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ADVISORY BOARD ON RADIATION AND WORKER HEALTH

National Institute for Occupational Safety and Health

DRAFT REVIEW OF ORAUT-OTIB-0052, REVISION 1: PARAMETERS TO CONSIDER WHEN PROCESSING CLAIMS FOR CONSTRUCTION TRADE WORKERS

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Disclaimer

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DRAFT REVIEW OF ORAUT-OTIB-0052, REVISION 1: PARAMETERS TO CONSIDER WHEN PROCESSING CLAIMS FOR CONSTRUCTION TRADE WORKERS	Page 2 of 26
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Record of Revisions

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TABLE OF CONTENTS

ABBREVIATIONS AND ACRONYMS

Advisory Board or Board	Advisory Board on Radiation and Worker Health
AMW	All Monitored Workers
CPWR	Center to Protect Workers' Rights
CTW	Construction Trade Worker
DOE	U.S. Department of Energy
EEOICPA	Energy Employees Occupation Illness Compensation Act of 2000
ER	Evaluation Report
HPAREH	Health Protection Annual Radiation Exposure History
INL	Idaho National Laboratory
MUD	Master Update Dump (INL exposure database)
NCW	Non-Construction Worker
NIOSH	National Institute for Occupational Safety and Health
ORAU	Oak Ridge Associated Universities
ORAUT	Oak Ridge Associated Universities Team
OTIB	ORAUT Technical Information Bulletin
PER	Program Evaluation Report
REX	Radiological EXposure (Hanford exposure database)
SC&A	Sanford Cohen and Associates
SEC	Special Exposure Cohort
SRS	Savannah River Site
TBD	Technical Basis Document

EXECUTIVE SUMMARY

On August 31, 2006, the National Institute for Occupational Safety and Health (NIOSH) issued Document No. ORAUT-OTIB-0052, "Parameters to Consider When Processing Claims for Construction Trade Workers" (ORAUT 2006). At the request of the Advisory Board on Radiation and Worker Health (Advisory Board), S. Cohen and Associates (SC&A) undertook a technical review of OTIB-0052, and issued a draft report in July 2007 (SC&A 2007). In this review of OTIB-0052, SC&A identified 16 findings. Subsequent to the SC&A review report being issued, the 16 findings and their potential resolutions were discussed at a series of meetings between the Advisory Board's Subcommittee for Procedures Review, NIOSH, and SC&A. These meetings were held on August 29, 2007; June 24, 2008; July 21, 2008; September 4, 2008; October 19, 2008 (teleconference); and October 14, 2008. In addition, on August 22, 2008, NIOSH provided the Subcommittee and SC&A with proposed changes to OTIB-0052, which were intended to address the 16 findings. During these meetings, 6 of the 16 findings were closed, 3 others were transferred to ORAUT-OTIB-0020 (ORAUT 2008), 1 was determined to be in abeyance, and 6 remained in progress. On February 17, 2011, NIOSH issued ORAUT-OTIB-0052, Revision 1 (ORAUT 2011).

The purpose of this report is to evaluate which findings have been addressed by OTIB-0052, Revision 1, and to provide the Subcommittee with recommendations as to the status of the 16 OTIB-0052 findings. The following table shows the status of the 16 findings that SC&A made against OTIB-0052 prior to Revision 1, the SC&A recommended status of each finding after Revision 1, and the status of other OTIBs that are related to OTIB-0052.

Finding	Status Prior to Revision 1	Recommended Status After Revision 1
OTIB-0052-01:	Transferred to Issue OTIB-0052-16	Transferred to ORAUT-OTIB-0020
OTIB-0052-02:	Closed	Closed
OTIB-0052-03:	Closed	Closed
OTIB-0052-04:	Closed	Closed
OTIB-0052-05:	In Progress	Closed
OTIB-0052-06:	Closed	Closed
OTIB-0052-07:	Closed	Closed
OTIB-0052-08:	Closed	Closed
OTIB-0052-09:	In Progress	Closed
OTIB-0052-10:	In Progress	Closed
OTIB-0052-11:	In Progress	Closed
OTIB-0052-12:	In Abeyance	In Progress
OTIB-0052-13:	In Progress	In Progress
OTIB-0052-14:	In Progress	In Progress
OTIB-0052-15:	Transferred to ORAUT-OTIB-0020	Transferred to ORAUT-OTIB-0020
OTIB-0052-16:	Transferred to ORAUT-OTIB-0020	Transferred to ORAUT-OTIB-0020
OTIB-0020:	Not Applicable	Not Applicable
OTIB-0014-01:	Transferred to ORAUT-OTIB-0052	Transferred to ORAUT-OTIB-0052

Three of the OTIB-0052 findings have been transferred to ORAUT-OTIB-0020 for resolution. An example of the OTIB-0020 recommended change that would result in the closing of Findings OTIB-0052-01, OTIB-0052-15, and OTIB-0052-16 is provided in Section 3.9.

As has been documented in the Subcommittee meeting transcripts, SC&A does not agree with NIOSH that the changes made to OTIB-0052 in Revision 1 sufficiently address the concerns raised in Findings OTIB-0051-13 and OTIB-0052-14. Thus, SC&A recommends that the status of these two findings remain In Progress.

Additionally, the change to OTIB-0052 indicated in the NIOSH Initial Response to Finding OTIB-0052-12 (i.e., that the REX database was used) was not reflected in Revision 1. Thus, SC&A recommends that the status of this finding be changed from In Abeyance to In Progress, until it can be determined whether the REX database was used for the Hanford analysis, and if not, why not.

A finding from the review of ORAUT-OTIB-0014 (ORAUT 2004) was transferred by the Subcommittee to be addressed in OTIB-0052. A review of OTIB-0052, Revision 1 does not indicate that Finding OTIB-0014-01 has been addressed. Thus, SC&A recommends that the status of Finding OTIB-0014-01 be kept as "Transferred."

