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ADVISORY BOARD ON
RADIATION AND WORKER HEALTH

National Institute for Occupational Safety and Health

SC&A'S EVALUATION OF ORAUT-RPRT-0083, REVISION 00, "EVALUATION OF MONITORING OF CONSTRUCTION WORKERS IDENTIFIED IN HIGH-LEVEL CAVE JOB PLANS AT THE SAVANNAH RIVER SITE"

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ABBREVIATIONS AND ACRONYMS

ABRWH	Advisory Board on Radiation and Worker Health
CTW	construction trade worker
dpm/L	disintegrations per minute per liter
HLCs	high-level caves
mrem/y	millirem per year
NIOSH	National Institute for Occupational Safety and Health
ORAU	Oak Ridge Associated Universities
ORAUT	Oak Ridge Associated Universities Team
PRID	Payroll Identification (number)
RPRT	report
SRS	Savannah River Site

1.0 INTRODUCTION AND BACKGROUND

In August 2017, the Advisory Board on Radiation and Worker Health tasked SC&A with a technical review of ORAUT-RPRT-0083, *Evaluation of Monitoring of Construction Workers Identified in High-Level Cave Job Plans at the Savannah River Site*, Revision 00, issued June 27, 2017 (NIOSH 2017, referred to as "RPRT-0083"). In RPRT-0083, the National Institute for Occupational Safety and Health (NIOSH) evaluated if Savannah River Site (SRS) subcontracted construction trade workers (CTWs) were monitored differently from prime contractor (DuPont) CTWs when doing the same types of work during the 1980s. NIOSH concluded that, "*As a result, radiation dose to subcontractor CTWs may be reconstructed using external and routine or event-driven bioassay monitoring data available for the worker, using coworker data, or using a combination of the two*."

This report presents SC&A's evaluation of RPRT-0083.

2.0 OVERVIEW OF ORAUT-RPRT-0083

For evaluation purposes, it is advantageous to provide a brief outline of RPRT-0083, as follows:

- **Introduction (Section 1.0)** – The purpose of the document was to evaluate if SRS subcontracted CTWs were monitored differently from prime contractor CTWs when doing the same types of work during the 1980s.

- **Identification of Workers (Section 2.0)** – The Oak Ridge Associated Universities Team (ORAUT, referred to as the "ORAU Team") obtained job plans and safety permits for the high-level caves (HLCs) in Building 773-A for the period 1980–1986. Table 2-2 (page 9) of RPRT-0083 summarized the total number of workers by year. A total of 397 DuPont CTWs (305 with potential for internal intake) and 650 subcontractor CTWs (350 with potential for internal intake) were identified.

- **Evaluation of CTW External Monitoring (Section 3.0)** – The ORAU Team searched the SRS dosimetry records for the 397 DuPont CTWs and the 650 subcontractor CTWs. Table 3-1 (page 11) of RPRT-0083 summarizes the percent of workers with recorded external monitoring data (monitored at least once during the calendar year). During the period 1980–1986, 99.5% of the DuPont CTWs and 96.8% of the subcontractor CTWs were monitored for external exposure.

- **Evaluation of CTW Internal Monitoring (Section 4.0)** – The ORAU Team reviewed the SRS plutonium bioassay logbooks for each of the workers who were identified as having a potential for exposure to determine if the workers were monitored for internal intake at least once in the year following the potential exposure. The ORAU Team found 255 unique subcontractor CTWs who did not have records of the required bioassay in the allotted time. The ORAU Team randomly selected 110 subcontractor CTWs, resulting in 133 CTW-job pairings (some CTWs worked on multiple jobs). Of these 133 CTW-job pairs, 88 required the use of respirators. The distribution of the crafts involved is illustrated in Figure 4-2 (page 12) of RPRT-0083. The ORAU Team searched the SRS dosimetry databases to determine if the subcontractor CTW-job pairs had records on file

of the required bioassays, per the time schedule as listed on pages 13–14 of RPRT-0083 for the radionuclides involved on the job. Table 4-2 (page 14) of RPRT-0083 summarizes the results; Figure 4-3 (page 15) illustrates the results on a yearly basis. For the period 1980–1986, 59 out of the 88 CTW-job pairs (67%) had the required bioassay within the required time period. Of the 88 CTW-job pairs, 34 subcontractor CTWs were on routine bioassay monitoring during the job plan's work period.

- **Evaluation of Workplace Monitoring (Section 5.0)** – This section indicates that Building 773-A was surveyed and swiped for contamination on routine, defined frequencies. The section provides copies of completed radiation survey logsheets for 1981–1986.

- **Evaluation of Incident Monitoring (Section 6.0)** – The ORAU Team located some subcontractor CTW contamination incidents in the radiation survey logsheets and worker bioassay history records. NIOSH concluded that these documents indicated that the types of work performed and the potential for radiation exposures were similar for both DuPont and subcontractor CTWs. Examples of these incidents are provided on page 22 of RPRT-0083. Examples of documents showing health physic monitoring for subcontractor CTWs are shown on pages 23–26.

- **Conclusions (Section 7.0)** – From its analyses, NIOSH concludes that:

  > *The Team finds subcontractor CTWs were monitored for both external and internal radiation exposure by external dosimetry, bioassay, continuous air monitoring, contamination monitoring, and radiation surveys. Work by subcontractor CTWs was preplanned. Instructions for work and protective measures and clothing were specified in the same manner and on the same forms as work to be by DuPont CTWs…. While some subcontractor CTWs might not have been monitored by bioassay, the report has shown their coworkers were monitored. As a result, radiation dose to subcontractor CTWs may be reconstructed using external and routine or event-driven bioassay monitoring data available for the worker, using coworker data, or using a combination of the two.*

- **Types of Forms (Attachment A)** – This attachment provides examples of various forms used for work involving subcontractor CTWs.

