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**ADVISORY BOARD ON
RADIATION AND WORKER HEALTH**

National Institute for Occupational Safety and Health

SC&A DRAFT REVIEW OF ORAUT-RPRT-0080

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ABBREVIATIONS AND ACRONYMS

ABRWH	Advisory Board on Radiation and Worker Health
CATI	computer-assisted telephone interview
CS	Central Shops
DOL	U.S. Department of Labor
EE	energy employee
FP	fission products
GM	geometric mean
GSD	geometric standard deviation
IA	induced activation
$\mu\text{Ci}/\text{cm}^3$	microcurie per cubic centimeter
mR/yr	milliroentgen per year
NBL	Neptunium Billet Line
NIOSH	National Institute for Occupational Safety and Health
Pu	plutonium
PuFF	Plutonium Fuel Form Facility
RWP	Radiation Work Permit
SEC	Special Exposure Cohort
SRDB	Site Research Database
SRS	Savannah River Site
SWP	Safe Work Permit
TLD	thermoluminescent dosimeter

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1.0 INTRODUCTION AND BACKGROUND

Since 2016, the National Institute for Occupational Safety Health (NIOSH) has released a series of reports that are specific to reconstructing neptunium exposures at the Savannah River Site (SRS). The three neptunium reports are as follows:

- ORAUT-RPRT-0065, Revision 00, *An Evaluation of Neptunium Operations at Savannah River Site* (NIOSH 2016a)
- ORAUT-RPRT-0077, Revision 00, *Evaluation of Health Physics Area and Health Physics Department Codes to Identify Neptunium Workers at the Savannah River Site* (NIOSH 2016b)
- ORAUT-RPRT-0080, Revision 00, *Potential Neptunium Exposure to Plutonium Fuel Facility Construction Workers in Building 235-F at the Savannah River Site* (NIOSH 2017; hereafter “RPRT-0080”)

The first report describes the historical production and separation of neptunium materials at SRS, which includes a timeline of operations as well as a discussion of radiological controls directly related to neptunium handling. The second report presents a quantitative comparison of Health Physics Area and Health Physics Department codes that are included in certain formats of SRS external dosimetry records. The purpose of NIOSH’s analysis in the second report was to demonstrate the correlation between the external dosimetry codes used to characterize the general work area and department for workers with elevated internal exposure potential to neptunium. The purpose of this second report was to develop a method to identify other potentially exposed workers for assignment of unmonitored coworker intakes. SC&A delivered its review of these first two reports in March and April 2017 (SC&A 2017a and 2017b, respectively); therefore, those reports and SC&A’s responses will not be discussed further in this document.

The third neptunium report (RPRT-0080) describes the construction of the Plutonium Fuel Form Facility (PuFF) in Building 235-F, which occurred from December 1973 into January 1977. In addition to the historical information related to the construction of the PuFF, RPRT-0080 describes the radiological controls and monitoring techniques in place to protect the construction workers from the neighboring facilities in Building 235-F (notably the Neptunium Billet Line [NBL] and the Uranium Alloy Line). The radiological controls included both passive controls (such as limits on access control and negative airflow from clean areas to controlled areas) and active controls (such as continuous air sampling, routine health physics contamination monitoring, and fixed ambient external dose badges). This report presents SC&A’s review of this third neptunium report (ORAUT-RPRT-0080), which identified three findings and three observations that are discussed in the following sections.

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2.0 SUMMARY OF ORAUT-RPRT-0080 CONCLUSIONS

Section 5.0 of RPRT-0080 contains the summary conclusions about the internal and external exposure potential for construction workers involved in construction of the PuFF. With regard specifically to external exposure, RPRT-0080, Section 5.0 states:

*Because of the radiological controls in place at the NBL and around the construction of the PuFF and the procedures requiring film or TLD badges in areas where potential worker exposures could occur, it is reasonable to assume that construction workers would have been monitored for external radiation exposure either directly if warranted or indirectly through the area monitoring dosimeters. **Therefore, the potential for undocumented external radiation exposures to the PuFF construction workers is very unlikely.*** [page 16; emphasis added]

Specific to internal exposures, RPRT-0080, Section 5.0 states the following:

Internal exposure to PuFF construction workers from airborne contamination from the NBL line and the Alloy Line was unlikely due to routine, consistent air sampling and contamination monitoring....

