

# Key Issues for Dose Reconstruction of Internal Dose for Subcontractors at Savannah River Site

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## Subcontractor Data Completeness

- NIOSH: SC&A's 30/90-day survey did not reflect prescheduled bioassay cycle for actinides.
- Agree, SC&A survey based on stipulated job-specific bioassays at “end of shift” or “end of job.”
- Routine Pu and EU bioassay frequency at 180 days (2/yr); Pu + EU = 22% sample of 248; some identified as “missing” may have been collected at 90–180 days.
- As SC&A noted in its July 2017 report:

*It is also understood that the 30- and 90-day bioassay criteria are “indicators” of RWP compliance and bioassay records completeness, and that later bioassays for potential exposure to longer-lived nuclides such as plutonium and neptunium would be relevant to dose assessment but problematic for subcontractor CTWs, given the intermittent nature of their work on site and common lack of compliance with termination bioassays.*

## Subcontractor Data Completeness (continued)

- However, SC&A believes there are overarching considerations that outweigh results of this limited survey:
  - Westinghouse Savannah River Company (WSRC) self-surveys remain the only representative indicator of job-specific completeness to date (with only the 1997 review apparently based on a complete set of Radiation Work Permits (RWPs)).
  - Missing RWPs (only 13 found, 1982–1995), compounded by shortcomings of available RWPs (disparities, inconsistencies, missing source terms), are much more confounding.
  - NIOSH’s reassessment of SC&A completeness results applying routine prescheduled monitoring data, results from RWP coworkers, and exposure trends combining routine and job-specific sampling, will require careful review – **“typical” work with routine “pre-scheduled” bioassays not necessarily the same as RWP work involving job-specific bioassays.**

## Subcontractor Data Completeness (continued)

- Conclusion: NIOSH 87–90% completeness for subcontractor monitoring vs. SC&A's 66–84% completeness; adjustment for actinides would come closer to 90% on upper range (transiency of subcontractor CTWs notwithstanding).
- However, WSRC 1997 survey of 21% completeness for job-specific bioassays remains most credible (only 13 RWPs/Standing Radiation Work Permits (SRWPs) sampled by SC&A for 1982–1995 vs. 100% surveyed by WSRC for 1997).

# Notice of Violation

- NIOSH position: Disagrees that Notice of Violation (NOV) would “prohibit dose reconstruction of subcontractor construction trades workers.”
- SC&A never made such a conclusion or recommendation. Recommendation from July 2017 report:

*SC&A recommends that the Work Group discuss the implications of these findings [of incompleteness, including that related to the NOV] with NIOSH and determine whether NIOSH has any available monitoring data or bounding approach that could ameliorate this fundamental data gap.*
- From August 24, 2017, presentation by SC&A to Advisory Board:

*[NOV] has important implications for CTW bioassay completion question; NIOSH conducting further investigation.*
- In its recent Work Group presentation, NIOSH reiterated WSRC’s arguments during the 1998 enforcement conference, i.e., strength of program, monitoring of “likely” exposures, and few or no confirmed intakes (for bioassays actually collected or resampled).
- However, from dose reconstruction standpoint, does NIOSH have “any available monitoring data or bounding approach” for those workers lacking job-specific bioassays?

# Use of Subcontractor Internal Monitoring Data in NOCTS

- NIOSH finds that 91% of 371 subcontractor claimants in NOCTS (340/371) have internal monitoring data. From its qualitative review, lack of monitoring appears to be “randomly distributed.”
- However, SC&A believes the key question is the **representativeness** of data:
  - Do the available internal monitoring data (primarily routine) effectively bound the exposures experienced by workers who were monitored only by job-specific bioassay (but whose bioassays are lacking)?
  - What was the actual exposure potential for “off-normal” transient work, and is it relatable to routinely monitored workers and their associated tasks?

# Use of Subcontractor Internal Monitoring Data in NOCTS (continued)

- SC&A concerns about **representativeness** (cont'd):
  - Interviews with former SRS subcontract workers indicate they were brought in to do the “more contaminated work to save the exposure of the onsite CTWs.” (Taulbee memo, 9/29/17 email attachment)
  - Because of the short duration spent on site by many affected workers, such short-term jobs were more likely to be monitored via job-specific bioassay instead of prescheduled routine bioassays (can only be checked for 1997).

