder and grind it up and put it in the plates for the ETR and the ATR back in the 1960’s. We ground the powder and put it in aluminum plates. That [REDACTED] became so dusty and contaminated a couple of fellows...got so hot they sent them to Oak Ridge to be counted. They put them on a plane and flew them there and back. When I worked in the [REDACTED], we had to have full body counts at UCLA every year.”</p> <p>Although it is known that some thorium plates were [REDACTED], it is not clear that this would be the fuel referred to by the interviewee in [REDACTED]. It is noteworthy that [REDACTED].</p>
249	<p>The EE began work for Atomics International in [REDACTED] and [REDACTED] at the De Soto site as a [REDACTED] unit beginning in [REDACTED]. The interview states that (pp. 291, 294):</p> <p>“All the SNAP reactor fuel, ATR, EBR, and SRE II was manufactured at Desoto. The only decladding on the hill would have occurred at the Hot Cell, which was designed to examine irradiated fuel. The Nuclear material from the Hot Lab decladding operation, I think, was shipped to Savannah River for eventual reprocessing. A lot of the scrap nuclear material from the Desoto operations went to Nuclear Fuel Services; some went to Oak Ridge...</p> <p>I know all of the material from Hot Lab decladding operations was sent to the RMDF (Radioactive Materials Disposal Facility) after it was repackaged, and then packaged and shipped in special containers for shipment to a DOE designated site. Some unirradiated SNAP fuel was shipped to Idaho for recovery/disposal.”</p> <p>It is not clear from the interview when the Sodium-Cooled Reactor Experiment (SRE) fuel (which contained thorium) was manufactured at De Soto.</p>
254	<p>The EE worked from [REDACTED] to [REDACTED] at SSFL. The only mention of De Soto occurs related to the EE’s work in the [REDACTED] (p. 90):</p> <p>“Some waste at the RMDF came from DeSoto, but most of it was from SSFL.”</p> <p>There is no mention of thorium processing or decladding operations at De Soto nor the shipment of irradiated unencapsulated fuel elements from the RMDF to De Soto.</p>
307	<p>The EE indicates that they were [REDACTED] from [REDACTED] down to [REDACTED] but does not provide the actual dates. From the interview (p. 354):</p> <p>“I remember experiments at DeSoto that were crazy!”</p> <p>No other specific information pertaining to the noted experiments at De Soto was provided.</p>
427	<p>From the interview (p. 364):</p> <p>“After the successful launch and startup of SNAP 10A, I was assigned to be the [REDACTED] in charge of [REDACTED]. Raw metal from Nuclear Fuels in Tennessee was purchased and broken break into fines and mixed with aluminum powder. Aluminum cladding was roll-bonded to the pressed compact fuel inserts. We made lots of fuel elements for Idaho and they are still being used. We went all the way from the raw metal to the completed fuel elements. All powders and compacts were processed in a string of glove boxes at DeSoto Facility of North American Rockwell.”</p> <p>As noted in Interview 247, the Tokai Nuclear Power Plant utilized a MAGNOX GCR beginning in 1965. In addition, the Tokai site operated a boiling-water reactor beginning in 1978. Both reactors used natural uranium. There is no mention in the interview of processing thorium materials or irradiated/spent fuel elements.</p>

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 40 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Interview #	Information and Quotes Relevant to De Soto
428	<p>The EE worked as a [REDACTED] at both SSFL and the De Soto facility from [REDACTED] to [REDACTED]. From the interview (p. 366):</p> <p><i>“I don’t recall anyone having an internal exposure at SSFL, although I do recall it happening at DeSoto now and then.”</i></p> <p>No specifics related to the noted internal exposures at De Soto are provided. The [REDACTED] program at both locations is discussed in a very general way without specific information relevant to the SEC investigation.</p>

Several of the interviews described in Table 3 note the movement of personnel and material between De Soto and SSFL (see Interviews 85, 106, 107, 254, and 307). The only mention of “fuels irradiation” at De Soto was in Interview 85, but further information on what time period or what that work entailed was not provided in the interview. None of the 13 identified interviews mentions thorium fuel fabrication. Follow-up interviews with those directly involved in the [REDACTED] (see Interviews 85, 110, 127, 155, 247, 249, and 427) may be beneficial in any future evaluations; however, the availability of the potential interviewees is unknown at this time.

Observation 6: SC&A identified 13 individuals among over 120 interviews conducted by DOE/EPA related to the SSFL site who may have relevant information regarding De Soto. If available, these individuals may represent suitable interview candidates in the future, as required.

Finally, a signed affidavit was provided by a former [REDACTED] at the De Soto facility who worked at least through [REDACTED]. One particularly relevant statement by the EE is as follows:

Radioactive materials shipments went back-and-forth between SSFL and DeSoto, including spent nuclear fuel that would reasonably be expected to contain any radionuclides used or generated at either location. This would include americium, thorium (and its associated progeny). There is no reason to assume that americium or thorium were exclusive to SSFL, with the degree of back-and-forth that was considered to be part of standard operations at the worksites.

[REDACTED] were directed to [REDACTED]. We did not have the time, directive, or a conceivable reason to [REDACTED]. [REDACTED] was used to be all-inclusive, and it was understood by all personnel that anything labeled with [REDACTED] could contain anything.

DeSoto routinely received materials from SSFL, and SSFL routinely received materials from DeSoto. It would be illogical to me, given my knowledge of site operations and my expertise as a [REDACTED], to assume that any radionuclide present at one location would not also be present at the other. [Former Worker Affidavit 2018, pp. 1–2]

The above quote affirms that materials were not necessarily restricted to one site or the other and could be transferred, and at a minimum stored, at either location. However, the affidavit did not provide specific information that would indicate unencapsulated americium or thorium would have been handled or processed, which would indicate the potential for internal exposure at De Soto. Conversely, such activities are well documented as occurring in multiple locations, including Building 20, at SSFL.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 41 of 75
-------------------------------------	----------------------------------	--	-----------------------------

On November 14, 2018, the EE was re-interviewed in a joint effort by the petitioner, SC&A, and NIOSH. Notes from the follow-up interview are undergoing classification review and final approval of the interviewee.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 42 of 75
-------------------------------------	----------------------------------	--	-----------------------------

6 CLAIMANT OVERVIEW

In addition to the documented interviews with former workers described in Section 5, SC&A examined a substantial portion of the claimant population to obtain information related to exposure potential and possible indications of internal americium and thorium exposure. Specifically, SC&A examined the CATIs and, in many cases, the U.S. Department of Labor (DOL) case files for 187 of the 257 claimants (~72%) with covered employment at the De Soto facility during the period under evaluation. Claimants selected for review were based on job titles with a reasonable potential for radiological work and/or positions that may have indirect knowledge of radiological activities such as project managers and planners. SC&A classified the 187 claimants into 10 general job categories:

1. Engineer/Technical Staff – These include workers designated as “MTS” (assumed to designate either “Member of the Technical Staff” or “Mechanical Testing and Simulation”) who would be expected to work hands on with the various experiments occurring at the site.
2. Program Coordinator/ Supervising Engineer – These workers might not necessarily be directly involved in hands-on work with radiological material but were in a position to oversee the experimental work at an administrative level.
3. Research/Chemist/Lab – These workers designed the various experiments and analyzed the results, potentially including the physical nuclear material.
4. Trades Worker – This category includes machinists, milling, welders, and general maintenance workers. However, specific involvement in fuel fabrication or other radiological activities were not identified.
5. Quality Assurance – These are workers in charge of analyzing the final end product specifications, including fabricated nuclear fuel.
6. Fuel Fabrication – These workers provided direct indication of involvement in the fabrication of nuclear fuel.
7. Health Physicist – This category includes any worker indicating that the primary responsibility was workplace radiological surveys, dosimetry (internal and external), or specific operational planning from a health and safety standpoint.
8. Instrument Tech/Electrician – This category includes workers who would install and service various instruments in both the fuel fabrication areas and radiochemistry labs.
9. Shipping – These workers were involved in the transfer of material from locations within ETEC and also to authorized offsite recipients (both commercial and DOE locations).
10. Security/Firefighter - These workers would reasonably be expected to enter nearly every area of the facility as well as be involved in any spills and incidents that occurred.

Table 4 and Figure 14 show a breakdown of each of these job categories. Table 4 also provides the percentage of claimants in each job category that indicated exposure to radiation during their employment as well as the more specific issue of exposure to thorium and/or americium. Table 4 shows that approximately one-third of the reviewed claims submitting CATI reports indicated any radiation exposure, and only 5% indicated the potential for americium and/or thorium exposure.

Figure 14. Percentage of Claimants Reviewed by SC&A by Job Title

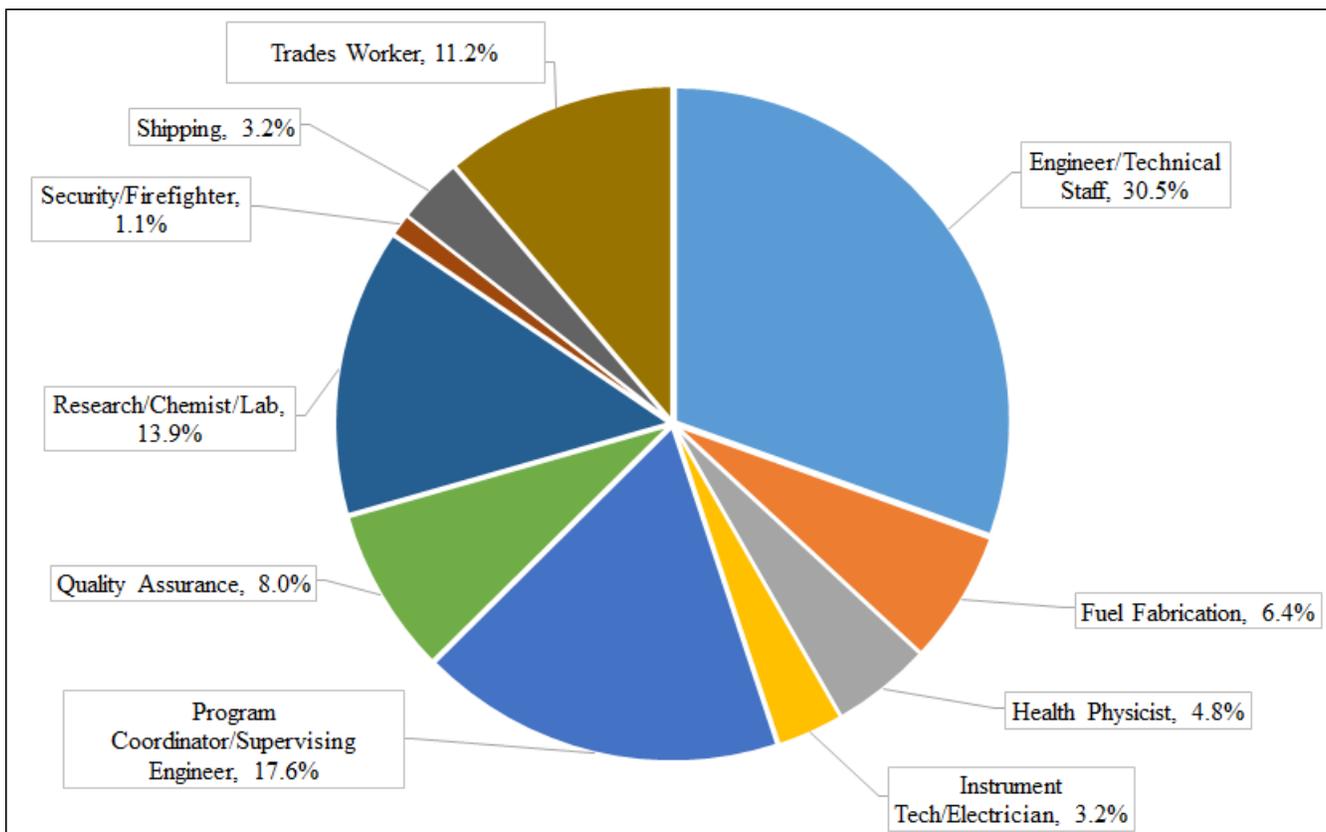


Table 4. Overview of Reported Exposure Potential Found in Reviewed Claimant CATI/DOL Files by Job Title Designation