From the air sample data and site documents obtained and reviewed, there appears very little likelihood that the construction workers building the PuFF facility in Building 235-F between 1973 and 1977 would have received inadvertent, unmonitored internal or external exposures. [page 17; emphasis added]

Underpinning both of the previous statements is the assumption that both a comprehensive and diligent *personnel monitoring* program and a thorough and widespread *area monitoring* program existed. In the case of the former, NIOSH has assumed that all workers who should have been monitored were monitored both internally and externally, and that those records are available for dose reconstruction. In the case of the latter assumption, NIOSH presumed (1) that area monitoring (including ambient external dose monitoring, area contamination surveys, and continuous air sampling) is sufficient to identify any exposure potential and would have triggered appropriate personnel monitoring as required, (2) or that ambient external dose monitoring within Building 235-F would provide a means to assign appropriate external dose to workers who were not directly assigned a dosimeter

Observation 1: Based on the statements in RPRT-0080, Section 5.0, SC&A presumes that NIOSH does not intend to assign any unmonitored coworker intakes or external doses to PuFF construction workers. Therefore, any dose assigned to this subset of construction workers would be based solely on individual monitoring records (where available).

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3.0 DISCUSSION OF AREA RADIOLOGICAL CONTROLS

3.1 ROUTINE CONTAMINATION SURVEYS

As indicated in the previous section and discussed in detail in Section 4.0 of RPRT-0080, daily, weekly, monthly and quarterly survey activities were routinely made by health physics personnel in Building 235-F. Specifically, NIOSH states:

A set of 16 weekly forms including the daily surveys for that week and 2 quarterly forms that included the monthly surveys for those quarters have been acquired for Building 235-F for the period between December 1973 and December 1974.
[NIOSH 2017, page 13]

Appendix A shows an example screenshot of a daily/weekly survey logsheet. The daily routine duties for Building 235-F in 1974 were as follows (Brown 2012):

1. Perform 60 cycle, source & background checks on scalers.
2. Source check all count rate meters for proper operation.
3. Source check all hand and shoe monitors for proper operation.
4. Prepare instruments for return to Calibrations. (Order on 8-4).
5. Survey lunch room. (Clean zone guides.)
6. Survey stepoff pads between regulated and clean zones. (Clean zone guides.)
7. Survey process room exit stepoff pads. (Regulated zone guides.)
8. Survey all cabinet glove ports in use and floors for billet line & Np process rooms and air locks. (Regulated zone guides.)
9. Change routine air samples, per OSR 4-252, 253, count, calculate & record results on Forms OSR 4-251, 252 and 253.
10. Take Radon-Thoron background air sample.

The weekly routine duties for Building 235-F in 1974 were as follows (Brown 2012):

1. Survey glove ports of cabinets not in use and which were not surveyed daily. See items 8 of daily routines. (Regulated zone guides.)
2. Make a smoke check to determine air flow direction at all doors of the Np & billet line process rooms.
3. Survey regulated service corridors and decontamination room. (Regulated zone guides.)
4. Survey regulated Maint & E & I shop. (Regulated zone guides.)
5. Survey regulated toilet. (Clean zone guides.)
6. Take water samples from billet leak testing tanks and send to 772-F for alpha-beta-gamma analysis.

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SC&A reviewed the Brown 2012 reference provided in NIOSH 2017 and concurs that NIOSH obtained only a partial set of daily/weekly survey logsheets.¹ Specifically, a complete set of daily/weekly logsheets is available from December 31, 1973, through March 22, 1974, with five additional daily/weekly logsheets available for 1974 for the weeks beginning April 1, June 24, September 23, September 30, and December 23. This represents only a very small percentage of the time during which the PuFF was constructed (~17 weeks out of ~146 total construction weeks,² or 11% of the total construction time). It is unclear whether additional daily/weekly survey logsheets are available and have not been captured or are currently unavailable for review. SC&A was unable to locate additional routine survey logsheets among the 9,774 documents available in the Site Research Database (SRDB) for SRS. Without further information, it may be inappropriate to extrapolate the results of routine surveys from a relatively short period at the beginning of construction to the remainder of PuFF construction activities.