To resolve Finding OTIB-0052-05, NIOSH placed a limitation on the use of the internal dose reconstruction portions of ORAUT-OTIB-0052. In brief, that limitation indicated that for the recalculation of internal exposures, OTIB-0052 only applied to uranium and plutonium, and that for all other radionuclides, the site technical basis document (TBD) would need to be consulted. SC&A believes that dose reconstructions (or other EEOICPA documents) may have been developed in the past that utilized the OTIB-0052 internal dose recalculation methodology for radionuclides other than uranium and plutonium. SC&A recommends that a Program Evaluation Report (PER) be undertaken to determine what, if any, dose reconstructions and other EEOICPA documents are affected by this newly imposed limitation on the use of OTIB-0052. For example, Section 3.2 identifies the Savannah River Site (SRS) Special Exposure Cohort (SEC) Petition Evaluation Report (ER) as a document that could be affected by OTIB-0052, Revision 1.

Similarly, to resolve Findings OTIB-0052-01, OTIB-0052-15, and OTIB-0052-16, NIOSH placed a restriction on the potential use of ORAUT-OTIB-0052 for certain Construction Trades Workers (CTWs) at the SRS. Although we believe that the workers identified in Revision 1 for this restriction are too specific (i.e., only SRS, only pipefitters, and only for certain time periods), SC&A recommends that a PER be undertaken to determine whether there were any dose reconstructions performed for workers who fall within the NIOSH-specified restrictions, and may need to have their dose reconstructions revised. Alternatively, SC&A would agree with postponing this PER until the Subcommittee, NIOSH, and SC&A can agree on the extent of the potentially restricted CTWs.

1.0 INTRODUCTION

On August 31, 2006, the National Institute for Occupational Safety and Health (NIOSH) issued Document No. ORAUT-OTIB-0052, "Parameters to Consider When Processing Claims for Construction Trade Workers" (ORAUT 2006). At the request of the Advisory Board on Radiation and Worker Health (Advisory Board), S. Cohen and Associates (SC&A) undertook a technical review of OTIB-0052, and issued a draft report in July 2007 (SC&A 2007). In this review of OTIB-0052, SC&A identified 16 findings. Subsequent to the SC&A review report being issued, the 16 findings and their potential resolutions were discussed at a series of meetings between the Advisory Board's Subcommittee for Procedures Review, NIOSH, and SC&A. These meetings were held on August 29, 2007; June 24, 2008; July 21, 2008; September 4, 2008; October 19, 2008 (teleconference); and October 14, 2008. During these meetings, 6 of the 16 findings were closed, 3 others were transferred to ORAUT-OTIB-0020 (ORAUT 2008), 1 was determined to be in abeyance, and 6 remained in progress. On February 17, 2011, NIOSH issued ORAUT-OTIB-0052, Revision 1 (ORAUT 2011).

The purpose of this report is to determine which findings have been addressed by OTIB-0052, Revision 1, and to provide the Subcommittee with recommendations as to the status of the 16 OTIB-0052 findings. Following this introductory section, the report is divided into two sections: Section 2.0 presents a detailed history of the evolution of OTIB-0052 and its associated 16 findings, while Section 3.0 provides SC&A's review of OTIB-0052, Revision 1, and makes recommendations to the Subcommittee as to what status changes are suggested for the 10 outstanding OTIB-0052 findings. Section 3.0 also presents suggested changes to ORAUT-OTIB-0020 that SC&A believes would help to resolve some of the OTIB-0052 findings, as well as a discussion of Finding ORAUT-OTIB-0014-01, which was transferred by the Subcommittee to be resolved under OTIB-0052. In addition, there are two attachments included with this report: Attachment 1 is the ORAUT proposed changes to OTIB-0052 that were provided by NIOSH in response to the discussions held during the July 21, 2008, Procedures Subcommittee meeting. Attachment 2 is an SC&A prepared listing of OTIB-0052 related topics to be discussed during the October 10, 2008, teleconference between some members of the Procedures Subcommittee, NIOSH, and SC&A.

2.0 HISTORY AND BACKGROUND OF ORAUT-OTIB-0052

Since ORAUT-OTIB-0052 was initially issued and reviewed by SC&A, there have been numerous meetings and discussions between the Procedures Subcommittee, NIOSH, and SC&A to attempt to reach a resolution to the findings raised by SC&A. This section presents a brief summary of those meetings and discussions.

2.1 REVISION 0, SC&A REVIEW AND FINDINGS, AND NIOSH RESPONSES

NIOSH issued ORAUT-OTIB-0052, Revision 0, on August 31, 2006. During the September 19–21, 2006 meeting, NIOSH presented a summary of ORAUT-OTIB-0052 to the Advisory Board. At that meeting, the Advisory Board charged SC&A with performing a review of ORAUT-OTIB-0052.

In May 2007, SC&A issued a draft report of our review of ORAUT-OTIB-0052 (SC&A 2007). Although the SC&A report did not explicitly tabulate them, the following 16 findings were identified by SC&A against ORAUT-OTIB-0052 and were documented in the Procedures Issues Tracking database:

Finding No. OTIB-0052-01: Does not address differences in doses received by different construction occupations.

Finding No. OTIB-0052-02: The dose databases used are lacking significant data during the early operational years.

Finding No. OTIB-0052-03: The dose databases do not always identify who were CTWs, and for CTWs, what were their occupations,

Finding No. OTIB-0052-04: NIOSH did not make modifications to the internal dose calculation methodology, as they indicated to Center to Protect Workers' Rights (CPWR) that they would.

Finding No. OTIB-0052-05: Plutonium and/or uranium were used to compare internal CTW to AMW doses. What about other radionuclides?