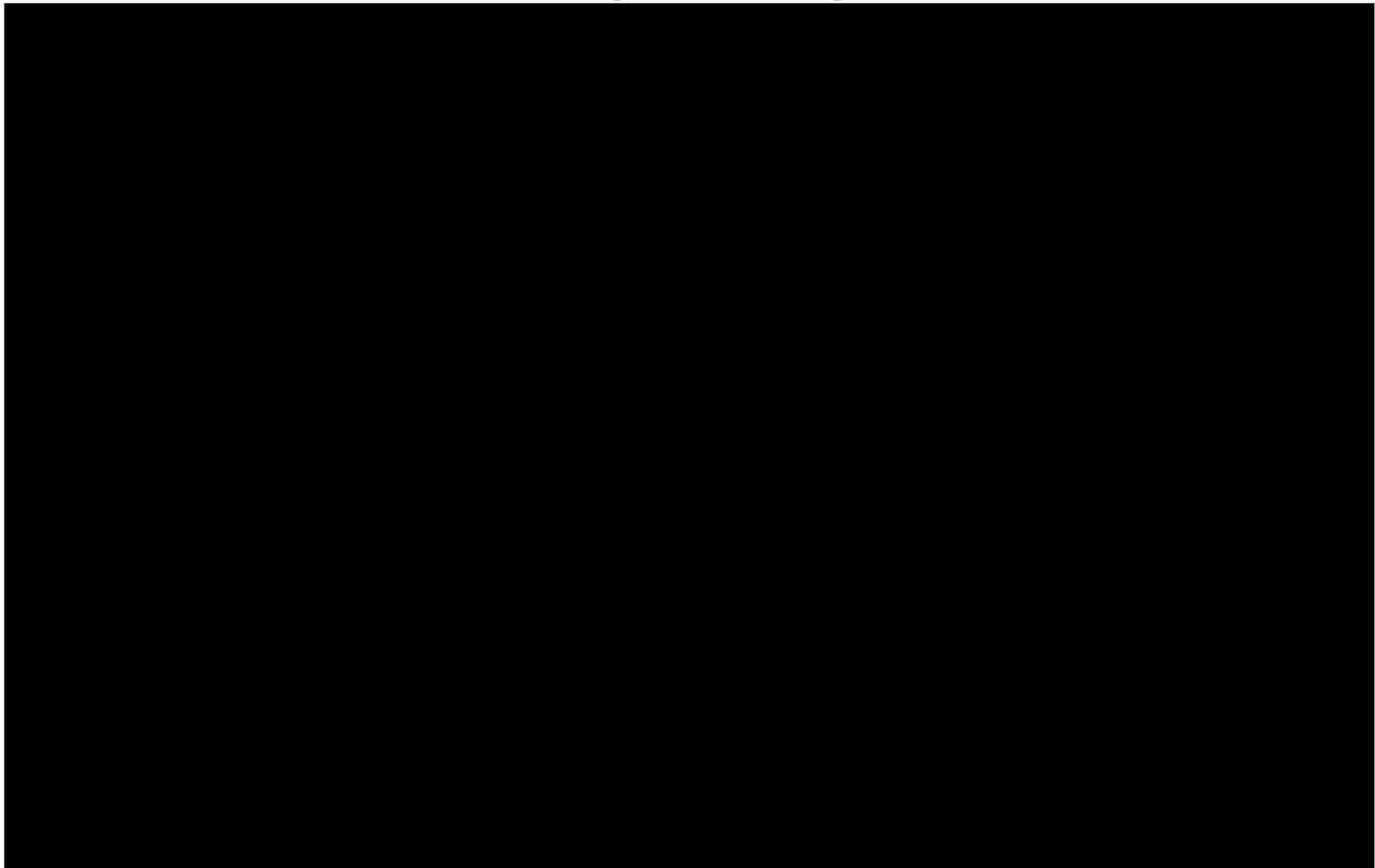
SC&A Job Title Designation	# Claims Reviewed (%)	# with CATI Completed	# of CATIs Indicating Exposure to Radiation (%)	# of CATIs Indicating No Exposure to Radiation (%)	# of CATIs with Unknown Exposure Potential (%)	# of CATIs Indicating Thorium or Americium Exposure (%)
Engineer/Technical Staff	57 (30.5%)	52	14 (26.9%)	0 (0.0%)	38 (73.1%)	1 (1.9%)
Program Coordinator/Supervising Engineer	33 (17.6%)	28	9 (32.1%)	5 (17.9%)	14 (50.0%)	1 (3.6%)
Research/Chemist/Lab	26 (13.9%)	24	5 (20.8%)	2 (8.3%)	17 (70.8%)	0 (0.0%)
Trades Worker	21 (11.2%)	16	3 (18.8%)	1 (6.3%)	12 (75.0%)	0 (0.0%)
Quality Assurance	15 (8.0%)	13	5 (38.5%)	0 (0.0%)	8 (61.5%)	1 (7.7%)
Fuel Fabrication	12 (6.4%)	12	6 (50.0%)	0 (0.0%)	6 (50.0%)	3 (25.0%)
Health Physicist	9 (4.8%)	9	4 (44.4%)	0 (0.0%)	5 (55.6%)	2 (22.2%)
Instrument Tech/Electrician	6 (3.2%)	5	3 (60.0%)	0 (0.0%)	2 (40.0%)	0 (0.0%)

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 44 of 75
-------------------------------------	----------------------------------	--	-----------------------------

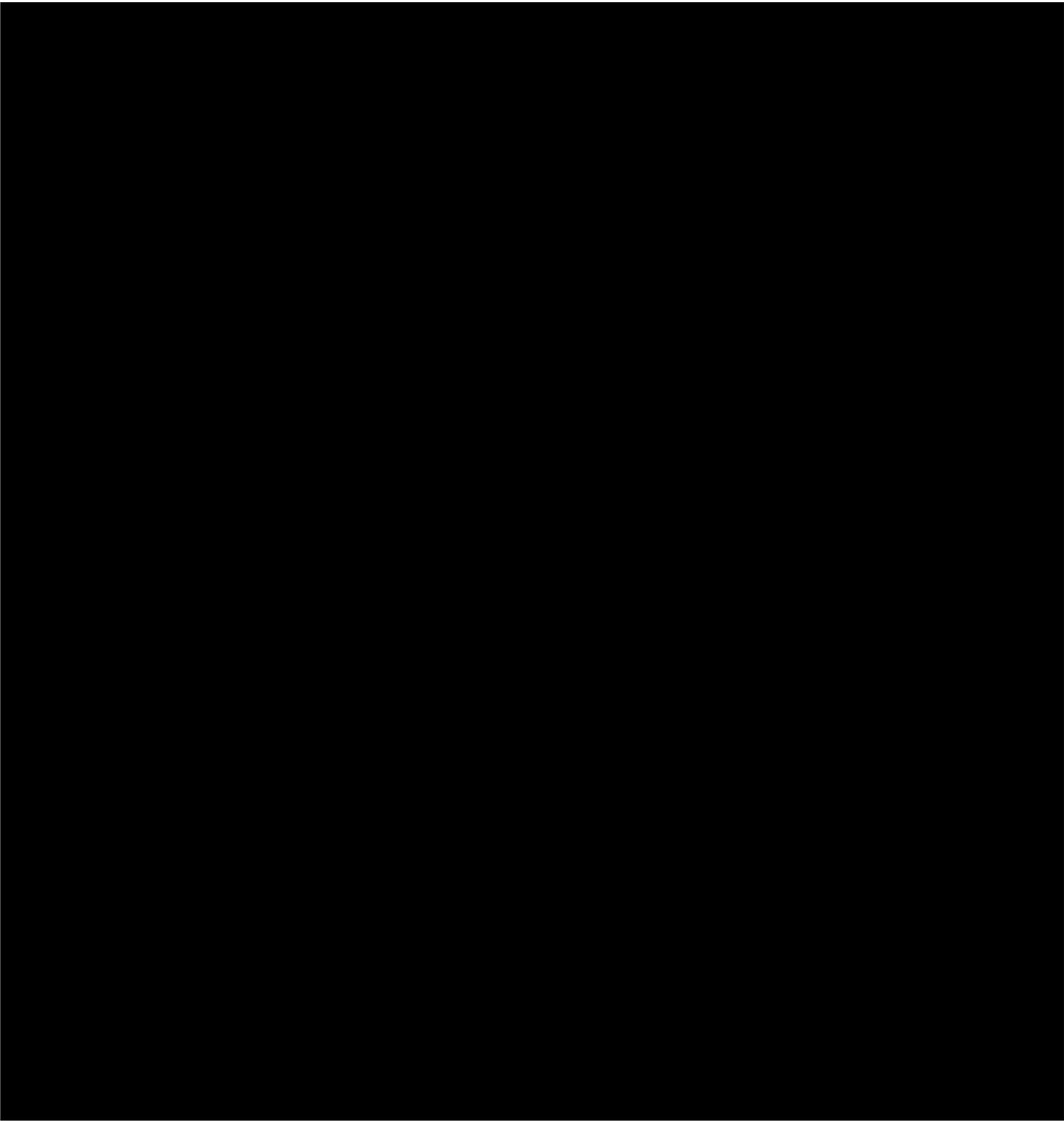
SC&A Job Title Designation	# Claims Reviewed (%)	# with CATI Completed	# of CATIs Indicating Exposure to Radiation (%)	# of CATIs Indicating No Exposure to Radiation (%)	# of CATIs with Unknown Exposure Potential (%)	# of CATIs Indicating Thorium or Americium Exposure (%)
Shipping	6 (3.2%)	4	4 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Security/Firefighter	2 (1.1%)	2	0 (0.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)
All Reviewed Claims	187 (100.0%)	165	53 (32%)	8 (5%)	104 (63%)	8 (5%)

Of the eight claimants who specifically identified exposure potential to americium and/or thorium in their CATIs, as well as other relevant internal exposure issues, six were performed directly with the EE and could potentially represent a future interview candidate. Table 5 describes these six claims.