Furthermore, the routine daily/weekly survey forms note that when contamination is found that is above the clean and regulated control guidelines, the Health Physics department should fill out a “radiation survey logsheet,” which documents the situation and any “unusual conditions” (Brown 2012). SC&A noted that the Brown 2012 reference given in RPRT-0080 included eight “radiation survey logsheets” that document 16 specific Health Physics activities. In each of the eight cases, there was no available daily/weekly survey report covering the relevant date of the unusual conditions. Without a full set of daily/weekly survey reports, it is impossible to know how many such situations occurred during the construction of the PuFF.

Finding 1: The conclusion that routine daily and weekly contamination survey activities restricted all potential radioactive contamination to the prescribed limits is supported by survey documentation that only covers approximately 11% of the total PuFF construction time. It is unknown whether the currently missing daily/weekly survey logs are available and have not been captured or are unavailable.

3.2 AMBIENT EXTERNAL DOSES

Regarding the monitoring of ambient external doses (beyond the contamination smear surveys described in the previous section), Section 4.0 of RPRT-0080 states the following:

Daily, weekly, and monthly control surveys were performed at specified locations in Building 235-F. These were performed to monitor ambient exposure rates....

Areas within the corridors were monitored routinely for ambient exposure rates. It is not certain they entered the PuFF construction area via the corridor outside the NBL facility to report for work. [pages 12, 15; emphasis added]

¹ SC&A counted 17 daily/weekly survey logsheets available in 1974 in the supplied reference (Brown 2012), while NIOSH indicates there were 16. SC&A assumes the discrepancy is the result of partial weeks reported at the start and/or end of the year.

² The total of 146 weeks for construction of the PuFF was calculated assuming a start date of December 1, 1973, an end date of January 31, 1977, with 3 months subtracted for which no construction work took place (March 12, 1976–July 12, 1976).

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This is echoed in DuPont 1966, which states:

*In order to provide a record of potential radiation exposures of personnel who do not wear film badges but could be exposed intermittently to low levels of radiation during their work, **Health Physics shall establish film monitoring stations so that radiation exposures of these people can be estimated. Film from these stations shall be processed, read, and the data permanently recorded at least once a month.*** [PDF page 2; emphasis added]

RPRT-0080 does not make further reference to the temporal availability, location, and magnitude of stationary film monitoring stations in Building 235-F. Nor does RPRT-0080 discuss how such potential information could be used for an individual claimant's dose reconstruction.

Table C-19 of ORAUT-TKBS-0003, Revision 03, *Savannah River Site* (NIOSH 2005), provides a method for estimating ambient external doses based on environmental releases for specific areas (in this case "F Area"). The ambient external doses presented in NIOSH 2005 are derived from a series of environmental monitoring reports that list the average annual penetrating dose for the corners of operating areas of the 200-F Area. However, it is not clear whether these measurements are representative of ambient exposure rates that are physically inside Building 235-F. In addition, there is significant variability among the annual exposure measurements at the operating corners. For example, in 1974 the corner of operating area measurements ranged from 73 milliroentgen per year (mR/yr) to 737.3 mR/yr (DuPont 1975).

Observation 2: RPRT-0080 is not clear about how (or if) stationary film monitoring stations found in Building 235-F will be utilized in individual dose reconstructions for workers who were not directly monitored for external radiation. Ambient exposure rates have been derived in NIOSH 2005 based on annual environmental monitoring, but it is not clear that they are representative of exposures experienced within Building 235-F.

3.3 AVAILABLE AIR MONITORING DATA

Table 2-3 in Section 4.0 of RPRT-0080 (recreated as Table 1 below) compiles available air sampling data during the period of construction of the PuFF at SRS. As seen in the table, the construction area and the clean corridor were monitored via air sampling, along with the pertinent areas of the NBL and Uranium Alloy Line. Not surprisingly, many more air samples were taken in the regulated areas of the NBL and Alloy Line than were taken in the construction area. In addition, the maximum observed air samples were significantly higher in the actual NBL and Alloy areas than surrounding clean areas, which is to be expected.