Finding No. OTIB-0052-06: Does not address how to determine CTW doses at sites that do not have a coworker OTIB.

Finding No. OTIB-0052-07: Does not address how to determine neutron CTW doses.

Finding No. OTIB-0052-08: All SRS external doses are from the HPAREH (Health Protection Annual Radiation Exposure History) database. Needs to evaluate other dose databases, e.g., Fayerweather and SRP-ABST.

Finding No. OTIB-0052-09: Evaluation is based on DOE annual exposure report. Needs to address the MUD dose database for INL.

Finding No. OTIB-0052-10: For post-1974, the ratio of penetrating doses experienced by CTW to other workers in OTIB-0052 does not agree with NIOSH 2005 (INL epidemiological study), which indicates a correction factor closer to 2, and perhaps greater for some job types.

Finding No. OTIB-0052-11: Claimant favorability of OTIB-0052 approach for INL early period internal dose (to 1965) cannot be determined.

Finding No. OTIB-0052-12: The REX dose database was not used. Needs to evaluate results based on the REX database to those given.

Finding No. OTIB-0052-13: The CTW doses need to be compared consistently to either AMW or Non-CTW. Currently, different sections perform different comparisons.

Finding No. OTIB-0052-14: The handling of 'missing dose' needs to be consistent. Currently, some sections include 'missing dose,' while others do not.

Finding No. OTIB-0052-15: No instructions are given as to what to do if high or low cumulative exposures are suspected.

Finding No. OTIB-0052-16: Some construction occupations (e.g., pipefitters) receive exposures larger than the average CTW exposure. The average member of such groups may consistently receive external exposures above the 95th percentile, but possibly not by much. Occupational detail in data not plentiful enough to define percentile value.

NIOSH provided their initial responses to the 16 SC&A findings on August 23, 2007.

2.2 AUGUST 29, 2007, SUBCOMMITTEE MEETING

SC&A presented its ORAUT-OTIB-0052 review findings to the Procedures Review Subcommittee during the August 29, 2007, meeting. Pages 167 through 228 of the August 29th meeting transcript document (ABRWH 2007) the SC&A presentation and the discussion that took place. Although there was much discussion on the SC&A findings, as the length of the transcript indicates, the status of each finding was only changed to In Progress, with none of the findings being resolved. One reason for not resolving the findings was that the NIOSH initial responses had been issued less than a week prior to the meeting, and neither the Subcommittee nor SC&A had had an opportunity to review them.

2.3 JUNE 24, 2008, SUBCOMMITTEE MEETING FINDING DISPOSITION

SC&A reviewed the NIOSH initial responses to the ORAUT-OTIB-0052 findings, and presented our replies and recommendations for finding status changes to the Procedures Subcommittee on (or about) June 20, 2008, prior to the Advisory Board meeting held June 24–26 in St. Louis.

On June 24, during the St. Louis Advisory Board meeting, the Procedures Subcommittee addressed the ORAUT-OTIB-0052 findings, NIOSH initial responses, and SC&A recommendations, and made the following finding status changes:

Finding No. OTIB-0052-01: Transferred to Issue OTIB-0052-16

Finding No. OTIB-0052-02: Closed

Finding No. OTIB-0052-03: Closed

Finding No. OTIB-0052-04: Closed

Finding No. OTIB-0052-05: In Progress

Finding No. OTIB-0052-06: Closed

Finding No. OTIB-0052-07: Closed

Finding No. OTIB-0052-08: Closed

Finding No. OTIB-0052-09: In Progress

Finding No. OTIB-0052-10: In Progress

Finding No. OTIB-0052-11: In Progress

Finding No. OTIB-0052-12: In Abeyance

Finding No. OTIB-0052-13: In Progress

Finding No. OTIB-0052-14: In Progress

Finding No. OTIB-0052-15: Transferred to ORAUT-OTIB-0020

Finding No. OTIB-0052-16: Transferred to ORAUT-OTIB-0020

2.4 JULY 21, 2008, SUBCOMMITTEE MEETING

On July 21, 2008, there was a lengthy discussion of SC&A's reply to NIOSH's initial responses to the six OTIB-0052 findings that were "In Progress" at that time (ABRWH 2008a, pages 34 through 81). The discussion was primarily between Jim Neton (NIOSH), Mel Chow (Chew and Associates), Robert Morris (ORAU), Arjun Makhijani (SC&A), and Steve Marschke (SC&A). At the end of the discussion, NIOSH (Stu Hinnefeld) indicated that they would provide the Procedures Subcommittee and SC&A with their proposed changes to OTIB-0052 resulting from the discussion (see the provided proposed changes below).

2.5 ORAUT PROPOSED CHANGES TO ORAUT-OTIB-0052

On August 22, 2008, NIOSH provided proposed changes to ORAUT-OTIB-0052 that were intended to address the findings that were not closed during the June 24th Subcommittee meeting. Those proposed changes are included in Attachment 1.

On October 10, 2008, a teleconference was held between NIOSH, SC&A, and certain members of the Subcommittee (i.e., Mark Griffon) to discuss portions of the NIOSH-proposed OTIB-0052 changes that SC&A did not fully agree with. No record of this telecom is available; however, the agenda for the teleconference is included in Attachment 2, and the teleconference was discussed during the October 14, 2008, Subcommittee meeting (see below).

2.6 SEPTEMBER 4, 2008, SUBCOMMITTEE MEETING

SC&A provided to the Subcommittee and NIOSH a markup of the ORAUT proposed changes to ORAUT-OTIB-0052, and there was a brief discussion of the SC&A comments (ABRWH 2008b, pages 26 through 41).