Table 5. [Redacted in full]



Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 45 of 75
-------------------------------------	----------------------------------	--	-----------------------------



[Note: Page 45 contained the continuation of Table 5, which is redacted in full.]

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 46 of 75
-------------------------------------	----------------------------------	--	-----------------------------

7 REFERENCES

Atomics International 1972. *Fuels Committee Annual Review and Inspection of Facilities at Headquarters and Nuclear Field Laboratory: Recommendations and Minutes of Fuels Committee Meeting Held 8/31/1972*, SRR-001-140-030. Atomics International – North American Rockwell. September 14, 1972.

Atomics International 1977. *Technical Information in Support of the Atomics International Application for Broad Nuclear Materials License – Operating Requirements and Standards (Technical Specifications) for Radiological and Nuclear Safety*, Rockwell International, Atomics International Division, Health, Safety and Radiation Services Department. January 24, 1977. [SRDB Ref. ID 77397]

Atomics International & State of California 1968–1969. Correspondence and Licenses Related to Special Nuclear Materials (SNM) Licenses for DeSoto Facility to 1995, Atomics International and State of California, Department of Public Health, Bureau of Radiological Health. Berkeley, CA. 1968–1969.

Author Unknown 1988. Survey and Analysis of Bldg. T-064 at SSFL, Gen-0005.zr/bg. August 19, 1988.

Barnes 1995. Updated Application for Broad Scope “A” License, 0015-70, J.G. Barnes, Rocketdyne Division, Rockwell International Corporation, Canoga Park, CA. August 10, 1995.

Bresson 1970. Internal memorandum from J.F. Bresson, North American Rockwell, to File, *Exposure of individual During Cut-Off Operation*. May 6, 1970.

Clow 1971. Internal memorandum from H.E. Clow, North American Rockwell, to N. Ketzlach, *Inspection of SNM Vault 11-H-22, 11-H-02, 11-H-04 and Vault Pad*. November 11, 1971.

CORE Advocacy 2018. *Americium, Thorium and Associated Progeny at DeSoto Facility: A Basis for SEC-00246*. CORE Advocacy for Nuclear & Aerospace Workers. Winnetka, CA. Transmitted to NIOSH October 22, 2018.

De Soto 1962. Inter-office letter from E. Rubenstein, Atomics International, Headquarters 003, to R.F. Wilmes, *Explosion of NaK & White Oil*, De Soto Facility, Canoga Park, CA. April 2, 1962.

De Soto 1964–1965a. De Soto Facility Health Physics Log Book, 1964–1965, De Soto Facility, Canoga Park, CA. Entries 1964–1965.

De Soto 1964–1965b. Logbook De Soto 1964–1965, De Soto Facility, Canoga Park, CA. Entries 1964–1965. [SRDB Ref. ID 169514]

De Soto 1965–1966. DeSoto Health Physics Log Book, De Soto Facility, Canoga Park, CA. 1962–1966.

De Soto 1969. HQ 1 Monitoring Reports Fourth Quarter, 1969, De Soto Facility, Canoga Park, CA. 1969. [SRDB Ref. ID 170379]

De Soto 1970a. Smear Surveys, Room Air and Lapel Sample Results, Tagged Area Entry Permits Building HQ 001 January 1 – June 30, 1970, De Soto Facility, Canoga Park, CA. [SRDB Ref. ID 170475]

Effective Date:	Revision No.	Document No./Description:	Page No.
12/7/2018	0 (Draft)	SCA-TR-2018-SEC006	47 of 75

De Soto 1970b. Smear Surveys, Room Air and Lapel Sample Results, Tagged Area Entry Permits Building HQ 001 July 1 – December 31, 1970, De Soto Facility, Canoga Park, CA. [SRDB Ref. ID 170476]

De Soto 1971. Radiological Survey and Air Sample Data for Building 001 January – July 1971, De Soto Facility, Canoga Park, CA. [SRDB Ref. ID 170494]

De Soto 1984–1998. HP Logbook 1985–1998, De Soto Facility. 1984–1998. [SRDB Ref. ID 170457]

De Soto 1997. De Soto Radiation Surveys and Maps of Building 104, De Soto Facility, Canoga Park, CA. 1995–1997. [SRDB Ref. ID 170416]

De Soto Petition 2017. *Special Exposure Cohort Petition (Form B) for De Soto Facility*, with attachments. Received December 13, 2017. [DSA Ref. ID 128711]

DOE 2011. *Santa Susana Field Laboratory Former Worker Interviews*, Prepared for the U.S. Department of Energy Santa Susana Field Laboratory by P2 Solutions, Idaho Falls, ID. November 2011. [SRDB Ref. ID 134601]

DPH 1969. *California Radioactive Material License No. 0015-59*. Department of Public Health, State of California – Human Relations Agency, Berkeley, CA. December 23, 1969. [SRDB Ref. ID 19184]

Former Worker Affidavit 2018. *Special Exposure Cohort (SEC) Petition 00246 – DeSoto Facility – Worker Affidavit*, CORE Advocacy for Nuclear & Aerospace Workers, Winnetka, CA. October 30, 2018.

Hart 1980. *Annual Review of Radiological Controls – 1977*, R.S. Hart, R.S., Rockwell International, Energy Systems Group, Technical Information Document N001TI000098. May 27, 1980.

Heine 1971. Internal memorandum from W.F. Heine, North American Rockwell, to M.E. Remley, *Operational Safety Unit Weekly Highlights – Week Ending April 17, 1971*. April 20, 1971.

Heine 1975. Letter from W.F. Heine, Atomics International Division, Rockwell International, to J.F. Proctor, E. I. du Pont de Nemours & Company, *Fission Product and Fissile Content of SRE Fuel*. July 2, 1975.

Ketzlach 1973a. Internal letter from N. Ketzlach, North American Rockwell, to M.E. Remley, *Weekly Highlights – Criticality and Nuclear Materials Controls*. February 19, 1973.

Ketzlach 1973b. *Criteria for the SS Vault Storage (SNAP and Other Fuels)*, N. Ketzlach, North American Rockwell, Technical Information Document TI-652-240-019. March 3, 1973.

Lupo 1999. *Confirmatory Survey of Mass Spectroscopy Laboratory Building 104 DeSoto Facility*, R.K. Lupo, Boeing – Rocketdyne. Canoga Park, CA. July 30, 1999.

Mooers 1959. Internal memorandum from A.R. Mooers, Atomics International, to J.C. Lang, *Radiological Safety Incident Report*. November 3, 1959.

Effective Date:	Revision No.	Document No./Description:	Page No.
12/7/2018	0 (Draft)	SCA-TR-2018-SEC006	48 of 75

NIOSH 2018. *SEC Petition Evaluation Report – Petition SEC-00246 – DeSoto Avenue Facility*, Revision 0, National Institute for Occupational Safety and Health, Cincinnati, OH. July 3, 2018.

Personal Communication 2008. *Interview with [name redacted] on North American Aviation at DeSoto and Atomics International March 6, 2008*. Interview Conducted on March 6, 2008.

Personal Communication 2017. *Personal Communication with former De Soto Avenue Facility health and safety employee*. Interview conducted on April 18, 2017. [SRDB Ref. ID 166532]

Personal Communication 2018a. *Documented Communication SEC-00246 With Former ETEC Employee May 1, 2018*. Interview conducted on May 1, 2018. [SRDB Ref. ID 172299]

Personal Communication 2018b. *Documented Communication SEC-00246 With Former ETEC Employee May 16, 2018*. Interview conducted on May 16, 2018. [SRDB Ref. ID 172300]

Rowles 1989. Internal memorandum from J. Rowles, Rockwell International, to R.T. Lancet, *Delay in Performing Required Radiological Survey of a Radioactive Materials Package*. July 20, 1989.

Santa Susana 1962–1966. *Log Book Building 012 (10/12/62 to 7/27/66)*, Santa Susana Field Laboratory, Chatsworth, CA. 1962–1966.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 49 of 75
-------------------------------------	----------------------------------	--	-----------------------------

ATTACHMENT A: SC&A COMMENTS ON SPECIFIC PETITIONER CONCERNS IN OCTOBER 2018 WHITE PAPER PREPARED BY CORE ADVOCACY FOR NUCLEAR & AEROSPACE WORKERS (CORE ADVOCACY 2018)

This attachment contains SC&A’s comments on 20 of the 23 items outlined in the document *Americium, Thorium and Associated Progeny at DeSoto Facility: A Basis for SEC-00246*, prepared by CORE Advocacy for Nuclear & Aerospace Workers in October 2018. Items 1, 2, and 12 do not reference source materials or interviews but rather refer directly to NIOSH site profile and SEC evaluation documents; therefore, they are not discussed here. For each of the remaining items, this attachment quotes the original petitioner submission from CORE Advocacy 2018, followed by relevant direct quotes from the source documentation and SC&A’s comments/discussion of the item.

One facet of the documentation that is common to many of the items (in particular, the health physics logbook entries) is the reference to the “SS Vault,” which was interpreted as the “Santa Susana Vault” in many of the petitioner items in CORE Advocacy 2018. Based on its review of source documentation and the context of many of the references to the “SS Vault,” SC&A believes that, in many cases, this term actually represents a vault (possibly a “stainless steel” vault) that was located in Building 1 at the De Soto site and not at the Santa Susana complex. SC&A’s rationale for this assumption is documented in Attachment B.

ITEM 3. CONFIRMATORY SURVEY, B-104, DESOTO FACILITY (LUPO 1999)

Petitioner Explanatory Text (CORE Advocacy 2018, p. 3): *“Page 4: Survey confirmed the presence of americium and thorium.”*

SC&A Discussion/Comments: Thorium was identified in excavated soils from a sanitary drain trench in Room 104. Thorium-232 (Th-232) concentrations ranged from 0.63 to 0.75 pCi/g. SC&A did not identify americium as a contaminant of interest in this document. Page 7 of Lupo 1999 states:

The soil samples from the sanitary drain trench and the segregated soil in B-boxes have levels of radioactivity below the soil concentration limits as listed in the Approved Site Wide Release Criteria for Remediation of Radiological Facilities (amended to the Boeing/Rocketdyne California Radioactive Materials License 0015). Therefore the Mass Spectroscopy Laboratory may be released for unrestricted use.

The document does not contain any additional information related to processes and activities at the De Soto facility during the SEC evaluation period that indicate an unmonitored internal exposure to thorium or unencapsulated Am-241.