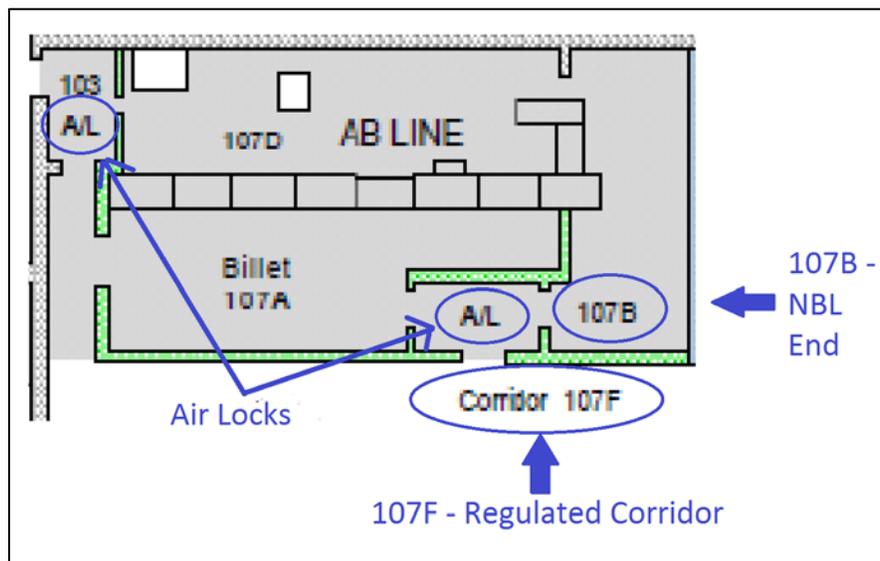
However, the calculated geometric mean (GM) alpha air concentration for the construction area was actually higher than the GM for the 107F – Regulated Corridor, which is directly adjacent to the NBL. In addition, the GM for construction areas was also higher than room 107B – NBL End (end of the NBL). At the calculated 50th percentile, the construction area air samples were numerically the same as the 107F – Regulated Corridor and comparable to the 50th percentile calculated for the 107B – NBL End. Figure 1 shows these two locations.

Observation 3: The calculated geometric mean and 50th percentile values for available air samples in the construction area are comparable and/or bound the calculated air samples from the 107F – Regulated Corridor and the 107B – NBL End locations. These locations are either directly adjacent to the NBL (107F – Regulated Corridor) or inside the airlocks of the NBL (107B – NBL End).

Table 1. Recreation of Table 2-3 from RPRT-0080 (NIOSH 2017) Showing Air Sample Results from 1973 to January 1977

Location	Number of Samples	Maximum ($\mu\text{Ci}/\text{cm}^3 \times 1.0\text{E}-12$)	50th percentile ($\mu\text{Ci}/\text{cm}^3 \times 1.0\text{E}-12$)	95th percentile ($\mu\text{Ci}/\text{cm}^3 \times 1.0\text{E}-12$)	GM ($\mu\text{Ci}/\text{cm}^3 \times 1.0\text{E}-12$)	GSD
Construction Area	101	0.22	-0.045	0.169	0.0322	2.22
Clean Corridor East	729	1.20	-0.054	0.190	0.0384	5.15
107F – Regulated Corridor	1507	1.71	-0.045	0.230	0.0234	5.18
107A – NBL Operations	1004	11.5	-0.029	0.185	0.0422	9.98
107D – NBL Maintenance	953	1.83	-0.021	0.200	0.0381	5.49
107B – NBL End	697	1.10	-0.043	0.200	0.0253	5.65
160 – Alloy Line Operations	1624	10.7	-0.044	0.266	0.0366	4.66
162 – Alloy Line Maintenance	1623	174	-0.039	0.300	0.0928	10.8