2.7 OCTOBER 14, 2008 SUBCOMMITTEE MEETING

During this Subcommittee meeting, there was a rather long discussion regarding the fact that the technical teleconference was held (ABRWH 2008c, pages 16 through 67); however, there was little discussion of any specific finding. At the end of the ORAUT-OTIB-0052 discussion, the status of all of the findings remained unchanged from those given during the June 24th meeting (see Section 2.3).

3.0 REVIEW OF ORAUT-OTIB-0052, REVISION 1

As described in Section 2.3, six of the ORAUT-OTIB-0052 findings were Closed by the Subcommittee during the June 24, 2008, meeting. Those six findings (i.e., OTIB-0052-02, OTIB-0052-03, OTIB-0052-04, OTIB-0052-06, OTIB-0052-07, and OTIB-0052-08) are not addressed in the following review of the ORAUT-OTIB-0052 Revision 1 changes.

3.1 FINDINGS OTIB-0052-01, -15, AND -16

> *Does not address differences in doses received by different construction occupations.*
>
> *No instructions are given as to what to do if high or low cumulative exposures are suspected.*
>
> *Some construction occupations (e.g., pipefitters) receive exposures larger than the average CTW exposure. The average member of such groups may consistently receive external exposures above the 95th percentile, but possibly not by much. Occupational detail in data not plentiful enough to define percentile value.*

As indicated in the ORAUT August 22, 2008, proposed changes (see Attachment 1), new Section 3.1 Limits and Exceptions, was added to ORAUT-OTIB-0052:

> *External dose to SRS pipefitters who were unmonitored and employed for a limited duration between 1972 and 1974 or between 1990 and 1998 may be underestimated slightly. See OTIB-0020 for additional guidance.*

In this new section, the concern was limited to Savannah River Site (SRS) pipefitters between 1972 and 1974 and between 1990 and 1998. As indicated by the following excerpt from the September 4, 2008, Subcommittee transcript (ABRWH 2008b, page 27), SC&A has concerns regarding the narrowness of the first sentence:

> *Mr. Marschke: … we were anticipating a little bit more general wording. This is – this is very specific. It's very specific to Savannah River. It's very specific to pipefitters. And it's very specific to time periods. We were kind of hoping and anticipating a little bit more generic statement…*

SC&A repeated this concern during the October 10, 2008, teleconference, and as Attachment 2 shows, we provided suggested wording for inclusion in a modified ORAUT-OTIB-0020. SC&A was expecting that wording similar to that suggested for OTIB-0020 would also be provided in OTIB-0052, as evidenced by the October 14, 2008, Subcommittee meeting transcript (ABRWH 2008c, page 22):

> *Mr. Marschke: … There was some concern about the exact wording. I think it was general agreement that this was the way we were going to go, but there was some concern that the wording may be changed from what is shown here*

> *presently. And that's one of the things that Jim Neton and NIOSH are working on.*
>
> *Mark, is that your recollection?*
>
> *Member Griffon: Yes. Yes, I think so. …*

Subsequent to our review of OTIB-0052, SC&A prepared a report (SC&A 2010a) that compared the SRS plutonium bioassay results used by NIOSH to develop ORAUT-OTIB-0075 (ORAUT 2009) to the SRS plutonium bioassay results used to develop OTIB-0052. As documented in that report, SC&A's primary concerns were, and remain:

(1) *The OTIB-0052 SRS plutonium bioassay analysis contained no data for CTWs in the 1950s, few in the 1960s, and few in the 1990s. Hence, the OTIB-0052 Pu spreadsheet cannot be used to make statements about relative CTW and NCW plutonium exposure in these periods.*

(2) *There are no job type or work area data in the OTIB-0052 Pu database. SC&A's review of OTIB-0075 has shown that both these parameters are critical in determining relative exposure potential of CTWs and NCWs.*

An additional finding of the SC&A comparison of the OTIB-0052 plutonium bioassay database to the claimant database regarding CTW exposures is:

> *The overall result … that CTW exposures were somewhat lower than NCW based on the OTIB-0052 Pu Spreadsheet for the 1980s does not correspond to the result based on the much larger claimant plutonium database analyzed by SC&A in its review of OTIB-0075. In* [the claimant database] *review, SC&A found that in the 1980s, Pu bioassay results were higher for CTW than for NCW in some work areas (…). This is contrary to the result derived from the OTIB-0052 Pu Spreadsheet.* [SC&A 2010a, page 10]

This additional review further demonstrates that there are likely CTWs who, due to the nature of their jobs and areas and times in which they worked, would have received internal exposures to plutonium, and other radionuclides, which were greater than the exposures received by the site's average NCW.

Since these three findings have been transferred to OTIB-0020, and since OTIB-0020 has not been revised to reflect these findings (see Section 3.9), SC&A recommends that these three findings not be Closed, but instead remain as "Transferred."

3.2 FINDING OTIB-0052-05

> *Plutonium and/or uranium were used to compare internal CTW to AMW doses. What about other radionuclides?*

As indicated in the ORAUT proposed changes of August 22, 2008 (see Attachment 1), new Section 3.1 Limits and Exceptions was added to ORAUT-OTIB-0052. This new paragraph referred the OTIB-0052 user to the site TBD for information regarding the intake of less common radionuclides (i.e., other than uranium or plutonium).

As stated in July 2010 (SC&A 2010b), SC&A "concurred with the suggested changes in Section 3.1 of OTIB-0052, specifically because NIOSH left the door open for site-specific considerations." Those "site-specific considerations" are contained within the proposed revision to OTIB-0020 (see Section 3.9). In brief, for any unmonitored CTW who expresses concern that they may have received higher than average exposures, OTIB-0020 will instruct the dose reconstructor to examine the dose records and consider the workplace conditions, potential source terms, and incident reports, and if necessary, modify the dose reconstruction and/or perform additional research.

When taken in conjunction with the modified cautions NIOSH indicated will be made to OTIB-0020, SC&A believes that this limitation on the use of OTIB-0052 addresses the finding, and recommends that the status of OTIB-0052-05 be changed to Closed.