ITEM 4. INTERNAL OPERATIONAL SAFETY UNIT WEEKLY HIGHLIGHTS (HEINE 1971)

Petitioner Text (CORE Advocacy 2018, p. 3): *“Page 2, Paragraph 4: Two thorium-alloy tensile samples were machined in fuel fabrication area, DeSoto B-001. Access by unmonitored workers performing ‘clean’ tasks is documented.”*

SC&A Discussion/Comments: Heine 1971 states (p. 2):

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 50 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Two thorium alloy tensile samples from the Science Center were machined in the fuel fabrication area in Hq 001 under health physics surveillance.

No other information was provided in the source document related to the operation. The cited entry indicates the week ending April 17, 1971. SC&A identified lapel air sampling results for the cutting of ThO₂ on March 23, 1971 (see Figure 13 in Section 4).

There is no indication that workers in the fuel fabrication area who were performing the “cold work” were not being properly monitored. Furthermore, the “cold work” was done in the hot machine shop and not the fuel fabrication area (also known as the powder room). The document indicates that material leaving the hot machine shops needs to be surveyed for contamination even when cold work is being performed.

ITEM 5. INSPECTION OF SPECIAL NUCLEAR MATERIAL VAULT ROOMS AT DE SOTO (CLOW 1971)

Petitioner Text (CORE Advocacy 2018, p. 3): “Storage of *thorium* and ‘bird cages’ containing SNAP fuel from SSFL, stored at DeSoto Building 001 and other DeSoto locations; vault inventory and materials processing are described. **Page 4, Item H:** Verifies storage of *thorium*.”

SC&A Discussion/Comments: SC&A confirms that at least two 55-gallon drums were found on the De Soto storage pad:

- One drum of ~15 kg of thorium from National Lead of Ohio
- One 55-gallon drum labelled as CAE 912

In the case of the first drum, the identified action was to “request a management decision.” In the case of the second drum, the identified action is “Drum contains ~15 Kg Thorium, submit for writeoff of material from AI inventory.”

The conclusion of the document states (p. 4):

The SNM Vault and associated areas located at DeSoto 001 are now acceptable as SNM storage areas and after a complete SNM inventory which could include repackaging, reweighing, and location index will be ready for audit by our regulatory agencies plus AI management.

No actual processing of the material in question is described. The action items associated with the SNAP bird cages were as follows (p. 4):

Disposed of to salvage during November 1971...

Sent to T064 for reissue if required after reconditioning by D/779 and D/785.

There was no indication in the source document that the birdcages were contaminated with irradiated fuels that may have contained transuranic material.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 51 of 75
-------------------------------------	----------------------------------	--	-----------------------------

ITEM 6. NUCLEAR FUELS COMMITTEE ANNUAL REVIEW (ATOMICS INTERNATIONAL 1972)

Petitioner Text (CORE Advocacy 2018, p. 3):

Page 3: *Confirms storage of SNAP fuel, contaminated ‘bird cages’ (from SSFL), and storage of FCEL fuel from SSFL Area IV Bldg. 100, at DeSoto Bldg. 001.*

Page 6: *DeSoto Building 001 and 004 Fuel Inventory included uranium-thorium (U-Th).*

SC&A Discussion/Comments: On page 3 of the cited document, the following recommendation was made:

Attention should be made to move fuel currently stored in bird cages in the mezzanine area of the SNAP Fuels Fabrication Area to the Storage Vault. This specifically refers to fuel stored for extended periods of time.

SC&A did not identify any information to indicate the birdcages had come back from SSFL or, more importantly, that the fuel had been irradiated. Fast Critical Experiment Laboratory (FCEL) fuel that was located in the Fuel Storage Vault of Building 001 was “being readied for disposal” (p. 3), and the document noted that it had not been properly tagged. SC&A did not identify any information to indicate the material was to be processed at De Soto other than “being readied for disposal.” According to the cited document, the material was originally to be combined with other FCEL fuel; however, the additional fuel was never sent to the De Soto facility. The resulting recommendation from Atomics International 1972 was as follows (p. 3):

Tags or other identification should remain with fuel materials until actual packaging operations are initiated.

Page 6 of the cited document lists the approximate amount of enriched fuel that was contained in Building 001 and 004 at De Soto, but SC&A identified no evidence to indicate the material in question was uranium-thorium fuel. The description in the cited reference only indicates that it was enriched fuel.

ITEM 7. INCIDENT REPORT, 1970 (BOEING INCIDENT REPORT DATABASE) (BRESSON 1970)

Petitioner Text (CORE Advocacy 2018, p. 3): **Page 1:** *Processes involving spent nuclear fuel resulted in inhalation by workers. Verifies possible presence and handling of transuranics.”*

SC&A Discussion/Comments: The cited document describes the cutting of swaged U-Alx wires, which should have required respiratory protection. The [REDACTED] on the job did not think they needed respiratory protection and was [REDACTED]

[REDACTED] SC&A found no indication in the cited documentation that the material in question was irradiated and thus might have contained transuranic contamination. Both [REDACTED] samples were submitted and evaluated for the [REDACTED] workers involved approximately [REDACTED] after the incident.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 52 of 75
-------------------------------------	----------------------------------	--	-----------------------------

ITEM 8. INCIDENT REPORTS (BOEING INCIDENT REPORT DATABASE) (MOOERS 1959)

Petitioner Text (CORE Advocacy 2018, p. 3): *“Page 6: Uranium-Thorium fuel slugs removed from DeSoto Building 001, taken to DeSoto SNAP Area without HP notification; high levels of contamination bordered on criticality incident; unmonitored and unaware worker involved.”*

SC&A Discussion/Comments: The incident described occurred in 1959, which is well before the current period under evaluation (1965–1995). The cited incident is not relevant to the current SEC petition.

ITEM 9A. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 3):

*Page 11 - November 12, 1964: ****THORIUM*****

10:00: Birdcage surveyed; it came from SSFL Vault (4064).

17:45: Thorium Oxide sifting processes. Airborne release and contamination.

SC&A Discussion/Comments: The cited document describes the birdcage as follows (PDF p. 11):

Checked birdcage of normal uranium (0.2 uc) for shipment from SS Materials Vault. 0.2 mr/hr@ surface & no contamination.

SC&A believes that the “SS Materials Vault” referenced is actually located at De Soto² for materials to be eventually shipped to SSFL rather than from SSFL. As stated in the cited document, there was no contamination on the birdcage.

Based on the cited document, the thorium-sifting operation occurred in Room 115-13, with the following description of the cleanup operations:

Lab was decontaminated by project personnel and subsequent smears revealed contamination reduced to acceptable limits.

Both entries in the cited document refer to 1964, which is outside the SEC period under evaluation and therefore not relevant to the current petition.

ITEM 9B. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 3):

Page 16 - November 18, 1964:

13:30: Reference to “spent” fuel rods, DeSoto

SC&A Discussion/Comments: The cited reference states the following (PDF p. 16):

² See Attachment B for information concerning the “SS Vault” at De Soto.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 53 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Monitored, tagged & signed green shipper in prep. For shipment of 4.80% enriched "U" fuel rods (spent fuel rods). A meter survey revealed 0.12 mr/hr γ at the surface. A smear survey revealed <30 d/m/100cm² $\beta\gamma$ and <1 d/m/100cm² α . The survey was performed in Room 115-85.

The material was smeared to be shipped, but no indication was given that any decladding operations occurred with the spent fuel at De Soto. The entry is from 1964, which is outside the SEC period under evaluation and therefore not relevant to the current petition.

ITEM 9C. DE SOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 3):

Page 59 - March 5, 1965:

13:30: Confirmation of shipment, from SSFL SNM Vault 4064 to DeSoto 004.

SC&A Discussion/Comments: The cited reference states the following (PDF p. 59):

Monitored Box of ~4.2 mc of I¹³¹ from SS Vault to Bldg HQ004. Indicated ~1.0 mr/hr @ surface w/ 2612.

This material identified is neither thorium nor americium. Additionally, SC&A believes that the SS Vault referenced was located at De Soto and, therefore, the box may not have been actually sent from SSFL. There is no indication from the cited documentation that the box of radioiodine was compromised and presented an internal exposure source.

ITEM 9D. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 77 - March 16, 1965:

13:15: Monitoring of 7 shield plugs shipped from CDHC (Area IV Hot Lab).

SC&A Discussion/Comments: The cited reference states the following (PDF p. 77):

Monitored and smeared 7 shielded plugs from C.D.H.C. in Control Station Bldg 001 Rm 11K-76. <0.1 mrad/hr @ surface on a 2650. Smear survey less than background.

The objects were smeared, but no contamination was found. There is no indication in the source documentation of any work performed with the material other than storage.

ITEM 9E. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 85 - March 18, 1965: **THORIUM**

Effective Date:	Revision No.	Document No./Description:	Page No.
12/7/2018	0 (Draft)	SCA-TR-2018-SEC006	54 of 75

22:00 - Confirms reflector / moderator cans from SRE (SSFL), for U-Th fuel, and addition of new hoist to accommodate SSFL shipments.

SC&A Discussion/Comments: The cited references states the following (PDF p. 85):

Checked out “A” frame host for Maintenance in the shop area. This host has been added to on the top beam to accommodate the lifting of Reflector-Moderator Cans for the SRE.

This entry refers to reflectors and moderator cans, not the actual SRE fuel. SRE fuel was fabricated prior to 1965 (the start of the SEC period under evaluation). It is not clear from the cited document that any actual processing of contaminated moderator/reflector material or previously manufactured fuel (other than storage) took place at De Soto.

ITEM 9F. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 100 - March 31, 1965: **THORIUM**

08:45 - Confirmed presence of SRE [U-Th] fuel element, “checked out” at DeSoto Machine Shop. Cutting of SRE U-Th fuel is a process thought to be confined to SSFL Area IV ETB (Building 003 Hot Cave). References to this process at DeSoto may suggest a need to correct NIOSH TBD’s.

SC&A Discussion/Comments: The cited reference states (PDF p. 100):

Checked out Fuel Element from SRE in Mach. Shop - reading < 0.1 mr/hr.

Based on the entry, “checked out” appears to simply mean a gamma dose rate survey. No reference is made to the decladding or processing of the SRE fuel at De Soto. No external contamination surveys were performed as would be expected for decladded fuel.

ITEM 9G. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 102 - March 32, 1965 [Date Entered in Log Book as “3-32-65”] **THORIUM**

14:00 - Describes smearing of contaminated SRE can in Machine Shop. Due to contamination, the can was not permitted to be cut open in a clean shop area. See entry above. This entry confirms shipments from SSFL to DeSoto; U-Th fuel from the SRE, for processes.

SC&A Discussion/Comments: The cited reference states (PDF p. 102):

smear the SRE can located in the Mach. Shop and found the following activity. North end of can 162 dpm 100cm² Beta Gamma – South end of can 568 dpm 100cm² beta gamma – We informed [redacted] of this activity and also told [them] we could not allow the can to be cut open in the clean shop area with this magnitude of activity.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 55 of 75
-------------------------------------	----------------------------------	--	-----------------------------

It is not clear from the cited reference if the object in question was, in fact, a fuel can or alternately a moderator/reflector can. However, the fact that they were planning to cut it open in a clean area before finding the contamination on the external surface of “the can” suggests it was not likely to be actual SRE fuel.