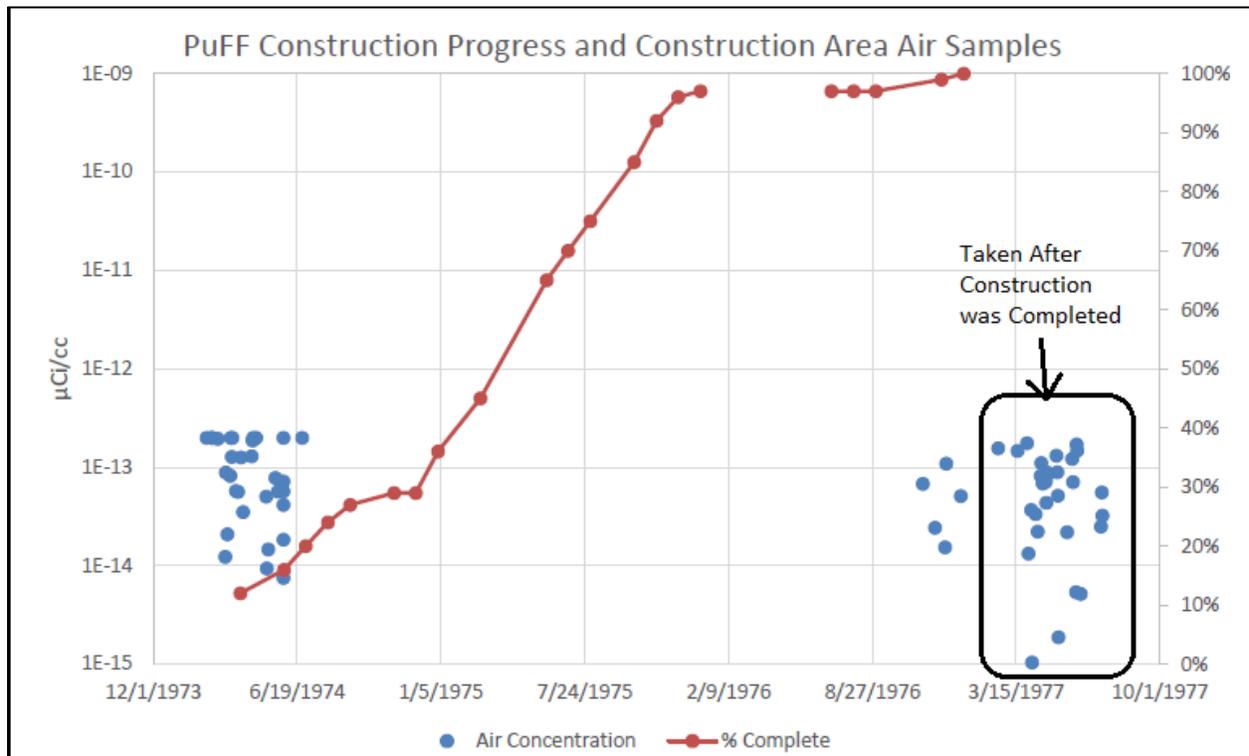
Figure 1. Neptunium Billet Line Area Showing Locations of the Airlocks and Rooms 107B – NBL End and 107F – Regulated Corridor



The air sampling results taken in the construction area by date were plotted in Figure 3-1, Section 4.0, of RPRT-0080 (reproduced below as Figure 2). Also plotted is the percentage of PuFF construction that had been completed at the time of the air sampling. It should be noted that most of the air samples shown to the right of the figure were taken after construction was

complete. Aside from a dozen air samples beginning in November 1976, all of the construction-related air sampling occurred before July 1974, when only 20% of the construction of PuFF had been completed.

Figure 2. Screenshot of Figure 3-1 from RPRT-0080 (NIOSH 2017) Comparing Available Air Sampling to the Construction Progress of PuFF (with SC&A annotation)



Finding 2: A temporal gap in currently available air sampling in the construction area exists from approximately July 1974 to early November 1976. During this temporal gap, more than 75% of the total construction work for the PuFF was performed.