However, SC&A questions how NIOSH will ensure that the OTIB-0052 internal dose methodology has not been improperly applied in the past when radionuclides other than uranium or plutonium were the primary contributors to the internal exposure. In brief, will there be a Program Evaluation Report (PER) or PER-like review to determine the impact, if any, of this limitation on previous dose reconstructions and other documents produced by NIOSH?

For example, the SRS Special Exposure Cohort (SEC) Petition Evaluation Report (ER) states first that, "tritium produced most of the personnel exposure from internal deposition" (NIOSH 2008, Section 5.2.1, page 27) and second that the "guidance of ORAUT-OTIB-0052 is to determine internal dose of construction workers using the same method applied to all other SRS workers" (NIOSH 2008, Section 7.1.2, page 57). In light of the new limitation NIOSH has imposed on the use of the OTIB-0052 internal methodology, SC&A would expect that some justification would be required prior to using the OTIB-0052 methodology for recalculating internal exposures, due to tritium and the other radionuclides discussed in Sections 7.1.1.4 through 7.1.1.11 of the ER, or alternatively, a methodology other than that provided in OTIB-0052 may be necessary to recalculate the internal exposures due to tritium and the other radionuclides.

3.3 FINDING OTIB-0052-09

Evaluation is based on DOE annual exposure report. Needs to address the MUD dose database for INL.

As indicated in the ORAUT proposed changes of August 22, 2008 (see Attachment 1), a new paragraph has been added to Section 5.13 that explains why the MUD dose database was not used.

SC&A agrees with this change, and recommends that Finding OTIB-0052-09 be Closed.

3.4 FINDING OTIB-0052-10

> *For post-1974, the ratio of penetrating doses experienced by CTW to other workers in OTIB-0052 does not agree with NIOSH 2005 (INL epidemiological study), which indicates a correction factor closer to 2, and perhaps greater for some job types.*

As indicated in the ORAUT proposed changes of August 22, 2008 (see Attachment 1), a new paragraph has been added to Section 5.13 that explains that the NIOSH 2005 data were not used, because the service workers are grouped with CTWs, a practice that is inconsistent with the approach taken in OTIB-0052.

SC&A agrees with this change, and recommends that Finding OTIB-0052-10 be Closed.

3.5 FINDING OTIB-0052-11

> *Claimant favorability of OTIB-0052 approach for INL early period internal dose (to 1965) cannot be determined.*

As indicated in the ORAUT proposed changes of August 22, 2008 (see Attachment 1), the second paragraph of Section 5.14 was modified. Much of the basis for Finding OTIB-0052-11 was based on data obtained from NIOSH 2005. As indicated in the response to Finding OTIB-0052-10, the NIOSH 2005 database contains service worker data, as well as CTW data, making it inconsistent with the approach taken in OTIB-0052.

Thus, SC&A agrees with the NIOSH approach, and recommends that Finding OTIB-0052-11 be Closed.

3.6 FINDING OTIB-0052-12

> *The REX dose database was not used. Needs to evaluate results based on the REX database to those given.*

In their Initial Response to Finding OTIB-0052-12, NIOSH indicated that:

> *The data used for the Hanford analysis was extracted by the site expert (Mr. Bihl) from the REX database and provided to the OTIB-0052 team as spreadsheet files. The identity of the source database was not communicated in the text of OTIB-0052. Any subsequent revision will correct this oversight.*

Based on that Initial Response, the status of Finding OTIB-0052-12 was changed to In Abeyance during the June 24, 2008, Procedures Subcommittee meeting.

In the ORAUT proposed changes of August 22, 2008 (see Attachment 1), the information from the Initial Response was not incorporated. Rather, Section 6.1 was modified to attempt to justify

not using the REX database. As we indicated during the October 10, 2008, teleconference, SC&A does not agree with that justification.

Until NIOSH determines whether the REX database was or was not used for the OTIB-0052 Hanford analysis, SC&A recommends that Finding OTIB-0052-12 be changed from In Abeyance to In Progress.

3.7 FINDING OTIB-0052-13

> *The CTW doses need to be compared consistently to either AMW or Non-CTW. Currently, different sections perform different comparisons.*

As indicated in the ORAUT proposed changes of August 22, 2008 (see Attachment 1), the second paragraph of Section 4.0 was modified to address Finding OTIB-0052-13. In essence, NIOSH does not disagree with the finding, but justifies not making any changes to OTIB-0052 because the impacts of the finding are negligible. This was discussed during the September 4, 2008, Subcommittee meeting (ABRWH 2008b, page 31):

> *Mr. Chew: I think you want us to define what negligible is.*
> …
> *Mr Morris: … that's 1.2 for the threshold of adjustment.*
> …
> *Dr. Makhijani: … So I'm just wondering why the threshold is 20 percent. That seems rather high.*
> …
> *Dr. Neton: Yeah, I'd suggest that, you know, we haven't had time to look through these comments that you're presenting here, and it's probably not productive to engage in some – some real time discussion here. Rather maybe we should just hear these out and ask for clarifications as we go and – and move from here.*

Neglecting whether 20% is an appropriate definition of negligible, the fact remains that NIOSH has not provided any analysis to demonstrate that the inconsistent comparisons that were performed (i.e., sometimes to AMW and other times to Non-CTW) result in less than 20% difference in the results. Also, it's not clear whether the 20% cutoff applies to the combination from all factors, or is applied to each individual factor. For example, NIOSH used the same negligibility argument to not make any changes as a result of Finding OTIB-0052-14. Does this mean that the combined effect of Findings OTIB-0052-13 and -14 is less than 20%, or is their combined effect less than 40%?