ITEM 9H. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 111 - April 13, 1965: **THORIUM**

13:45 - Smears of SRE moderator element in high-bay, before ends were “disassembled and machined.” This entry confirms U-Th SRE fuel processes, shipments from SSFL to DeSoto, and the presence of U-Th SRE spent fuel for further processing.

SC&A Discussion/Comments: The cited reference states (PDF p. 111):

Smear S.R.E. moderator element in high bay before ends are disassembled and machined. South end of can read <BKGD α 100 cm² & 243.46 d/m $\beta\gamma$. They are deconing can before disassembly.

As shown in the cited logbook entry, the object in question was an SRE “moderator element” and not a fuel element. Alpha smear surveys, which might have indicated transuranic contamination, were at background.

ITEM 9I. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 113 - April 15, 1965: **AMERICIUM**

11:00 - Confirmed presence of Americium-241 crystals.

SC&A Discussion/Comments: The cited reference states (PDF p. 113):

Monitored and tagged a container of Am²⁴¹ crystals 0.2 mr/hr @ surface. Container is going to Bldg 4 from 11H02.

The entry describes an external gamma scan of a container of americium. It should be noted that no smear survey was conducted, which likely indicates a sealed source that was not externally contaminated. No further information is provided as to the prior or future use of the americium that might result in internal exposure potential.

ITEM 9J. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 117 - April 21, 1965:

Effective Date:	Revision No.	Document No./Description:	Page No.
12/7/2018	0 (Draft)	SCA-TR-2018-SEC006	56 of 75

08:30 - Survey of Atomics International test capsules irradiated at SSFL was conducted, verifying shipment of irradiated materials from SSFL to DeSoto for various processes.

SC&A Discussion/Comments: The cited reference states (PDF p. 117):

Surveyed AL Test Capsules that had been irradiated at SS – highest surface reading was 30 mr/hr – smeared these capsules inside and outside – counts were at background or less. These will be housed in a lead pig in Room 524-51.

Based on SC&A’s review of the cited document, it appears that the capsules were actually aluminum (“AL”) test capsules rather than Atomics International (“AI”) test capsules. The irradiated aluminum, by itself, would not consist of transuranic material. Furthermore, if actual fuel was present in the capsules, then it is likely the capsules would be placed in appropriate birdcages to prevent a criticality incident rather than placed in a lead pig, which is typically used for shielding from activated materials with significant external dose rates. Finally, if actual irradiated fuel was present in the capsules, there is no indication the capsules had been compromised and the fuel material was available for inhalation or ingestion.

ITEM 9K. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 118 - April 21, 1965:

15:30 - Shielded starter-can containing “old M.F.P. [Mixed Fission Product] and Sr-90 sludge was leaking water from within. M.F.P. from SSFL may have contained americium, thorium, etc.

SC&A Discussion/Comments: The cited reference states (PDF p. 118):

Received call from [name redacted] D/755 that a shielded starter can containing old M.F.P. and Sr⁹⁰ sludge was leaking water from within. Smears of water and shoes of men involved read < BKGD βγ 100 cm². 2650 read 15. mrad/hr. at surface & 2 mrad/hr @ 1 meter. Then gave permission of shipment from dock to Bldg. 004.

It should be noted that only external dose rate measurements and beta-gamma surface contamination were measured; no alpha readings were taken of the leaking water as would be expected if transuranic material were present in the material. SC&A is unaware of the use of americium as a neutron starter material for nuclear reactors in use at De Soto or SSFL.

ITEM 9L. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 120 - April 26, 1965:

10:35 - Radioactive metal from received from SSFL was to be machined at DeSoto Hot Lab, and returned to SSFL.

SC&A Discussion/Comments: The cited reference states (PDF p. 120):

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Effective Date:	Revision No.	Document No./Description:	Page No.
12/7/2018	0 (Draft)	SCA-TR-2018-SEC006	57 of 75

Smearred and surveyed R/A metal rod from SS which will be machined down in the 'Hot Lab' 11 H 41 and returned to SS. Max reading at surface 0.3 mr/hr - no surface contamination."

It is not possible to definitely say what the "metal" actually consisted of; however, it seems that if it was a fuel element that information would have been included in the logbook entry rather than simply described as a "metal rod." It is possible that the material in question was activated cladding material, which would not have contained transuranic contamination, and was intended to undergo further testing.

ITEM 9M. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 129 - May 4, 1965: **THORIUM**

10:30 - SRE fuel elements at DeSoto; shipment to SSFL. [U-Th spent fuel – all SRE operations ended in 1964, with exception of SRE-PEP Program that ended in 1967].

SC&A Discussion/Comments: The cited reference states (PDF p. 129):

Surveyed SRE Fuel Elements going to SS max. reading 1.0 mr/hr surface.

It is noteworthy that only an external dose rate measurement was performed on the fuel elements. If they had been freshly fabricated at De Soto, then a smear survey of the cladding would certainly have been warranted. Since De Soto served as the headquarters for the entire ETEC site, many materials were received there prior to being shipped to SSFL. In any case, the cited reference does not provide any information that would indicate the fuel elements were compromised and represented the potential for internal exposure to uranium-thorium materials contained in the SRE fuel elements.

ITEM 9N. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 141 - May 18, 1965:

9:30 - [REDACTED] describes smearing tools and R/A waste at Radioactive Materials Disposal Facility (RMDF), Area IV SSFL. At 9:00, [REDACTED] was performing duties at DeSoto; by 9:30 [REDACTED] was performing duties at SSFL Area IV. By 10:30, [REDACTED] was back at DeSoto Facility.

SC&A Discussion/Comments: SC&A acknowledges that energy employees were allowed (and directed) to move freely between the De Soto and SSFL locations based on the job requirements and skills available for a specific task. The cited reference does not indicate internal exposure potential at the De Soto site that would preclude the ability to reconstruct exposures to workers located at that facility.

ITEM 9O. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 4):

Page 145 - May 20, 1965: **THORIUM-OXIDE**

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 58 of 75
-------------------------------------	----------------------------------	--	-----------------------------

9:15 - *Shipment of Thorium-Oxide.*

SC&A Discussion/Comments: The cited reference states (PDF p. 145):

Surveyed shipment of Th-O at S.S. Vault.

As stated previously, SC&A believes that the reference to the “SS Vault” refers to a location that is physically at the De Soto facility (see Attachment B). In this case, the thorium-oxide was surveyed but there is no indication of any planned decladding operation or other processing of the material beyond storage in the vault.

ITEM 9P. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 5):

Page 146 - May 20, 1965: ****THORIUM-OXIDE****

8:30 - *Box of Thorium-Oxide.*

SC&A Discussion/Comments: The cited reference states (PDF p. 146):

Checked out 12 R/A barrels of 4.29% U-235 going to SS – and 1 Box of Thorium Oxide going to an outside contractor.

There is no indication in the cited logbook entries indicating the thorium had been processed at De Soto. It is possible the material was being stored prior to the shipment to the “outside contractor.” Since no contamination or dose rate information were reported, it is likely the material did not present an internal radiation hazard.

ITEM 9Q. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 5):

Page 151 - May 27, 1965: ****THORIUM****

16:00 - *Four (4) shipments of SRE fuel elements (U-Th) going to SSFL.*

SC&A Discussion/Comments: The cited reference states (PDF p. 151):

Surveyed (4) shipments of SRE Fuel elements going to SS Max reading 0.9 mr/hr.

Similar to previous entries, only a dose rate measurement was performed rather than smear surveys looking for external contamination. There is no indication that the elements had undergone any processing at the De Soto facility. Additionally, they are referred to as “shipments,” so it is possible they simply arrived at the De Soto loading dock before being transferred along to SSFL.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 59 of 75
-------------------------------------	----------------------------------	--	-----------------------------

ITEM 9R. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 5):

Page 157 - June 7, 1965:

9:30 - Shipment from SSFL SNM Vault arrived and smeared at DeSoto; shipped to Sandia.

SC&A Discussion/Comments: The cited reference states (PDF p. 157):

Surveyed Shipment from SS Vault going to Santa Su.

As stated previously, SC&A believes that the referenced “SS Vault” in this logbook entry is actually located at De Soto (see Attachment B) and that the material is being sent to “Santa Su” (assumed to be shorthand for Santa Susana) rather than being shipped to “Sandia” (assumed to be Sandia National Laboratory). The practice of using “Santa Su” to represent SSFL was observed by SC&A in several other logbook entries.

ITEM 9S. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 5):

Page 160 - June 9, 1965:

15:00 - Shipment to Hanford, Ux / NaK.

SC&A Discussion/Comments: The cited reference states (PDF p. 160):

Checked Ux NAK Loop Exp. Going Hanford – surface activity 0.1 mr/hr.

There are no indications in the cited logbook entry (nor in the surrounding entries) of the material being processed or handled other than possibly storage at De Soto. In addition, it is not clear that the material had been irradiated and thus potentially contained transuranic material, such as americium.

ITEM 9T. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 5):

Page 160 - June 10, 1965: **THORIUM**

14:00 - Survey of SRE fuel rods (U-Th) to SSFL

SC&A Discussion/Comments: The cited reference states (PDF p. 60):

Surveyed shipment of SRE rods going to SS – 0.7 mr/hr & 2.1 curies.

No external contamination was identified in the noted logbook entries or surrounding entries related to the SRE rods. It is not clear when the fuel rods had been fabricated. No evidence was observed to indicate internal exposure potential to the SRE fuel.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 60 of 75
-------------------------------------	----------------------------------	--	-----------------------------

ITEM 9U. DESOTO FACILITY LOG BOOK (DE SOTO 1964–1965A)

Petitioner Text (CORE Advocacy 2018, p. 5):

Page 224 - August 23, 1965: **THORIUM**

08:30 - Shipment from SSFL; a 55 gallon drum containing “SRE Material.” [U-Th]

SC&A Discussion/Comments: The cited reference states (PDF p. 224):

Delivered shipment papers to [name redacted] at the Vault – on a shipment made from Santa Susana – a 55 gal drum containing SRE material.

No further information is contained in the logbook entry as to any proposed processing activities of the SRE material, nor were any actual surveys of the 55-gallon drum performed that might indicate contamination and potential internal exposure potential.

ITEM 10. SPECIAL NUCLEAR MATERIALS (SNM) LICENSES FOR DESOTO FACILITY TO 1995 (ATOMICS INTERNATIONAL & STATE OF CALIFORNIA 1968–1969)

Petitioner Text (CORE Advocacy 2018, p. 5):

Page 7: Specified contractor use of SNM at DeSoto Facility, 8900 DeSoto Ave., Canoga Park, CA.