# Use of Subcontractor Internal Monitoring Data in NOCTS (continued)

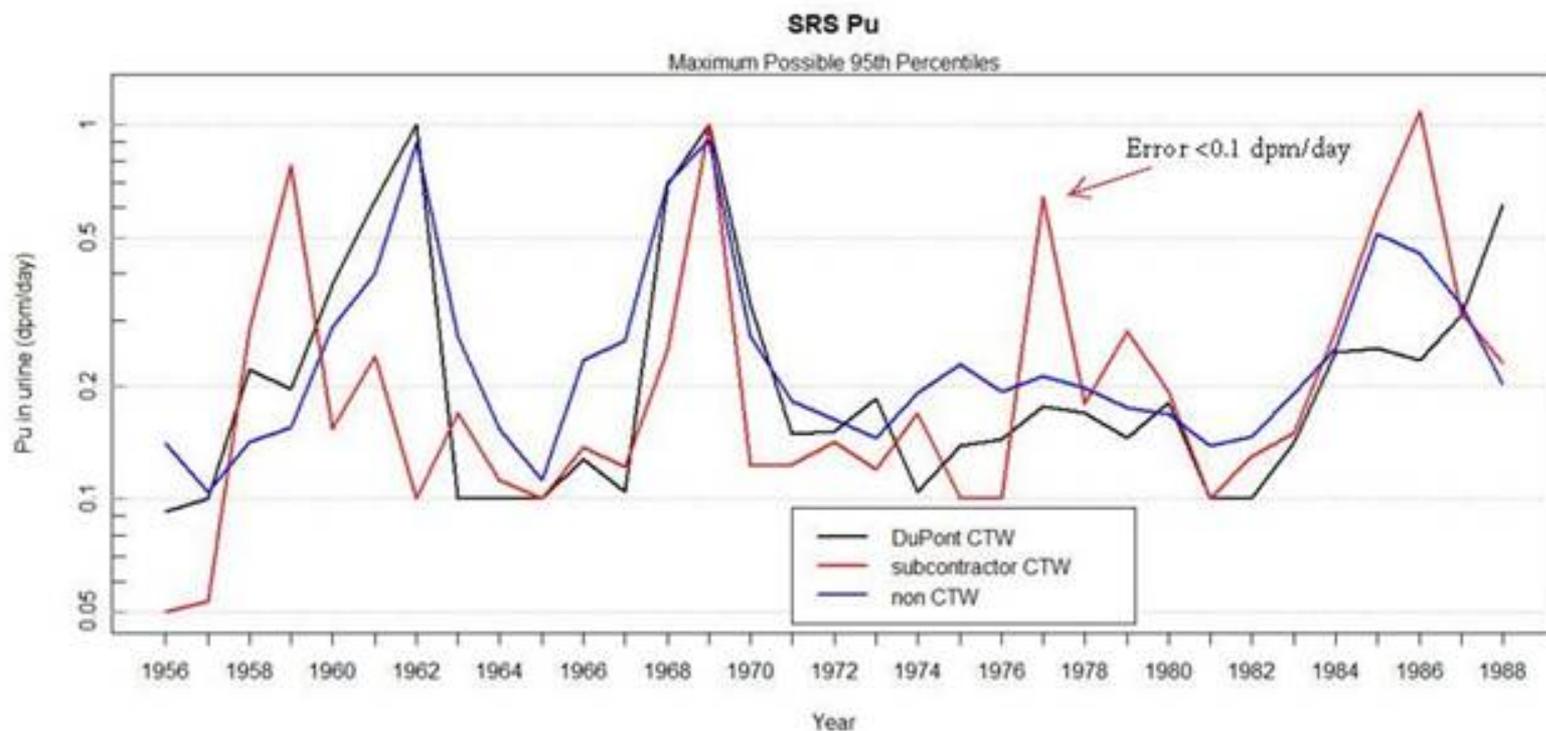
- SC&A concerns about **representativeness** (cont'd):
  - Coworker Criteria (Version 4.1) need to be fully evaluated:

*For routine monitoring programs, a review of the program should be conducted to determine the basis for the selection of program participants. It must be established who was monitored and why they were monitored... In this evaluation there must be some demonstration that the monitored population consisted of: 1) a representative sample of the exposed population, or; 2) the workers with the highest exposure potential. [Neton 2015]*
  - Key Question from above criteria: **What is the class of workers with the highest potential for exposure and are they appropriately represented in the available coworker data?**
  - NIOSH analysis of available NOCTS data for plutonium indicated a factor of 2–5 difference between monitored subcontractors (primarily routine monitoring) and regular construction trade workers during certain years in the late 1970s and 1980s at the 95th percentile (see next slide).
  - Given the completeness issues identified for the job-specific monitoring program, a meaningful numerical comparison between job-specific and routine monitoring for subcontractors may not be possible.

# Is There a Difference between Routine Bioassay Data for DuPont CTW and Subcontractor CTW?

- Question raised by Board members at 8/16/17 Work Group meeting.
- NIOSH response (Taulbee 9/29/17) based on stratification of NOCTS plutonium and tritium bioassay data for DuPont Construction Workers and Subcontractor Construction Workers at the 95th percentile (1956–1988).
- NIOSH conclusion: “there is no systematic difference between DuPont Construction Trades Workers and Subcontractor Construction Trades Workers.”
- However, SC&A pointed out that NIOSH acknowledges exceptions for later 1970s and 1980s, where 95th percentile for Pu is 2–5 times higher for subcontractor CTWs.
- NIOSH response is that 95th percentile excretion rates have little effect on the final coworker model development – that these outlier values would be “smoothed out” in the development of intake values from bioassay data.
- SC&A respectfully disagrees – the identification and analysis of the highest exposed group of workers is important in an SEC context.
- *Note: NIOSH has since identified at least one error in original analysis and is currently revising the stratification comparison utilizing additional logbook data.*

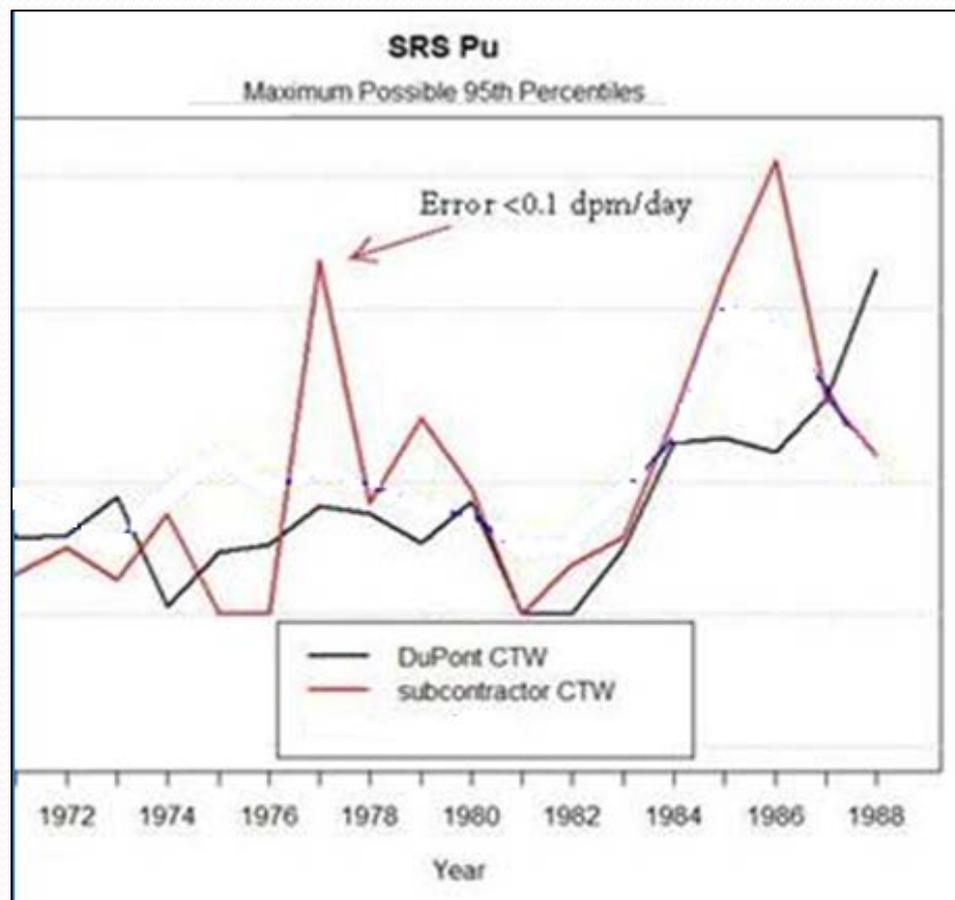
# Is There a Difference between DuPont CTW and Subcontractor CTW Bioassay Data?