- **Job Descriptions (Attachment B)** – Attachment, Table B-1, lists the descriptions of jobs by selected CTW. Table B-2 lists the job number (a total of 133 CTW-job pairs), job plan date, respirator requirements, alpha and fission product air concentration monitoring results, status of health physics monitoring, plutonium bioassay date, fission products bioassay date, and *in vivo* bioassay date.

3.0 SC&A'S EVALUATION OF ORAUT-RPRT-0083

The following is a summary of SC&A's evaluation of RPRT-0083.

3.1 FINDINGS

SC&A did not identify any specific findings with the methodology and statistical analyses in RPRT-0083.

3.2 OBSERVATIONS

SC&A did identify areas that require clarification or further development. The following observations list these areas than need to be addressed.

Observation 1. The title of RPRT-0083 is *Evaluation of **Monitoring** of Construction Workers Identified in High-Level Cave Job Plans at the Savannah River Site.* [Emphasis added.]

The introduction on page 6 of RPRT-0083 states:

> *This report addresses if Savannah River Site (SRS) subcontracted construction trade workers (CTWs) were **monitored** differently from prime contractor (DuPont) CTWs when doing the same types of work during the 1980s.* [Emphasis added.]

However, the last sentence of the conclusions on page 27 states:

> *As a result, radiation dose to subcontractor CTWs may be reconstructed using external and routine or event-driven bioassay monitoring data available for the worker, **using coworker data**, or using a combination of the two.* [Emphasis added.]

To go from determining the fraction of workers monitored for external and internal exposures to the use of that information for coworker data regarding prime and subcontractor CTWs requires addressing eight basic items:

1. The fraction of prime CTWs externally monitored (badged)
2. The fraction of subcontracted CTWs externally monitored (badged)
3. The external dose distribution for the prime CTWs as a function of time (i.e., mrem/y)
4. The external dose distribution for the subcontractor CTWs as a function of time (i.e., mrem/y)
5. The fraction of prime CTWs monitored for intakes (bioassayed for the appropriate radionuclides)
6. The fraction of subcontractor CTWs monitored for intakes (bioassayed for the appropriate radionuclides)
7. The internal intake distribution for the prime CTWs as a function of time (i.e., dpm/L)

8. The internal intake distribution for the subcontractor CTWs as a function of time (i.e., dpm/L)

This information can then be used in determining if there are sufficient data to create a coworker dose model: either separate models for prime CTWs and subcontractor CTWs, or a combined coworker dose model if the two distributions are similar.

However, RPRT-0083 only addressed Item 1 (fraction of prime CTWs externally monitored), Item 2 (fraction of subcontractor CTWs externally monitored), and Item 6 (fraction of subcontractor CTWs monitored for intakes). The remaining five items were not included in the report. Is additional quantitative information forthcoming to address these five items?

Observation 2. Page 10 of RPRT-0083 states:

> *Using the name, PRID data, and year, the Team searched SRS quarterly external monitoring reports for each worker to determine if the worker was monitored for external radiation at least* ***once during the year****.* [Emphasis added.]

SC&A has the following comment concerning this statement.

Did the ORAU Team consider external monitoring for an individual that occurred anytime within the year of the job plan to be sufficient to be counted as monitored?

It would seem the temporal relationship between the actual job and available external monitoring data is necessary to make a proper connection. External monitoring during the fourth quarter is not relevant to a job done in the first quarter (and vice versa).

Observation 3. Page 13 of RPRT-0083 states:

> *Certain subcontractor CTWs are likely to have been sampled in relation to work in other SRS areas during the same year as the year of the reviewed Job Plan or permit at Building 773-A, or as part of routine bioassay. SRS ran a plantwide bioassay program. Results of bioassay obtained in other areas is still under evaluation for use in reconstructing doses from work in Building 773-A.*

Also, page 22 of RPRT-0083 states:

> *The types of work performed and potential for radiation exposures were similar for both DuPont and subcontractor CTWs.*

SC&A has the following concerns:

1. How can routine, or job-specific, bioassays for different jobs and other areas of the site be applied when radionuclides may be different for different jobs and locations?

2. It should be emphasized that even if it is demonstrated that the type of work and the potential for exposure were similar for the two groups of CTWs, this cannot

automatically be projected to other facilities, work areas, and time periods at SRS without supporting evidence.

4.0 SUMMARY AND CONCLUSIONS

SC&A evaluated RPRT-0083 and had no specific findings with the methodology or statistical analyses. However, SC&A did identify areas that require clarification or further development. These areas are described in the three observations in Section 3.0 of this report.

SC&A would like to emphasize that even if it is demonstrated that the type of work and the potential for exposure were similar for the subcontractor CTWs and the prime CTWs at the HLCs during the period 1980–1986, this cannot automatically be projected to other facilities, work areas, and time periods at SRS without supporting evidence.

5.0 REFERENCES

NIOSH 2017. *Evaluation of Monitoring of Construction Workers Identified in High-Level Cave Job Plans at the Savannah River Site*, ORAUT-RPRT-0083, Revision 00, National Institute for Occupational Safety and Health, Cincinnati, Ohio. June 27, 2017.