Pages 22-24: Attachment I - Possession Limits, Authorized Uses / General Licensing Conditions

- Licensed radioactive materials permitted for use at HQ (DeSoto) / SSFL
- Up to 1,000 pounds of **Thorium** as “Schedule I Material” (R&D purposes)
- **Americium-241** as “Schedule II Material” (relatively large amount of sealed sources permitted in inventory, to be used for radiography, R&D), and a “Schedule III Material” (required for production and fabrication efforts).

SC&A Discussion/Comments: While PDF page 7 of the cited document collection lists De Soto as one of the “addresses at which radioactive material will be used,” the document also specifically lists the “Nuclear Development Field Laboratory” (AKA – SSFLF) under the same license.

PDF page 25 of the cited document collection describes the authorized use of natural thorium (Schedule I material):

"To be used for calibration of instruments and for research and development as defined in Section 30175(j) of California Administrative Code, Title 17, except for production of neutrons.

PDF page 25 also authorizes use of Am-241 (Schedule II) as follows:

To be used as components of Baher Industries Pyr-A-Larm fire detection devices, Models F3, F5, F5A, and F5B.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 61 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Schedule III authorizes use of Am-241 as follows:

To be used in fabrication of sealed sources and transfer to authorized recipients.

None of the cited passages use authorizations for americium or thorium directly indicates that such materials were used in actual processes that may have resulted in the potential for internal exposure.

ITEM 11. RENEWAL APPLICATION, BROAD SCOPE "A" R/A MATERIAL LICENSE 0015-79 (BARNES 1995)

Petitioner Text (CORE Advocacy 2018, p. 5):

Page 6: *Identification of Applicant and Locations Where R/A Material Will Be Used*

- *Locations identified as **DeSoto** / SSFL*
- *License revisions and updates included Am / **Th**, accommodated facility changes in operations, and confirmed materials storage and transport between SSFL, Canoga and DeSoto during SSFL ETEC Site Remediation Period, until at least 1995.*

SC&A Discussion/Comments: It should be noted that the material entry "I" which designated "natural thorium" has been deleted from the license renewal (see PDF page 8 of Barnes 1995)

Material entries E and H (Am-241 Schedule III and II, respectively) refer to sealed sources (see PDF pages 7 and 8 of Barnes 1995). PDF page 33 of Barnes 1995 notes:

Of the Rocketdyne facilities currently licensed, only activities at the Santa Susana Field Laboratory and the Mass Spectrometry Laboratory (DeSoto) handle unencapsulated materials.

PDF pages 36 and 37 of Barnes 1995 state:

1) *Active Facilities:*

a) *Gamma Irradiation Facility [State of California]:*

The Cobalt-60 sources formerly in this facility have been removed from Rocketdyne property and removed from the License. Preliminary release surveys have been conducted. Final release surveys will be performed at a future date [sic].

b) *Mass Spectrometry Lab [State of California]:*

Based upon commercial considerations, this activity [at the mass spectrometry laboratory] has been terminated. The facility is currently undergoing Decontamination and Decommissioning.

SC&A acknowledges that the special nuclear material license covered both SSFL and De Soto; in addition, it is apparent that a significant portion of the workforce was utilized at both locations. However, the license itself does not indicate any proposed activities or processes that would represent an

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 62 of 75
-------------------------------------	----------------------------------	--	-----------------------------

unmonitored internal exposure source that would preclude sufficiently accurate dose reconstruction under EEOICPA.

ITEM 13. INCIDENT REPORT (BOEING INCIDENT REPORT DATABASE), 1989 (ROWLES 1989)

Petitioner Text (CORE Advocacy 2018, p. 6): *“A radioactive materials shipment of TRUMP-S supplies (a program to separate transuranics) was received at DeSoto. The report specifies that Special Nuclear Materials (SNM) License 21 was modified to accommodate the TRUMP-S program. The primary shipping address indicated on SNM-21 is the DeSoto Facility, which received materials for TRUMP-S that were subsequently stored, instead of being shipped to SSFL SNM Vault (Building 4064) within the requisite timeframe. The immediate causes of the incident were identified, and suggest that DeSoto Facility would be expected to routinely receive Type B Radioactive Materials.”*

SC&A Discussion/Comments: Based on the cited documentation, the package was never considered “lost,” and no contamination or indications of a compromised package were identified. It should be noted that the actual shipment of TRUMP-S material only contained uranium and plutonium (no americium), as stated on PDF page 2 of Rowles 1989.

ITEM 14. ROCKWELL INTERNATIONAL CORRESPONDENCE, RE: FISSION PRODUCT AND FISSILE CONTENT OF SRE FUEL, 1975 (HEINE 1975)

Petitioner Text (CORE Advocacy 2018, p. 6): *“This document describes SRE fuel (Core II), as Uranium-Thorium Alloy / Experimental Fuel that was removed from the SRE reactor in 1964. Its presence and processes at DeSoto Facility, described in the Log Book entries above, support a determination that thorium processes were undertaken at the worksite.”*

SC&A Discussion/Comments: The cited document does describe the uranium-thorium content of SRE Core II fuel assemblies as well as citing an unnamed report documenting criticality studies related to fuel decladding. However, no mention is made as to where the decladding operations occurred. The correspondence shows the address of the De Soto facility; however, that would be expected as it was the headquarters for the entire facility and regularly received and transported materials.

ITEM 15. GEN-ZR-000, RADIOLOGICAL SURVEY OF SSFL AREA IV SPECIAL NUCLEAR MATERIALS (SNM) VAULT, BUILDING 4064, 1988 (AUTHOR UNKNOWN 1988)

Petitioner Text (CORE Advocacy 2018, p. 6): *“SNM Vault (4064 or ‘T-064’), used to store packaged source material (normal uranium, depleted uranium, thorium) and Special Nuclear Material (enriched uranium, plutonium, U-233), in addition to miscellaneous radioactive wastes, irradiated fuel elements, and spent fuel casks. Log Books references routine shipments between SSFL 4064 and DeSoto, and 4064 U-Th contamination.”*

SC&A Discussion/Comments: SC&A agrees that Building T046 was used for the storage of SNM during the period of interest. The results of the 1988 survey (Author Unknown 1988) concluded the following (p. 91):

The building T-064 interior, filter plenums, fenced-in storage yard, and 2-acre surrounding area were inspected for radioactive contaminants. All direct and removable

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 63 of 75
-------------------------------------	----------------------------------	--	-----------------------------

measurements made for alpha/beta radioactivity on inside walls and floors show that contamination is far below acceptance limits for release for unrestricted use.

SC&A was unable to locate any evidence in the cited document that internal exposure potential existed at De Soto to unmonitored materials such as thorium or unencapsulated americium.

ITEM 16. ATOMICS INTERNATIONAL, CRITERIA FOR THE SS VAULT STORAGE (SNAP AND OTHER FUELS) DURING CLOSE-OUT OF THE SNAP PROGRAM, 1973 (KETZLACH 1973B)

Petitioner Text (CORE Advocacy 2018, p. 6): “Criteria for fuel storage at the DeSoto Vault and SSFL SNM Vault (4064)”

SC&A Discussion/Comments: SC&A acknowledges that various types of nuclear material, including nuclear fuel, were stored at the De Soto facility. However, SC&A was unable to identify information in the cited reference that would indicate a source or process that could result in the potential for internal exposure that would preclude a sufficiently accurate or bounding dose reconstruction.

ITEM 17. NORTH AMERICAN ROCKWELL, WEEKLY HIGHLIGHTS, SNAP CLOSE OUT 1973 (KETZLACH 1973A)

Petitioner Text (CORE Advocacy 2018, p. 6):

- *Shipment of unenriched U-235 from SSFL Area IV Hot Lab to DeSoto SS Vault*
- *Consolidation of SNAP natural U, transferred to the DeSoto SS Vault*
- *Cutting of SNAP extruded rods*
- *Reference to SNAP fuel storage in birdcages, drums and shelves at DeSoto SS Vault / SSFL*
- *THORIUM plate shipment to Japan*

SC&A Discussion/Comments: The cited references states (p. 1):

Consolidation of SNAP natural U in the SNAP Fuel Fabrication Area (MBA 06) has begun. Some of it has now been transferred to the Building 001 SS Vault.

Cutting of SNAP extruded rods will begin after the Apollo machining is complete.

General criteria for the storage of SNAP fuels in birdcages, drums and on shelves in the SS Vaults at DeSoto and Santa Susana were prepared...

The Th plates scheduled for shipment to Japan have been inspected by QA. The plates will be recoated before packaging for shipment.

The cited reference does not indicate that the SNAP fuel transferred to De Soto had been irradiated. It is possible that the SNAP fuel was fresh and only contained highly enriched uranium rather than transuranic material. The cutting of the SNAP fuel refers to “extruded rods,” which likely refers to fresh fuel that had been recently fabricated. Regarding the shipment of thorium material to Japan, the cited reference indicates that the plates should be recoated but does not indicate the plates required any machining or other activity that might produce airborne contamination.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 64 of 75
-------------------------------------	----------------------------------	--	-----------------------------

**ITEM 18. SSFL AREA IV SNAP BUILDING 4012 LOG BOOK, 1963 ([NAME REDACTED] ENTRIES)
(SANTA SUSANA 1962–1966)**

Petitioner Text (CORE Advocacy 2018, p. 7): *“The Log Book chronicles the ongoing problem of ‘bird cages’ containing SNAP-TRAN fuel elements, which were shipped interchangeably between DeSoto (HQ) and SSFL. The document verifies that shipments from SSFL to DeSoto were routine, and included SNAP reactor parts, contaminated water samples from the SNAP Dunk Tank, and contaminated Beryllium parts.”*

SC&A Discussion/Comments: The majority of the logbook entries in the cited reference predate the SEC period under evaluation. Furthermore, the logbooks pertain to Building 012 (later referred to as Building 4012: SNAP Critical Test Facility) which is located at SSFL, not the De Soto facility. Three instances were observed in the cited reference indicating the transfer of material between SSFL and De Soto:

- Two instances of water samples (one from the dunk tank and one from the hold up tank)
- The transfer of two paint cans containing tritium, which were smeared prior to shipment to Building 004 at HQ

Although CORE Advocacy 2018 indicates that contaminated beryllium parts were shipped to De Soto, PDF page 33 of the cited reference indicates that only the smears that had been taken on the beryllium parts were shipped to “H.Q.” for analysis. All other logbook entries pertaining to the transfer of radioactive materials were shipments between Building 012 and Building 064, which are both located at SSFL.