Source: Taulbee email 11/4/2017

# Is There a Difference between DuPont CTW and Subcontractor CTW Bioassay Data?

Same chart as the previous slide but focuses on the SEC evaluation period and only DuPont CTWs versus Subcontractor CTWs  
(Note: NIOSH has identified that the 1977 data point is in error)



Source: Taulbee email 11/4/2017

## Is There a Difference between DuPont CTW and Subcontractor CTW Bioassay Data?

*“for most years there is little difference in the 95 percentile urinary excretion between DuPont CTWs and Subcontractor CTWs. The exception appears to be in the later 1970s and 1980s. This observation is somewhat supported by contemporary interviews with subcontractor CTWs. **Subcontractor CTW indicated that they were called in for more contaminated work to save the exposure of the onsite CTWs. For some years (1977–1979 and 1984–1986) this appears to be the case in that the 95th percentile of the subcontractor CTWs is a factor of 2–5 higher.**” [emphasis added]*

- Tim Taulbee, memo to SRS/SEC Work Groups, 9/29/2017

## Responses to Other NIOSH Concerns

- NIOSH: No effect on the coworker model for 1997, as all of the worker data have been collected and evaluated.
- SC&A response:
  - SC&A agrees that job-specific bioassay data are available for 1997, given the complete survey (and resampling) accomplished by WSRC at that time.
  - However, it is not clear whether similar **complete** surveys are available for prior years; lack of available RWPs makes any conclusions difficult for years before 1997.
  - The 1997 coworker model may not be applicable to prior years because the numbers, makeup, jobs, work locations, and exposure potential of workers under RWP job-specific bioassays would not be sufficiently available.
  - The site did not conduct resampling for 1996, based on a judgment that it would not be “cost-effective” given that no internal exposure was expected (1998 DOE Enforcement Conference Summary).

## Responses to Other NIOSH Concerns (continued)

- NIOSH: “DOE acknowledged rigorous radiological control program during enforcement meeting.”
- SC&A response:
  - SC&A is not taking issue with the WSRC radiological control program, though administrative controls (e.g., procedural implementation) were found deficient.
  - SC&A is concerned with the “repetitive” non-participation, at relatively high rates, of WSRC workers in the RWP-prescribed job-specific bioassay program and its implications for dose reconstruction with sufficient accuracy.
  - As DOE emphasized in its enforcement action, “the potential exists to overlook worker exposures to radioactive material due to unrecognized field conditions or other types of personnel error.” DOE further identified a substantial internal exposure that was detected by the retrospective bioassay program, not by the WSRC field indicator program.

## Responses to Other NIOSH Concerns (continued)

- NIOSH: SC&A has not demonstrated that subcontractors were primarily or only monitored via job-specific bioassays that would bias a coworker model.
- SC&A response:
  - Given lack of actual RWPs, it is not feasible to even evaluate who was missed, what work being done, protective measures provided, and overall exposure potential. However, SC&A recommended (via email) to Work Group (cc to NIOSH) on 10/6/17 that makeup of 1997 workers on job-specific bioassays be ascertained (though we can only establish makeup for that year).