SC&A does not believe that NIOSH has responded to this concern, and therefore recommends that the status of Finding OTIB-0052-13 remain In Progress.

3.8 FINDING OTIB-0052-14

> *The handling of 'missing dose' needs to be consistent. Currently, some sections include 'missing dose' while others do not.*

For the reasons described in Section 3.7 for Finding OTIB-0052-13, SC&A does not believe that NIOSH has responded to this concern, and therefore recommends that the status of Finding OTIB-0052-14 remain In Progress.

3.9 ORAUT-OTIB-0020

As discussed in Section 3.1, SC&A was anticipating that ORAUT-OTIB-0020 would be modified in order to address Findings OTIB-0052-01, -15, and -16. A suggested revision to the current OTIB-0020, Section 4.0, is shown below:

> *Some workers are concerned that their dose records are not accurate because they were encouraged or instructed by a supervisor not to wear their badges (dosimeters), or they were not given badges while doing jobs that could have resulted in exposures sufficient to exceed an administrative or regulatory dose limit, or they were unmonitored and worked in construction trades that may have received higher than average exposures (e.g., pipefitters). If ~~this concern is~~ any of these concerns are expressed by a claimant verbally in an interview or in written correspondence, the dose reconstructor should try to determine if this could have happened by examining the dose records and considering the workplace conditions, potential source terms, and incident reports . In cases in which the dose reconstructor believes this could have happened, it might be necessary to modify the dose reconstruction and/or perform additional research.*

During the July 21, 2008, Procedures Subcommittee meeting, it appeared that NIOSH agreed that a change (similar to the above) would be made to OTIB-0020 to address Findings OTIB-0052-01, OTIB-0052-15, and OTIB-0052-16 (ABRWH 2008a, page 74):

> *DR. NETON: Let me chime in here. It seems to me that the recommendation here would not be that hard for us to implement. I mean, the way I read this it basically says that we would put a statement in TIB-0020 alerting people that there may be certain classes of workers who could have higher exposures that we need to consider. And that's all it really says here.*
>
> *MR. MARSCHKE (by Telephone): That's all we're looking for.*
> …
>
> *MR. CHEW (by Telephone): Jim, are you recommending that we put that in -0052 or go to -0020?*
>
> *DR. NETON: This would go into -0020. I don't have a particular problem with putting some additional guidance language in there to make sure that something doesn't fall through the cracks is really what this is trying to accomplish.*

Since Findings OTIB-0052-01, OTIB-0052-15, and OTIB-0052-16 have been transferred to OTIB-0020, and since OTIB-0020 has not been revised to reflect these findings, SC&A recommends that these three findings not be Closed, but instead remain as "Transferred."

3.10 ORAUT-OTIB-0014, FINDING OTIB-0014-01

Particular care must be taken when assigning a construction worker to a given category of exposures due to the highly diverse nature of the exposures that some construction workers experienced.

The purpose of ORAUT-OTIB-0014 is to provide guidance to dose reconstructors on (1) when they can assign environmental internal doses, rather than potential workplace exposures to workers, and (2) the methodology for assigning such doses. The above finding was developed during the review of ORAUT-OTIB-0014. Since this finding is related to the determination of CTW dose reconstruction, the Subcommittee transferred Finding OTIB-0014-01 to OTIB-0052 during their November 7, 2007, meeting.

Since ORAUT-OTIB-0052, Revision 1, does not make any statement as to what, if any, particular care should be taken when reconstructing CTW doses utilizing OTIB-0014, SC&A recommends that this finding not be Closed, but instead remain as "Transferred."

REFERENCES

ABRWH 2007. *The Verbatim Transcript of the Working Group Meeting of the Advisory Board on Radiation and Worker Health Held in Cincinnati, Ohio on August 29, 2007*, Advisory Board on Radiation and Worker Health.

ABRWH 2008a. *The Verbatim Transcript of the Working Group Meeting of the Advisory Board on Radiation and Worker Health Held in Cincinnati, Ohio, on July 21, 2008*, Advisory Board on Radiation and Worker Health.

ABRWH 2008b. *The Verbatim Transcript of the Working Group Meeting of the Advisory Board on Radiation and Worker Health Held in Redondo Beach, California, on September 4, 2008*, Advisory Board on Radiation and Worker Health.

ABRWH 2008c. *The Advisory Board Workgroup Convened in the Frankfort Room of the Cincinnati Airport Marriott, Cincinnati, Ohio at 10:00 a.m., Wanda Munn, Working Group Chair, Presiding*, Advisory Board on Radiation and Worker Health.

NIOSH 2005. *An Epidemiologic Study of Mortality and Radiation-Related Risk of Cancer Among Workers at the Idaho National Engineering and Environmental Laboratory, a U.S. Department of Energy Facility*, HHS Publication No. 2005-131. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Division of Surveillance, Hazard Evaluations, and Field Studies, January.

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ORAUT 2004. *Assignment of Environmental Internal Doses for Employees Not Exposed to Airborne Radionuclides in the Workplace*, ORAUT-OTIB-0014, Rev. 00, Oak Ridge Associated Universities Team, Cincinnati, Ohio. June 22, 2004.

ORAUT 2006. *Parameters to Consider When Processing Claims for Construction Trade Workers*, ORAUT-OTIB-0052, Rev. 00, Oak Ridge Associated Universities Team, Cincinnati, Ohio. August 31, 2006.

ORAUT 2008. *Use of Coworker Dosimetry Data for External Dose Assignment*, ORAUT-OTIB-0020, Rev. 02, Oak Ridge Associated Universities Team, Cincinnati, Ohio. December 4, 2008.

ORAUT 2009. *Use of Claimant Datasets for Coworker Modeling*, ORAUT-OTIB-0075, Rev. 00, Oak Ridge Associated Universities Team, Cincinnati, Ohio. May 25, 2009.