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4.0 INDIVIDUAL MONITORING RECORDS AMONG CLAIMANT CONSTRUCTION WORKERS

To characterize the individual external and internal exposure monitoring for SRS construction workers who could have potentially been involved in the construction of the PuFF, SC&A examined the available monitoring records for construction trade workers who were employed during the period of interest (December 1973–January 1977). Specifically, SC&A attempted to identify available claimants who indicated work in the [REDACTED] (or, more specifically, [REDACTED]). Wherever possible, claimants with short-term and intermittent employment were targeted, as it would be more likely that any mention of work in the area of interest could be attributed to construction of the PuFF as opposed to work in the [REDACTED] facilities during other covered employment periods. While other location and temporal information found in the claim files was noted, it was very difficult to place a given SRS claimant in a specific area during a specific time.

SC&A examined in detail 34 claims with a wide range of construction trade worker job types, such as Carpenters, Painters, Asbestos Workers/Insulators, Concrete Finishers, Ironworkers/Pipefitters/Welders, Electricians, and General/Construction Laborers. Of those 34 claimant computer-assisted telephone interview (CATI) reports:

- 18 mentioned at least some specific work locations in their CATI reports.
- 6 simply stated that they worked all over the site.
- 10 had no knowledge of work location or the CATI was declined.

Of the 34 claimants, 21 had no evidence of potential work in [REDACTED] and so are not discussed further in this report. Ten of the 34 claims described work in [REDACTED], but it was not possible to correlate the [REDACTED] work with the time period of the PuFF construction. These 10 claims are summarized in Appendix B (see Cases 4–13³). As seen in those 10 case descriptions, there is a great deal of uncertainty in trying to establish the connection between available claimant records and actual work locations.

Only [REDACTED] of 34 reviewed claims could be correlated with work in [REDACTED] and/or [REDACTED] during the period of interest with any degree of certainty. The following sections discuss these [REDACTED] claims (Cases 1–3).

4.1 CASE 1

The energy employee (EE) worked as a [REDACTED] from [REDACTED] [REDACTED]. The EE also had covered employment in the [REDACTED] and from [REDACTED]. The U.S. Department of Labor (DOL) case files indicate that the EE was [REDACTED] during the [REDACTED] period and worked as [REDACTED]. The CATI was

³ Case numbers referenced in this report are arbitrarily assigned and do not represent actual claim numbers assigned by NIOSH, the U.S. Department of Energy, or DOL.

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performed with the EE and indicates that they worked [REDACTED] but also specifically mentions Building [REDACTED].

Only an annual dose summary is available in the EE's dosimetry file that does indicate external monitoring in [REDACTED]. Additional external monitoring is not indicated until [REDACTED] in the annual summaries. The EE was not monitored internally until [REDACTED], when a series of uranium samples were submitted for [REDACTED]. No other relevant information was identified.

4.2 CASE 2

The EE worked as a [REDACTED] from [REDACTED], [REDACTED], and again on [REDACTED]. The EE also had covered employment in the [REDACTED]. The CATI was performed with the EE. It directly indicated work in [REDACTED] and the [REDACTED] during [REDACTED]. The CATI described the following incident but did not provide a date:

Once [redacted] was working on adding a new addition. He was working outside the contaminated area. They brought out an old piece of pipe from the contaminated area and had him weld it onto a new piece of pipe. Liquid shot out of the pipe onto his face.

The description of the incident in the CATI indicated that no follow-up internal monitoring occurred as a result of the incident. The CATI also described working in and around [REDACTED] in Building [REDACTED] and indicated that work was done using Radiation Work Permits (RWPs) and Safe Work Permits (SWPs) "in the [REDACTED]." The DOL case files indicate that the EE worked for [REDACTED] during the period of interest.

External dosimetry records provided with the claim indicate that monitoring occurred in [REDACTED] (per the annual summary) and that a [REDACTED] was accrued in [REDACTED]. Internal dosimetry indicates that a [REDACTED] sample was taken on [REDACTED], with the area designated as "[REDACTED]." As SRS internal bioassay results do not generally indicate the reason for the sample, it is not known if the sample was the result of an incident or a planned bioassay based on the EE's work.

4.3 CASE 3

The EE worked as an [REDACTED] from [REDACTED], to [REDACTED]. The DOL case files indicate work with [REDACTED] during this period. The EE also has [REDACTED] other covered employment periods in the [REDACTED]. The CATI was performed with the EE, who indicated work specifically in the [REDACTED] areas during [REDACTED].

