ISSUES RESOLUTION MATRIX FOR ORAUT-OTIB-0034, REVISION 01, "INTERNAL DOSIMETRY COWORKER DATA FOR X-10"

Finding Number	Finding Description	NIOSH Response	Finding Resolution
Rev. 00 Finding 1	**The procedure is not complete in terms of required data.** The document references and uses data and procedures from other documents that need to be known in order to understand the described procedures in OTIB-0034.	**1/9/2009:** NIOSH explained that it is not possible for every NIOSH document to cross-reference every other potentially applicable document, since has proven to be a dynamic process. Additionally, NIOSH/ORAUT has a training program, and everyone on their team knows what protocol is most current and should be used in a given situation.	**6/9/2009:** Based on this explanation, SC&A and the SCPR agreed with NIOSH's response, and the SCPR closed the finding.
Rev. 00 Finding 2	**The procedure points out that "a chronic exposure pattern was assumed." This may not be claimant favorable in many cases at ORNL (X-10), considering the fact that numerous buildings exist on the site where exact dates of operations are not known, and the site depended on area health physicists to determine if in-vivo monitoring should be done. Thus, identification of the workers to apply coworker models to is difficult, if not impossible.** **4/16/2014:** SC&A agrees with the NIOSH response and recommends that the finding be closed.	**8/13/2009:** NIOSH explained that chronic exposures are assumed for all coworker studies in order to account for many small, acute intakes that might have occurred and so that all time periods of site operation are covered. Because the studies are based on an aggregate of all monitored workers rather than individual workers, the derived intakes are an approximation of the total potential for intakes rather than any specific incident. The dose reconstructor reviews all information in an individual's file, including work history, job title, CATI, and external dose history, in order to make an informed professional judgment as to whether a particular nuclide should be assigned from the coworker study. **2/13/2013:** The SCPR tasked SC&A with the review of NIOSH's response.	**4/16/2014:** The SCPR agreed with SC&A's recommendation and closed the finding.

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Rev. 00 Finding 3	**For plutonium Type S, the chronic intake for the entire set of years was fitted to the bioassay data for the last 3 years (1986 through 1988), and all the previous years of much higher values were ignored.** **3/9/2009:** SC&A recommends that the status of issue OTIB-0034-03 be changed to "In Progress." Specifically, SC&A recommends that OTIB-0034 be provided with the same detailed explanation as used in ORAUT-OTIB-0061 (2007), where the same methodology is proposed: For non-systemic (respiratory and GI tract) organs, dose reconstructors should follow these steps: (1) Run the type M intakes. If this action does not result in a POC >50%, then (2) Run the minimizing type S intake. If this action still does not yield a POC >50%, then (3) Manually fit the coworker bioassay data for the time frame of interest for the employee, using the assumption of type S material. By adding these sentences, NIOSH can take care of two issues at the same time: (1) Make clear that the intake values for Type S reported in ORAUT-OTIB-0034 are only to be used as an underestimate of the dose. (2) Use Type S compounds for systemic organs, when it is claimant favorable to assume Type S, instead of Type M. Presently, ORAUT-OTIB-0034 only recommends the use of Type M for the Systemic Organs. OCAS-PER-012 (2007), *Evaluation of Highly Insoluble Plutonium Compounds*, cites X-10 as one of the sites where Type Super S is to be considered, but there is no mention to possible exposures to Type Super S Pu in OTIB-0034. SC&A believes that OTIB-0034 should include Type Super S Pu. Finally, NIOSH should answer why lung-counting data were not used to build the coworker model.	**3/9/2009:** The Type S intake rate is assumed to be an underestimate and can only be applied to compensable cases. Section 5.2, "Dose Assignment," says: "*The calculated intake rates for type M material should be used for all systemic organs and intake periods. For non-systemic (respiratory and GI tracts) organs, the type S intake rate may only be used as an underestimate. If an overestimate or best estimate is needed for non-systemic organs, an individualized fit to the bioassay data, assuming type S material, for the specific work period of the Energy Employee being evaluated must be performed. Table A-3 provides the bioassay data to be used to perform the individualized fit*." **11/20/2013:** SC&A noted that in Revision 01 of OTIB-0034, plutonium modeling was updated to include best estimate intakes for Type S material; 95th percentile intakes were added for all nuclides, and Attachment A data tables expanded to include information on the number of samples and employees used in the statistical analysis. Therefore, it was recommended that the finding be changed from "in abeyance" to "closed."	**2/13/2014:** The SCPR accepted SC&A's recommendation and closed the finding.