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SC&A 2010a. *Comparison of ORAUT-OTIB-0052 Plutonium Data for Construction and Non-Construction Workers and the Implications for Coworker Models at Savannah River Site*, SC&A, Inc., Vienna, Virginia, and Saliant, Inc., Jefferson, Maryland. April 14, 2010.

SC&A 2010b. *SC&A Conclusions Regarding Savannah River Site Work Group ORAUT-OTIB-0052 Internal Dose Methodology for Less Common Radionuclides*, Memo to SRS Work Group, SC&A, Inc., Vienna, Virginia, and Saliant, Inc., Jefferson, Maryland. July 10, 2010.

ATTACHMENT 1: AUGUST 22, 2008, DRAFT – ORAUT PROPOSED CHANGES TO ORAUT-OTIB-0052

Several editorial changes to OTIB-0052 are necessary to close findings discussed in the July 21, 2008 Work Group on Procedures. The proposed changes are shown here. They have not been reviewed or approved.

The following is inserted as section 3.1 in response to Finding OTIB-0052-05

LIMITATIONS AND EXCEPTIONS

Analysis and recommendations in this document are based on data that were readily available, and abundant enough to enable statistically significant comparisons. Consequently there may be unusual cases in which the recommendations of this document do not apply. Intakes of less common radionuclides, those other than uranium or plutonium, are not assessed. Refer to the site technical basis document for information regarding less common radionuclides.

External dose to SRS pipefitters who were unmonitored and employed for a limited duration between 1972 and 1974 or between 1990 and 1998 may be underestimated slightly. See OTIB-0020 for additional guidance.

The following is a modification to the second paragraph of section 4.0 in response to Findings OTIB-0052-13 and OTIB-0052-14

The quality, usability, and accessibility of the data varied, making a standardized comparison among sites difficult. For example, some data are available in a modern database as official records while others are available only as summaries in centralized compilations. Some data have rigorously characterized parametric descriptions, while others are described only by a mean value. At some sites the AMW group includes the CTWs and at others it does not. Some site comparisons are made using data that have been corrected for external missed dose, while others are made without that correction. The analysis method was appropriately adapted to the differences in data, but in all cases the comparisons are consistent within each particular site. The outcome of a specific comparison may have been affected by these differences, but only negligibly in context of the threshold for adjustment described in Section 4.2.

The following is added after the second paragraph of section 4.0 in response to Finding OTIB-0052-08

The usefulness of data from other sources besides HPAREH was evaluated. The Fayerweather (NEED REF) database contains some data prior to 1960 that are not in HPAREH. SC&A compared reconstructed doses using the HPAREH and Fayerweather data and concluded that the average and 95th-percentile doses are higher when the HPAREH data are used. (SC&A 2007) This provides assurance that the workers contained in the Fayerweather database are adequately represented by those in the HPAREH database and the analysis is favorable to the CTW claimant.

The following is add after the first paragraph of section 5.13 in response to Findings OTIB-0052-09 and OTIB-0052-10

Data presented in NIOSH (2005) were considered for comparison but rejected because they include data on civilian employees of the Naval Reactor Facilities who are not covered by EEIOCPA. Also confounding that data is the fact that service workers are grouped with CTW, a practice which is inconsistent with the definition of CTW used in this document.

The following is a modification to the second paragraph of section 5.14 in response to Finding OTIB-0052-11

Data for internal exposures for workers at the INL was not available in a validated electronic format. However, Horan and Braun's (1993) report briefly discusses non-penetrating and internal exposures, and indicates that they were traditionally negligible: "Non-penetrating radiation exposure to the skin from soft X-rays or Beta particles were also not included along with irradiation by internally deposited radionuclides since historically they have been extremely rare events and as a result a very minor contributor to the effective dose." No comparison of CTW and AMW internal dose or non-penetrating dose is presented. Nevertheless general guidance for internal dose reconstruction developed in this document also applies to unmonitored CTWs at INL.

The following is a revision of section 6.1 in response to Finding OTIB-0052-12. The changes are highlighted in red

The data were extracted from various sources including a scientific paper (Keene 1960), a series of annual reports based on AEC Form 190 (Foster 1959–1973), a series of letter reports (Annual Radiation Exposure Summary to USAEC from the Manager, Radiation Protection, Hanford Laboratory), the annual summary reports of radiation exposures (see Summary Annual Reports in the References Section), the REMS database (DOE 2006), and a Hanford coworker study of external dose (ORAUT 2005e).

The data from Keene (1960) for the period from 1944 through 1959 consists of the fourteen job categories that have the highest accumulated dose for that time period. Five of the job categories are assumed to represent CTWs. The number of workers, the average service in years, and the average dose is provided for each job category. From these data, average doses per year are calculated for CTWs and AMWs.

From 1960 through 1972 the data come from letters, required by AEC Order, summarizing the site annual dose data (Foster et al. 1959–1973). The reports generally present the annual dose in ranges (e.g., 0–1 rem, 1–2 rem, etc.). In those instances, the value of the midpoint of each range was used to calculate the average dose.

No annual report was located for 1973.

From 1974 through 1990 the data were extracted from the *Annual Report, Radiation Exposures for DOE and DOE Contractor Employees*

For the period from 1991 through 2005 the doses for the CTWs and AMWs are determined using the REMS database (DOE 2006). The annual collective penetrating dose is determined by subtracting the collective committed effective dose equivalent (if any) from the collective total effective dose equivalent (person-mrem). The average penetrating dose is determined by dividing the annual dose by the number of workers with measured dose. For the CTWs, the annual dose is determined by summing the annual

doses for the REMS "Construction" and "Laborer" labor categories. The workers in the REMS "Laborers" category are segregated by the reporting organizations. The annual doses reported by the organizations that are not the M&O contractor are summed and added to the annual dose for the REMS "Construction" category. Doses in the range less than 100 mrem are not included. This eliminates most visitors and administrative personnel from the REMS data. The average annual dose for CTWs is determined by dividing the annual dose for the "Laborers" and the "Construction" categories by the number of workers in those categories with measurable dose. For AMWs, the average annual dose is determined by summing the annual doses in the REMS "All" category (i.e., management, scientists, service, etc.) and dividing that sum by the sum of workers who had measured dose in the "All" category.