Annual summary reports of external dosimetry indicate that external monitoring occurred in [REDACTED]; the cycle dose reports for [REDACTED] indicate [REDACTED] exposures in [REDACTED]. Relevant internal dosimetry included a [REDACTED] taken on [REDACTED], with the area designated as "[REDACTED]." Similar to Case 2, it is not discernable whether the [REDACTED] was the result of a planned SWP/RWP or was the result of an incident. The next internal monitoring result was a [REDACTED] sample for fission products associated with [REDACTED].

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4.4 GENERAL DISCUSSION

Case 1 specifically mentioned Building [REDACTED] (as opposed to the more general “[REDACTED]”) in the CATI report; however, the EE did not provide a timeframe for that work. Though it was clear that the EE was monitored externally during the period of interest ([REDACTED]), no information was available to ascertain *where* the EE might have been monitored. There was no internal monitoring for the claim until [REDACTED]. This represents a case where the EE was able to definitively say he or she worked in [REDACTED]. However, there is no evidence to affirm or deny when such work happened. In such cases where there is no clear evidence of work location, it is the general practice under the auspices of the Energy Employees Occupational Illness Compensation Program Act to reconstruct doses in the most claimant favorable manner. This would generally involve the assignment of coworker intakes.

Cases [REDACTED] both had [REDACTED] results for [REDACTED] during the period of interest, and those results were actually labelled “[REDACTED].” For Case [REDACTED], this [REDACTED] sample appears to have resulted from [REDACTED] the construction work, as the covered employment period ends shortly afterward. For Case [REDACTED], the situation is less clear. Although Case [REDACTED] had a sample at [REDACTED] covered employment in [REDACTED], the EE also [REDACTED] external dose in [REDACTED] that cannot be associated with any particular area of work.

In both [REDACTED] and [REDACTED], it is not possible to determine whether the samples were taken as end-of-work samples (as might be specified in an SWP/RWP) or samples taken as the result of an incident. It is important to note that the topic of compliance with SWP/RWP bioassay requirements at SRS is an upcoming topic of discussion for the SRS and Special Exposure Cohort (SEC) Issues Work Groups.

The 10 additional cases summarized in Appendix B further demonstrate the uncertainty in definitively trying to place a given worker in a site location for the purposes of assigning or denying the application of coworker doses. This is especially true for construction trade workers who may have worked intermittently at the PuFF construction area but were generally dispatched out of other areas, such as the Central Shops.

Finally, SC&A is not aware of any credible way to differentiate workers who may have been doing maintenance in other sections of the F Area versus the subset of construction workers who were specifically in the PuFF area. For example, a worker may indicate he or she worked in F Area but was actually doing maintenance work on the NBL glovebox line instead of work in the PuFF. In such cases, application of unmonitored coworker intakes would clearly be warranted. Although in some instances CATI reports can be informative in establishing work locations, SC&A does not feel the onus should be on the claimant to inform the dose reconstruction process of what specific activities were undertaken and at what times. In cases where uncertainty in work location exists, assignment of coworker intakes should be the default option.

Finding 3: Based on a review of a subset of construction trade worker claim files for SRS during the period of interest (December 1973–January 1977), SC&A feels that there is a considerable amount of uncertainty in trying to credibly place a worker at the PuFF construction operation versus any other location within F Area (let alone at other SRS site areas). Therefore, SC&A

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does not see a credible way to restrict the assignment of unmonitored doses to claims based on work directly associated with PuFF construction.

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5.0 SC&A CONCLUSIONS AND RECOMMENDATIONS

SC&A agrees that there were radiological controls and safeguards in place to limit the spread of contamination, and thus potential exposures to workers involved in the construction of the PuFF, to within acceptable levels. However, SC&A does not agree that the lack of monitoring records for an individual worker indicates that no exposures occurred as was indicated in Section 5.0 of RPRT-0080.