ITEM 19. H&S ANNUAL REVIEW OF RADIOLOGICAL CONTROLS, 1977 (HART 1980)

Petitioner Text (CORE Advocacy 2018, pp. 6–7):

- *Special Nuclear Material (SNM) License 21 lists SSFL and DeSoto, on the same license*
- *The report considers DeSoto and SSFL together, combining:*
 - *Worker Dosimetry*
 - *Film Badge and TLD Data*
 - *Whole Body Doses*
 - *Worker Exposure*
- *Throughout this report on Radiological Controls, there is no reference to the separation of materials, the confinement of specific isotopes to SSFL, or restriction of certain isotopes from DeSoto.*

SC&A Discussion/Comments: SC&A acknowledges that that the nuclear material licenses and health physics program covered both the De Soto facility and SSFL. SC&A further acknowledges that materials were not specifically confined to one location. However, the cited reference does not contain information related to the decladding of irradiated fuel that would contain transuranic material, nor does it indicate any specific operations involving thorium that occurred at De Soto.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 65 of 75
-------------------------------------	----------------------------------	--	-----------------------------

ITEM 20. INCIDENT REPORT, ATOMICS INTERNATIONAL 1962 (NEW DOCUMENT) (DE SOTO 1962)

Petitioner Text (CORE Advocacy 2018, p. 7):

- *Describes the process of “stripping” SNAP fuel at DeSoto Facility Building 001.*
- *Verified storage of drums containing contaminated NaK that had been “reclaimed by the stripping of SNAP fuel rods.” It is reasonable that this materials would have come from SSFL SNAP complex.*
- *SNAP Technical Manuals describe SNAP fuel, and the generation of Am-241.*
[Footnote: Atomics International, *Nuclear Space Power Systems*, by H.M. Dieckamp, Vice President, Engineering, page 259. September 1967.]

SC&A Discussion/Comments: The incident report does not refer to the SNAP fuel rods as having been irradiated, so it is not clear that Am-241 would have been present during the “stripping” operation, which occurred in Building 1. Furthermore, this incident occurred on March 28, 1962 and thus is not relevant to the SEC period under evaluation.

ITEM 21A. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960s (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 2: Shipment of 2 microcuries of Am-241”

SC&A Discussion/Comments: The full logbook entry on 8/3/1965 in the cited reference appears to read (PDF pp. 2–3):

*Shipped 2 mcuries of Am²⁴¹ for [name redacted]. They represented 2 sources (**sealed**) to be returned for credit. Radiation level not detectable with 2612. [Emphasis added.]*

As noted in the above quote, the sources were sealed and did not exhibit detectable external contamination.

ITEM 21B. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960s (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 5: Irradiated fuel element from Santa Susana Building 4009 and 4028 arrived at DeSoto.”

SC&A Discussion/Comments: The cited reference appears to state (PDF p. 5):

Smear paper wrapper brought from [illegible] after using it to wrap an element in question from S.S. which was removed from Bldg 9 to Bldg 28 without proper identification or clearance. Indicated radiation 170 mr/hr + 10,000 d/m βγ surface contamination. Paper wrapper showed no detectable contamination – Reported findings to [name redacted] at S.S.

The logbook entry does not indicate that the fuel element had been decontaminated post irradiation. It is noteworthy that smears of the items in question were only surveyed via dose rate measurements and

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 66 of 75
-------------------------------------	----------------------------------	--	-----------------------------

beta-gamma surface contamination (no alpha smears were taken). Neither the cited logbook entry or surrounding entries indicated if the element had been irradiated nor whether any processing of the element was planned to take place (such as decladding).

ITEM 21C. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960S (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 8: Radioactive shipment from SSFL, lacking labels.”

SC&A Discussion/Comments: The cited logbook entry appears to read (PDF p. 8):

Call from [name redacted] regarding a R/A shipment from Rocketdyne. No I.C.C. labels in evidence. Was shipped by [name redacted] from HR 004. [Redacted] stated Q.C. monitored the container prior to removal from A.I. facilities. Will check with Q.C.

No evidence of follow-up was identified in later entries of the logbook. Other entries from this date in the logbook refer to activities in HQ 004. The shipment was from what appears to read “HR 004” (unknown location) but was possibly meant to be “HQ 004,” in which case the shipment would be leaving, rather than arriving, at the De Soto facility.

ITEM 21D. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960S (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 10: Contaminated SNAP-10 parts at DeSoto had come from Santa Susana’s salvage yard.”

SC&A Discussion/Comments: The cited logbook entry appears to read (PDF pp. 10–11):

Smear results of BeO contamination of what looked to be reflectors indicated max of 1.0 µgm/100cm². [Name redacted] of air space safety was contacted and the suspected parts were found to be from a SNAP 10 mock-up and were fabricated from magnesium. H+S requested the parts in question be removed from salvage yard and decontaminated.

As seen in the entry, the contamination was BeO on a magnesium reflector, rather than an irradiated fuel element that would be likely to contain Am-241.

ITEM 21E. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960S (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 13: DeSoto accepted / analyzed 2 ‘planter boxes’ containing ‘scotch tape’ from reactor, received from SSFL Hot Lab.”

SC&A Discussion/Comments: The boxes containing the “scotch tape” were monitored via a Juno detector and found a maximum surface dose rate of 250 mr/hr. It was expected that the “specimens” would be plated for further analysis; however, the results of any such analysis were not located in later logbook entries.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 67 of 75
-------------------------------------	----------------------------------	--	-----------------------------

ITEM 21F. DESOTO FACILITY BUILDING 004 LOG BOOK, c. 1960s (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 15: Contaminated Dowanol received from SSFL.”

SC&A Discussion/Comments: The liquid Dowanol was smeared for beta-gamma, and the results were less than 30 dpm; therefore, it is not clear to what extent the material was actually contaminated. The samples were taken to a laboratory in Building 004 for analysis; however, no follow-up information was identified.

ITEM 21G. DESOTO FACILITY BUILDING 004 LOG BOOK, c. 1960s (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 16: Re-used and recirculated, contaminated ‘pig’ received from SSFL Building 4028 (SNAP).”

SC&A Discussion/Comments: The cited logbook entry does not provide actual data as to the type or amount of contamination found on the pig. The logbook entry simply indicates that quality control will be notified of the condition of the pig as it is sent back to Building 28 (Building 4028).

ITEM 21H. DESOTO FACILITY BUILDING 004 LOG BOOK, c. 1960s (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 17: Survey of ‘starter can’ from SSFL with 5000 dpm surface contamination.”

SC&A Discussion/Comments: Based on the handwriting style of other numbers in the logbook, it appears the entry actually indicates “3000 d/m” and does not specify if it is beta-gamma activity or alpha. The logbook entry indicates protective clothing and decontamination were recommended. SC&A is not aware of Am-241 being used in a neutron starter material at SSFL.

ITEM 21I. DESOTO FACILITY BUILDING 004 LOG BOOK, c. 1960s (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 19: Capsule’s arrival at DeSoto Facility, after irradiation in a reactor at SSFL.”

SC&A Discussion/Comments: The cited logbook entry appears to state (PDF p. 19):

[Name redacted] *stated the capsule being sent to [name redacted] indicated 5 rem/hr after removal from the reactor at S.S. with >30,000 dpm β surface contamination. Arrival expected tomorrow and a recommended “cooling off” period was suggested to [name redacted] who concurred.*

Further information about the capsule in question was not identified in subsequent logbook entries. It is unknown if the capsule was intended to be processed or only stored at the De Soto facility. Additionally,

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 68 of 75
-------------------------------------	----------------------------------	--	-----------------------------

the external contamination was identified as beta-gamma. If transuranic contamination existed on the external surfaces of the capsule, it would be identified as alpha.

ITEM 21J. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960S (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “*Page 21: Receipt of Mixed Fission Products (MFP) from SSFL.*”

SC&A Discussion/Comments: The cited logbook entry appears to state (PDF pp. 21–22):

Call from [caller] regarding a shipment of M.F.P. from S.S. by [sender] to HQ 4 on the 12th of this month. [Caller] had no record, traffic had no record. Discussion with [sender] found [sender] had only 2 shipments received at HQ 1 this month, one was NaK samples and the other was M.F.P. The question regarding the shipment [sic] is very vague and do not understand [caller’s] concerns.

Since the material in question was identified as mixed fission products, it is unlikely the material contained thorium or americium. However, interviews with former workers do indicate that MFP was used as a general term for all radioactive material. The cited reference does not provide any indication that the material was in a form that represented an internal exposure hazard nor what future work was planned for the material.

ITEM 21K. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960S (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “*Page 54: Receipt of new source materials from SSFL.*”

SC&A Discussion/Comments: The cited logbook entry appears to state (PDF p. 54):

*Checked out new source mtl. From S.S. in Hot Chem - 25 rem/hr indicated.
Recommended [worker] hold until [worker] discussed it with [worker’s] supervisor.*

While this is material clearly represents an external dose hazard, information as to what the actual source material was is not provided. Furthermore, there are no indications that the source was externally contaminated, which may have indicated an internal exposure hazard.

ITEM 21L. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960S (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “*Page 57: Labeling radioactive materials with ‘R/A Tape, Isotope Unknown.’*”

SC&A Discussion/Comments: The cited logbook entry appears to state (PDF p. 57):

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 69 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Checked out Mettler Balance for Radiation in hot chem. Indicated 60 mr/hr at the bal. pins. A Rep. of Mettler Co. was allowed to remove the pins and take them out of the plant. They (2) were contained in a plastic box and identified with R/A tape. Isotope unknown.

The logbook does not indicate that any smears for external contamination were taken, only that it was surveyed to obtain the external dose rate.

ITEM 21M. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960S (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 75: Continuous test, involving MFP.”

SC&A Discussion/Comments: The cited logbook appears to state (PDF p. 75):

Evaluated a new test involving coolant which will be operating in a hood of 426-71. The test will be continuous until further notice. Essentially the liquid will be held at elevated temperatures. Slight MFP involved however the lab area was reclassified from clean to controlled and proper door entrance signs applied.

Based on this description, the material was kept in a hood with only “slight” MFP involved, and the room was changed to a controlled area. There was no indication of the spread of contamination or the release of airborne material during the operation in either the cited or subsequent logbook entries.

ITEM 21N. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960S (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 98: Pipe formerly containing OMRE (SSFL Organic Moderated Reactor) filter samples, present.”

SC&A Discussion/Comments: The cited logbook entry appears to state (PDF p. 98):

An emptie [sic] 6" pipe capped at each end formerly containing O.M.R.E. filter samples was removed from the hot chem. and returned to [name redacted].

There are no indications in either the cited or subsequent logbook entries indicating what work had been done with the filter samples nor whether an internal exposure potential was present.

ITEM 21O. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960S (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 104: ‘Hot’ samples of NaK received from SSFL, opened, surface container contamination was 16,000 dpm”

SC&A Discussion/Comments: The cited logbook entry appears to state (PDF pp. 104–105):

Hot samples of NaK from S.S. radiation facilities were opened in the Hot Chem area... Contamination indicated > 16,000 d/m βγ on the surface of the sample primary

Effective Date:	Revision No.	Document No./Description:	Page No.
12/7/2018	0 (Draft)	SCA-TR-2018-SEC006	70 of 75

container. The use of R/A hood assisted in the control of the contamination as the 3 hour air sample indicated at the conclusion of the opening and dilution of the samples. (Bkgd airborne contamination).