Use of data from the REX database was considered and rejected. The site expert cautioned that prior to 1965 the database contains no information that would differentiate CTW from General Electric employees.

The following is added to the end of section 7.0 in response to Finding OTIB-0052-11

More accurate dose reconstructions are possible at sites with abundant dosimetry data. At sites lacking data, dose reconstruction methods tend to produce higher, bounding doses and tend to be more favorable to the claimant. Application of the guidance in this document along with the site-specific guidance available in technical basis document results in dose reconstructions that are favorable to the unmonitored CTW claimant.

The following references were added or modified

Foster, R. F., A. R. Keene, K. R. Heid, C. M. Unruh, and H. V. Larson, 1959–1973, "Hanford Annual Radiation Summary Letter Reports." [SRDB Ref ID: 26116]

NIOSH (National Institutes for Occupational Safety and Health), 2005, *An Epidemiologic Study of Mortality and Radiation-Related Risk of Cancer Among Workers at the Idaho National Engineering and Environmental Laboratory, a U.S. Department of Energy Facility*, HHS (NIOSH) Publication No. 2005-131, U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Division of Surveillance, Hazard Evaluations, and Field Studies, January. [SRDB Ref ID: xxxxx]

ORAUT (Oak Ridge Associated Universities Team), 2005g, *Use of Coworker Dosimetry Data for External Dose*, ORAUT-OTIB-0020, Rev. 01, Oak Ridge, Tennessee, October 07

Fayerweather [TBD]

SC&A (S. Cohen & Associates) 2007, Review of ORATT-OTIB-0052, *Parameters to Consider when Processing Claims for Construction Trade Workers*, SCA-TR-TASK3-0004, DRAFT July 30. [SRDB Ref ID xxxxxx]

The following is added to the publication record at the beginning of the document.

The Advisory Board tasked SC&A to review OTIB-0052 Rev. 00 PC-0. A draft report and sixteen findings were produced. Eight findings were closed after discussion in the Procedures Review Working Group, three were transferred to another Working Group, and five ("in abeyance") are closed by this

revision. These changes clarify the basis for certain assumptions and provide cautions regarding the limitations of the available data.

[Details TBD]

This revision does not result in an increase of dose and no PER is required. Training required: As determined by the Task Manager. Initiated by John M. Byrne. Approval:

ATTACHMENT 2: TOPICS FOR OCTOBER 10, 2008 TELECONFERENCE

Three areas of the NIOSH proposed changes to OTIB-52 that SC&A wants to discuss:

(1) *External dose to SRS pipefitters who were unmonitored and employed for a limited duration between 1972 and 1974 or between 1990 and 1998 may be underestimated slightly. See OTIB-0020 for additional guidance.*

This statement is more general than we were looking for.

Instead of modifying OTIB-0052 to address this concern, the modification should be made to OTIB-0020. The following was taken from OTIB-0020, and modified as indicated:

Some workers are concerned that their dose records are not accurate because they were encouraged or instructed by a supervisor not to wear their badges (dosimeters), or they were not given badges while doing jobs that could have resulted in exposures sufficient to exceed an administrative or regulatory dose limit, *or they were unmonitored and worked in construction trades that may have received higher than average exposures (e.g., pipefitters).* If *any of these concerns are* expressed by a claimant verbally in the CATI [computer assisted telephone interview] interview or in written correspondence, the dose reconstructor should try to determine if this could have happened by examining the dose records and considering the workplace conditions, potential source terms, and incident reports. In cases in which the dose reconstructor believes this could have happened, it may be necessary to modify the dose reconstruction and/or perform additional research.

(2) *The outcome of a specific comparison may have been affected by these differences, but only negligibly in context of the threshold for adjustment described in Section 4.2*

I don't think you can simply state that the effect is negligible; I think that you need to provide some support for that statement. SC&A tried to support the statement, first, generically, but when that failed, we used an example with some made-up numbers. Our results showed that the two methods for determining the CTW dose ratio could modify the correction factor upwards by up to ~0.1. Whether or not 10% is negligible is up to the WG to decide. Also, there may be better ways to quantify the difference between the two methods for calculating the CTW dose ratio than the examples that I used.

When we started to discussed this at Redondo Beach, it was pointed out that up to 20% differences were considered negligible during the development of OTIB-52, and that Arjun took issue with that value. Could you indicate where in OTIB-52 this 20% is discussed, I wasn't able to locate it?

(3) *Use of data from the REX database was considered and rejected. The site expert cautioned that prior to 1965 the database contains no information that would differentiate CTW from General Electric employees.*

We agree that REX can not be used prior to about 1965, but since REX gives larger CTW to All Worker dose ratios than the data that was used (as Figure 3.16-4 of our report shows), we feel that it should have been used whenever possible. Also, to cover the period that REX does cover (i.e., 1965 to the present) you used 4 data sets: (1) 1965–1972 Foster et al. letters, (2) nothing for 1973, (3) 1974–1990 *Annual Reports, Radiation Exposures for DOE and DOE Contractor Employees*, and (4) 1991–2005 REMS. Our recommendations would be to use (1) Keene from 1944–1959, (2) Foster, et al, letters from 1960–1970, and (3) REX from 1971–2005. Finally, as we listed in our report, we believe that the REMS database has a number of features "that make it undesirable for use in the development of a detailed methodology for reconstructing doses to CTWs."