The air sampling and routine contamination survey data presented in RPRT-0080 represent only a fraction of the period covering the construction of the PuFF (Findings 1 and 2). Furthermore, the analysis of air sampling data presented in RPRT-0080 showed comparable levels of alpha activity at the median and 50th percentile for construction areas versus the regulated corridor and NBL End Room (Observation 3).

RPRT-0080 indicates that workers who were not directly monitored for external radiation via film badge or thermoluminescent dosimeter (TLD) would have been monitored via fixed external monitoring stations located within Building 235-F. However, it is not clear how such data are intended to be used in the context of an individual dose reconstruction. In the case of construction trade workers who may have been inside Building 235-F for the construction of the PuFF, it has not been established that ambient environmental exposures developed in NIOSH 2005 are representative and appropriate (Observation 2).

A review of a sample of construction trade worker claim files demonstrated significant uncertainty in establishing the worker's location, job duties, and exposure potential during the period of interest. As a practical matter, SC&A is not aware of a credible method for distinguishing construction trade workers who were involved in construction of the PuFF versus other maintenance activities within the F Area (Finding 3). Thus, it does not seem feasible or appropriate to restrict the assignment of coworker intakes based on involvement in this specific construction activity. Therefore, SC&A recommends that unmonitored external and internal doses should be assigned to all construction trade workers who had the potential to enter the facility.

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6.0 REFERENCES

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APPENDIX A: EXAMPLE OF A DAILY/WEEKLY SURVEY LOGSHEET FOR BUILDING 235-F

Revised 8/73

Ref Radiation Survey Logsheet # _____
Page _____ of _____ pages
Week beginning 11/4/74

**BUILDING 235-F CONTROL SURVEYS
(DAILY AND WEEKLY ROUTINES)**

Initialing the proper space indicates that the routine was completed, the radiation and contamination levels were below established operating guides and no abnormal conditions were observed. (Disc smear survey required for clean zone guides. A P.T. smear survey required for regulated zone guides.)

A radiation survey logsheet number in the proper space indicates the routine was completed and that conditions were not as stated above. The conditions are stated on the radiation survey logsheet under that number. Notify supervision of unusual conditions.

ITEM		SHIFT	DAILY ROUTINES						
			M	T	W	T	F	S	
1.	Perform 60 cycle, source & background checks on scalars.	8-4							
2.	Source check all count rate meters for proper operation.	12-8							
		8-4							
		4-12							
3.	Source check all hand and shoe monitors for proper operation.	8-4							
4.	Prepare instruments for return to Calibrations. (Order on 8-4).	12-8							
		8-4							
		4-12							
		8-4							
5.	Survey lunch room. (Clean zone guides.)	8-4							
6.	Survey stopoff pads between regulated and clean zones. (Clean zone guides.)	12-8							
		8-4							
		4-12							
7.	Survey process room exit stopoff pads. (Regulated zone guides.)	8-4							
8.	Survey all cabinet glove ports in use and floors for billet line & Mp process rooms and air locks. (Regulated zone guides.)	12-8							
		8-4							
		4-12							
9.	Change routine air samples, per OSR 4-252, 253, count, calculate & record results on Forms OSR 4-251, 252 and 253.								
10.	Take Radon-Thoron background air sample.	12-8							
		8-4							
		4-12							

WEEKLY ROUTINES

ITEM	SHIFT	DATE & INITIALS
1. Survey glove ports of cabinets not in use and which were not surveyed daily. See items 8 of daily routines. (Regulated zone guides.)	8-4	11/4/74
2. Make a smoke check to determine air flow direction at all doors of the Mp & billet line process rooms.	8-4	11/5/74
3. Survey regulated service corridors and decontamination room. (Regulated zone guides.)	8-4	11/5/74
4. Survey regulated Maint & E & I shop. (Regulated zone guides.)	8-4	11/6/74
5. Survey regulated toilet. (Clean zone guides.)	8-4	
6. Take water samples from billet leak testing tanks and send to 772-F for alpha-beta-gamma analysis.	8-4	1-6-74

(Filed Weekly)

Daily Survey Shift Log

Weekly Survey Shift Log

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APPENDIX B: [REDACTED IN FULL]

[Appendix B is withheld in its entirety to prevent the disclosure of Privacy Act-protected information.]