As indicated in the full logbook entry, the work was performed in the Hot Chem lab under a hood, with air samples taken during the extent of the operation. The results of the air samples were at background levels. Furthermore, there is no indication that the sodium-potassium alloy (NaK) samples would have contained transuranic material.

ITEM 21P. DESOTO FACILITY BUILDING 004 LOG BOOK, c. 1960s (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 120: *Bi-annual inspection; shipment of irradiated materials at SSFL to be ‘reclaimed.’ However, after discussion with the SSFL HP, it was found that the ‘radiation time in the reactor was insufficient to attain the necessary activity desired, therefore the samples were returned to SSFL, unopened.’ This entry suggests that highly irradiated samples were routinely accepted at – and opened by – DeSoto personnel (1966).*”

SC&A Discussion/Comments: The logbook entry indicates (PDF p. 120):

a bi-annual elect. Inspection for Dept 779 was accomplished and papers were given to Sect.

Based on this entry, it appears the inspection was related to the electrical infrastructure and not radiation. With regard to the irradiated material, the cited logbook entry states (PDF p. 120):

Was notified of a shipment of irradiated Cu, Na, and Mg in facilities at S.S. to be received by [name redacted]

Therefore, the material in question did not consist of irradiated fuel elements that likely would have contained transuranic material.

ITEM 21Q. DESOTO FACILITY BUILDING 004 LOG BOOK, c. 1960s (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 125: *Acceptance of irradiated glass from the STIR (SSFL) Program*”

SC&A Discussion/Comments: The cited logbook entry appears to state (PDF pp. 125–126):

Irradiated glass from the S.T.I.R. program was received by [names redacted] for analysis. Radiation survey indicated 1.5 Rem/hr @ surface of the glass. It was removed from Hot Chemistry where it was removed from its cask and transferred to 423-35 for further analysis. There it was placed in an oven for drying after water decon. from there to a glovebox in 423-51 by [name redacted]. It will remain there until further decay.

It appears the material in question certainly represented an external exposure hazard, but no indication of internal exposure potential was observed in either the cited or subsequent logbook entries.

NOTICE: This document has been reviewed to identify and redact any information that is protected by the Privacy Act 5 U.S.C. § 552a and has been cleared for distribution.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 71 of 75
-------------------------------------	----------------------------------	--	-----------------------------

ITEM 21R. DESOTO FACILITY BUILDING 004 LOG BOOK, C. 1960S (NEW DOCUMENT) (DE SOTO 1965–1966)

Petitioner Text (CORE Advocacy 2018, p. 7): “Page 131: Found can of radioactive materials sent from SSFL in 1964, which were ‘lost in the shuffle.’”

SC&A Discussion/Comments: The cited logbook entry appears to state (PDF pp. 131–132):

Discovered a starter can in the salvage yard containing aluminum tubes containing NaK and Li that were sent to D.S. facility from S.S. in 1964, then apparently became lost in the shuffle [sic]. The proper party [name redacted] of HQI was notified - the R/A ICC label which indicated BeO was removed and the Pkg released to be returned to HQI for storage.

It appears the starter can contained beryllium. There is no indication via dose rate measurements or swipe surveys to indicate the material was an internal or external exposure hazard, though the material apparently had an “R/A” label. There is no indication the material would have been contaminated with either thorium or americium.

ITEM 22. VISITOR BADGE “KEY” (NO REFERENCE IDENTIFIED)

Petitioner Text (CORE Advocacy 2018):

SSFL and DeSoto employees routinely have “Visitor Logs” in their personnel records, which reflect occasions of dosimeter issuance and use at Specific Area IV or DeSoto locations. The Visitor Logs use Building Location / Account “Codes” that correspond to each dosimeter badge, and that correlate the badge to a specific location. The codes consist of four digits, sometimes with an added letter. Until recently, it was not possible to decipher the codes to establish where an employee may have been issued a dosimeter.

Boeing supplied a “Key” that can be used to decipher Visitor Log Building Location / Account Codes. When Visitor Logs are compared to the “Key,” we find that the same codes were often used for dosimeter badges at both SSFL Area IV and DeSoto locations; therefore it is not always possible to make a distinction between a dosimeter that was issued (and presumably used) at DeSoto verses SSFL. Moreover, the added letters that are often needed to specify an exact location are frequently missing from the Visitor Logs. For example, an employee’s Visitor Log may indicate a Building Location and Account Code of “6001.” Boeing’s “Key” confirms that “6001” may apply to various SSFL Area IV locations, or various DeSoto locations. Without the added letter, it is not possible to determine exactly where an employee was at the time of dosimeter issuance or use.

Additionally, although Visitor Logs reflect a single date of badge issuance, it does not necessarily mean that the badge was only worn for a single day. The “Key,” worker records, and incident reports confirm that Visitor Badges / dosimeters were issued and worn for daily, weekly, and quarterly periods; sometimes more than one badge was worn; badges were frequently worn interchangeably at either SSFL or DeSoto location(s).

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 72 of 75
-------------------------------------	----------------------------------	--	-----------------------------

SC&A Discussion/Comments: SC&A acknowledges that workers moved freely between the De Soto facility and the SSFL (Area IV) site areas. The appropriate assignment of covered employment areas to claimants under EEOICPA is under the purview of the Department of Labor and thus is beyond the scope of this review.

ITEM 23. FORMER WORKER, [REDACTED], ATOMICS INTERNATIONAL (NEW DOCUMENT) (FORMER WORKER AFFIDAVIT 2018)

Petitioner Text (CORE Advocacy 2018, p. 8): “[Name Redacted], a former [REDACTED] at *Atomics International*, provided an affidavit that may be helpful in our review of information related to *DeSoto Facility and the SEC Petition*. [Name Redacted] is willing to be interviewed and as provided his contact information.”

SC&A Discussion/Comments: One particularly important excerpt from the affidavit stated the following (pp. 1–2):

Radioactive materials shipments went back-and-forth between SSFL and DeSoto, including spent nuclear fuel that would reasonably be expected to contain any radionuclides used or generated at either location. This would include americium, thorium (and its associated progeny). There is no reason to assume that americium or thorium were exclusive to SSFL, with the degree of back-and-forth that was considered to be part of standard operations at the worksites.

[REDACTED] were directed to [REDACTED]. We did not have the time, directive, or a conceivable reason to [REDACTED]. [REDACTED] was used to be all-inclusive, and it was understood by all personnel that anything labeled with [REDACTED] could contain anything.

DeSoto routinely received materials from SSFL, and SSFL routinely received materials from DeSoto. It would be illogical to me, given my knowledge of site operations and my expertise as a [REDACTED], to assume that any radionuclide present at one location would not also be present at the other.

SSFL and DeSoto routinely re-used and re-circulated various types of shipping containers, from drums to lead boxes to “bird cages.” The containers were transported back-and-forth on a regular basis. A “bird cage” is a shipping container that is designed to keep lead containers immobile and to prevent them from being stacked or stored too closely together. We had continuous problems with high-level gamma contamination on bird cages that arrived to Building [REDACTED] from DeSoto Facility.

No indication is given in the original affidavit to indicate that americium was used at De Soto in unencapsulated form, and no specific operations are discussed with relation to thorium processing that might differ from the operations identified in NIOSH 2018. Birdcages contaminated with “*high-level gamma*” would generally be considered an external hazard, which would have been measured via an individual worker’s external dosimeter. There is no information provided to indicate the contaminated birdcages contained transuranic material that represented an internal exposure hazard.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 73 of 75
-------------------------------------	----------------------------------	--	-----------------------------

SC&A, in conjunction with NIOSH and CORE Advocacy for Nuclear & Aerospace Workers, performed a follow-up interview with this EE on November 14, 2018. Notes from the follow-up interview are undergoing classification review and final approval of the interviewee.

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 74 of 75
-------------------------------------	----------------------------------	--	-----------------------------

ATTACHMENT B: RATIONALE FOR ASSUMING REFERENCES TO “SS VAULT” REFER TO A DE SOTO FACILITY

SC&A’s assumption that many of the logbook entries referencing the “SS Vault” actually refer to a De Soto facility is corroborated by the Atomics International technical information document titled *Criteria for the SS Vault Storage (SNAP and Other Fuels)* (Ketzlach 1973b), which identifies the vault at the De Soto facility as “MBA 01” and contains a reference to the “DeSoto SS Vault,” as shown in Figure B-1. The designation of “MBA 01” as well as the “Building 1 SS Vault” also appears in the 1973 document, *Weekly Highlights – Criticality and Nuclear Materials Controls* (Ketzlach 1973a), as shown in Figure B-2.

Figure B-1. Excerpts from *Criteria for the SS Vault Storage (SNAP and Other Fuels)* Referencing the “DeSoto SS Vault” (Ketzlach 1973b, pp. 6 & 8)

Atomics International
North American Rockwell

NO. . TI-652-240-019
PAGE . 6

B. Vault Shelf Storage

Although the vault shelf storage requirements for the SNAP Close-Out, as well as current vault shelf inventories, are relatively small, criteria are presented for the storage of much larger quantities.

1. DeSoto Vault (MBA 01)

a. North and South shelf sections

(1) In the absence of moderation within a 5.0" dia. x 5.6" tall can (or smaller), 10 kg ²³⁵U/ storage location/shelf is safe (in 1 to 4 cans).

Atomics International
North American Rockwell

NO. . TI-652-240-019
PAGE . 8

6. N. Ketzlach, "Nuclear Safety in Vault Storage," AI-TDR-No. 8532 (May 24, 1963)

7. V. J. Schaubert, "DeSoto SS Vault Criticality Operating Criteria," NSA-001-140-003 (November 13, 1970)

Effective Date: 12/7/2018	Revision No. 0 (Draft)	Document No./Description: SCA-TR-2018-SEC006	Page No. 75 of 75
-------------------------------------	----------------------------------	--	-----------------------------

Figure B-2. Excerpt from a North American Rockwell Internal Letter that References the Building 001 SS Vault (MBA 01) (Ketzlach 1973a, p. 1)

Internal Letter		 North American Rockwell	
Date	February 19, 1973	No	
TO	M. E. Remley	FROM	N. Ketzlach
Address	071 778 NB08	Address	071 785 NB11
		Phone	1692
Subject	Weekly Highlights - Criticality and Nuclear Materials Controls		
<u>SNAP CLOSE-OUT</u>			
The SNAP 93% ²³⁵ U enriched chop stock involving 132.4 kg contained ²³⁵ U has been shipped to Y-12 and the associated data package prepared.			
The unirradiated enriched archive samples (643 gm contained ²³⁵ U) at the AIHL have been transferred to the <u>Building 001 SS Vault (MBA 01)</u> for later shipment to scrap recovery or to reprocessing.			
Consolidation of SNAP natural U in the SNAP Fuel Fabrication Area (MBA 06) has begun. Some of it has now been transferred to the <u>Building 001 SS Vault.</u>			