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Rev. 00 Finding 4	**The assumed and predicted intake fits versus the values in the first approximately 5 years are much less, and from about 3,800 days to 7,200 days.** The model fit is much higher, indicating that the percentile used for deriving the intake should be greater. This would, in turn, be more claimant favorable. **8/28/2014:** SC&A reevaluated the data and concluded that NIOSH's fit of the early data was appropriate. SC&A recommended closing the finding.	**8/13/2014:** NIOSH stated that it is unclear what is meant by this comment. In the fit to the early data, there are 8 results above the line of fit and 8 points about equally below, which would seem to indicate an adequate fit.	**8/28/2014:** The SCPR accepted SC&A's recommendation and closed the finding.
Rev. 01 Finding 1	**ORAUT-OTIB-0034 fails to mention/address potential exposure to Pu-239 Type SS in its coworker model.** **4/16/2014:** SC&A reviewed Section 5.2 of OTIB-0034, Rev. 02, and found that NIOSH adequately addressed the issue of considering the potential for Type Super S solubility for plutonium and recommended that the finding be closed.	**2/13/2014:** NIOSH indicated that the need to consider Type Super S solubility for plutonium was addressed in Section 5.2 of OTIB-0034, **Rev. 02**, which was published 1/21/2014, shortly after SC&A submitted their review of OTIB-0034, Rev. 01. SCPR tasked SC&A with the review of the Section 5.2 of Rev. 02.	**4/16/2014:** The SCPR found SC&A's recommendation acceptable and closed this finding.
Rev. 01 Finding 2	**Three of the six values for the 95th percentile intake of Pu-239 Type S in Table 5-5 of OTIB-0034 are significantly lower than values derived by SC&A.** **4/16/2014:** SC&A reviewed Table 5-5 of OTIB-0034, Rev. 02, and found that NIOSH had corrected the Type S Pu-239 values and recommended that the finding be closed.	**2/13/2014:** NIOSH stated that the values in Table 5-5 have been corrected and updated as indicated by SC&A in OTIB-0034, **Rev. 02**. SCPR tasked SC&A with the review of OTIB-0034, Table 5-5, Rev. 02.	**4/16/2016:** The SCPR found SC&A's recommendation acceptable and closed this finding.

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Rev. 01 Finding 3	**Guidance for the assignment of the 95th percentile intake values to unmonitored workers is currently inadequate.** Guidance is too vague for consistent interpretation by dose reconstructors to categorize an unmonitored worker as eligible for a 95th percentile intake rate. **4/16/2014:** SC&A reviewed Section 5.0 of OTIB-0034, Rev. 02, and still was not satisfied that the guidance was prescriptive enough.	**2/13/2014:** NIOSH stated that additional guidance on assignment of 95th percentile intake rates has been added to Section 5.0 of OTIB-0034, **Rev. 02.** Therefore, the SCPR tasked SC&A with reviewing the guidance in Section 5.0. **8/28/2014:** After discussion, it was agreed that this finding will be addressed in an implementation guide on coworker modeling that NIOSH is preparing.	**8/28/2014:** The SCPR changed the status of the finding to "In Abeyance," awaiting the issuance of the implementation guide. It should be noted that a draft of the coworker implementation guide has been published and reviewed by the Board. This guide contains the following discussion regarding assignment of 95th percentile dose: "*For workers that are considered to have worked in environments with a potential for elevated exposure, the 95th percentile of the distribution should be used as an upper bound of their exposure during the modeled time period. Although it could be argued that the job categories that fall under this criterion should be listed, any attempt to do so might be artificially restrictive. This decision is most accurately made using the information available in the site profiles, the claimant interview and other documents that might be in the worker's records. For workers who were less likely to be highly exposed and/or were intermittently exposed in the workplace, the full distribution (i.e., the geometric mean and its associated standard distribution if a lognormal fit is used) should be used as representative of their potential for exposure during the modeled period.*" Wording in the draft implementation guide appears to adequately address this finding. However, the SCPR will need to formally close the finding at a future meeting.

Finding Number	Finding Description	NIOSH Response	Finding Resolution
Rev. 01 Finding 4	**NIOSH's assumption of ORNL bioassay data as representative of a full day (24 hours) of urinary excretion is subject to question.** The ORISE/CER urinalyses data show that for all bioassays, the dpm/24-hour activity values are consistently a factor of 10 higher than the dpm/sample values. This relationship would imply a constant sample volume of 140 ml that was analyzed for all nuclides and all personnel monitored. On the assumption that the urinalyses data do not consistently reflect the collection of a quantified 24-hour urine volume from which defined aliquots of samples were taken for analysis, these data must be questioned.	**8/28/2014:** NIOSH reviewed and provided a copy of the data dictionary (SRDB Ref. ID 134695, PDF pp. 12–13), which indicated that the value in the "dpm/24" column in both the "1951 – 1978" and "1979 – 1985" datasets is expressed to one decimal place. Within this format, the integer value expressed as "000000001" is actually the real number value "0.1."	**8/28/2014:** Based on the evidence provided by NIOSH, SC&A and the SCPR agreed that the data represented a 24-hour sample, and the SCPR closed the finding.

CATI = computer-assisted telephone interview; GI = gastrointestinal; ORNL = Oak Ridge National Laboratory; POC = probability of causation; SCPR = Subcommittee for Procedure Reviews; SRDB = Site Research Database