## Responses to Other NIOSH Concerns (continued)

- NIOSH: Even if larger percentage of subcontractors used the job-specific bioassay compared to WSRC employees (CTWs or operations), a larger fraction of subcontractor CTWs were monitored via routine bioassay.
- SC&A response:
  - As noted in prior slides, SC&A disputes that NIOSH has demonstrated there is no systematic difference between in-house CTWs and subcontractor CTWs, and typical routine work and RWP work, in terms of exposure potential. NIOSH would need to demonstrate that routinely monitored workers (whether in-house CTWs, subcontractor CTWs, or both) were performing the same work as workers who required job-specific monitoring.

## Responses to Other NIOSH Concerns (continued)

- NIOSH: There is no evidence of a workplace exposure nor an indication that there was a missed intake of radionuclides at SRS.
- SC&A response:
  - NIOSH position mirrors WSRC's unsuccessful rebuttal to DOE in the 1998 enforcement action. DOE emphasized "the potential exists to overlook worker exposures to radioactive material due to unrecognized field conditions or other types of personnel error."
  - Assuming 1997 proportion of missing bioassays is indicative of past practice, there are no means to verify whether transient subcontractor CTWs had intakes. As DOE pointed out, WSRC field indicators, alone, are not sufficient.
  - Examples from SRDB and NOCTS indicate intakes of radioactive material that were not identified by field indicator program.
  - For transient subcontractor CTWs, such missed bioassays may result in missed intakes.

## Conclusions

- WSRC self-surveys are the most valid reviews of job-specific bioassay completeness in the 1990s (21% completeness for 100% sample in 1997); 1997 resampling showed no intakes but does not resolve completeness for earlier years (NIOSH is requesting any earlier surveys). Focus should be on whether a valid coworker model can be developed.
- From NIOSH draft Coworker Criteria (Neton 2015), “representativeness” is a key issue: How relatable are exposures of subcontractors on RWP job-specific bioassays compared to those working under “typical” or general work conditions with prescheduled routine bioassays? NIOSH needs to adequately demonstrate that routinely monitored workers were doing the same jobs or tasks as those solely on job-specific bioassay.

## Conclusions (continued)

- RWPs before 1999 at SRS were neither complete nor consistently applied with respect to job-specific bioassays. Unmonitored intakes may have occurred due to workplace radiological source terms not being properly characterized and included in RWPs. Most RWPs appear to be missing for WSRC 1989–1995; few remain for the DuPont era (past interviews indicate subcontractor records destruction in 1989 during contract transfer).
- SC&A will review NIOSH's evaluation of NOCTS subcontractor CTW data when a dataset is available, but use of prescheduled routine bioassay data for coworker application remains problematic for the reasons stated in this presentation (i.e., may not be representative).

# References

- DOE 1998a. U.S. Department of Energy, Office of Enforcement and Investigation, Enforcement Conference Summary, Bioassay Program Deficiencies, NTS-SR-WSRC-ESH-1997-0001. July 28, 1998.
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- Neton 2015. “Draft Criteria for the Evaluation and Use of Coworker Datasets,” Revision 4.1, James W. Neton, National Institute for Occupational Safety and Health, Cincinnati, OH. February 26, 2015.
- NIOSH 2017. National Institute for Occupational Safety and Health presentations (respective) before the Savannah River Site Work Group of the Advisory Board on Radiation and Worker Health: “Summary of Status and Key Issues, Response to SC&A’s Evaluation of Savannah River Site Subcontractor Bioassay Data Completeness,” and “Subcontractor Internal Monitoring Data in NOCTS,” Hebron, KY. November 2017.
- SC&A 2017a. *Evaluation of Savannah River Site Subcontractor Bioassay Data Completeness*, SCA-TR-2017-SEC009, Revision 0, SC&A, Inc., Arlington, VA. July 2017.
- SC&A 2017b. Presentation before the Advisory Board on Radiation and Worker Health, “Evaluation of Savannah River Site Subcontractor Bioassay Data Completeness,” Santa Fe, NM. August 24, 2017.
- Taulbee 2017a. Tim Taulbee, National Institute for Occupational Safety and Health, memorandum attachment to email to James Melius and Brad Clawson, Advisory Board on Radiation and Worker Health. September 29, 2017.
- Taulbee 2017b. Tim Taulbee, National Institute for Occupational Safety and Health, email memorandum to Brad Clawson, Advisory Board on Radiation and Worker Health. November 4, 2017.