

# Suggested Updates to the Outstanding Dose Reconstruction and Special Exposure Cohort Issues for Consideration by the Work Group on Hanford Site Profile and SEC

Response Paper

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National Institute for Occupational  
Safety and Health

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## **BACKGROUND**

The most recent update of the overall issues matrix for the Hanford site was prepared by SC&A and submitted to the Work Group on Hanford Site Profile and SEC (hereafter, the Work Group) in August, 2011. SC&A provided subsequent updates to the Work Group in April and October of 2013 following the addition of an “83.14” class to the SEC that extended coverage to all Hanford workers through December 31, 1983. That class was added via SEC Petition SEC-00201 and had an effective date of September 22, 2012. The subsequent issues updates provided to the Work Group in 2013 addressed the period calendar 1984 through calendar 1990 with respect to several of the remaining SEC-related issues in the matrix. Not all of the open issues identified in the August, 2011 matrix were included, however.

Since the 2013 updates to the Work Group, NIOSH and SC&A have made a number of visits to Hanford for site research purposes. These activities have included reviews of both physical records and electronic databases, as well as numerous interviews with current and former Hanford site workers. As a result of these site research activities an additional class of workers was identified and added to the SEC in 2015. That class was added via Petition SEC-00226 and had an effective date of June 21, 2015. It covered Hanford workers that did not work for one of the site prime contractors, the Department of Energy, or the Pacific Northwest National Laboratory during the period calendar 1984 through 1990.

Since the addition of the most-recent 83.14 class to the SEC in 2015, NIOSH and SC&A have engaged in a number of exchanges and discussions for the purpose of consolidating all of the dose reconstruction and SEC issues that remain open for the Hanford site. A principal goal for this effort was to develop updates for each of these issues for the Work Group’s consideration that reflected the SEC period currently under evaluation, the site research progress that has been made since the last updates provided to the Work Group, and the addition of the 83.14 SEC class in 2015, for entry into the Board Review System (BRS) for tracking. This document presents the consensus updates for that purpose as agreed upon between SC&A and NIOSH.

## **INTRODUCTION**

The purpose of this document is to present proposed input to the BRS for the special exposure cohort- and radiation dose reconstruction-related issues pertaining to the Hanford Site that remain to be resolved for consideration by the Hanford Work Group. The SEC issues are currently being addressed within the context of Petition SEC-00057-3 for workers that worked for one of the Hanford site prime contractors during calendar 1984 through calendar 1990. The proposed entries reflect consensus input agreed upon between SC&A and NIOSH as discussed in the Background section above.

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## **SUGGESTED BRS ENTRIES FOR HANFORD SITE ISSUES**

This section discusses each of the unresolved dose reconstruction- and SEC-related issues for the Hanford site identified in SC&A's update to the WG dated August 19, 2011. For each issue the discussion begins with the applicable title and description from the most recent updates provided to the Work Group, i.e. from August, 2011 or October, 2013, as appropriate. A proposed title and description to be entered into the BRS then follow, representing consensus input from SC&A and NIOSH. The proposed BRS entries are then followed by a discussion providing additional information about the issue and the proposed input. For some issues the discussion includes recommendations from SC&A and NIOSH that the issue be closed or deleted. In these cases there is no proposed description, pending input from the Work Group regarding whether the issue will remain open.

### **Matrix Issue 3**

Previous title: Thorium-232 internal exposure from January 1, 1960 onward
<u>Previous description</u>
Data are not adequate from up to at least December 31, 1983. Production and exposure potential may have been intermittent. There may have been exposure during remediation of certain areas; remains OPEN for most Hanford workers from 1984 onwards. Validity of uranium bioassay use for Th dose not established by NIOSH.
Proposed title: No change
<u>Proposed description</u>
This is a SEC issue relating to potential thorium exposures during remediation of certain areas, the potential use of thorium in nuclear fuel fabrication and related operations within the 300 Area during 1984 through 1990, and possible thorium use in other areas at Hanford during that time.

### **Discussion**

SC&A and NIOSH recommend that the scope of this issue be expanded from what it was previously to include investigation of potential operational use of thorium in nuclear fuel fabrication and related operations within the 300 Area during 1984 through 1990.

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#### **Matrix Issue 4**

Previous title: HEU – uranium intake estimation
<u>Previous description</u>
Alpha spectrometry data are available. The issue is whether workers who had exposure potential in the post-1983 period were monitored in this way. Remains OPEN and needs to be addressed during DR reviews (this issue remains under active review by NIOSH through onsite research).

Proposed title: No change
<u>Proposed description</u>
This is a SEC issue pertaining to whether workers who potentially received intakes of HEU during the post-1983 period were monitored by alpha spectrometry (for urinalysis) or by other appropriate means. It is contingent upon identification of a potential source of HEU intakes by Hanford workers during 1984 through 1990.

#### **Discussion**

SC&A and NIOSH agreed to propose updating the wording of this issue to reflect that, thus far, a source term representing potential intakes of highly-enriched uranium (HEU) has not been identified at Hanford for the period 1984 through 1990 and the issue was therefore contingent upon whether such a source or sources existed.

#### **Matrix Issue 6**

Previous title: Uranium intake estimation to 1990 for unmonitored workers
<u>Previous description</u>
Uranium bioassay data are adequate for dose reconstruction and coworker models. Some revisions are needed to ensure that NIOSH’s approach is claimant favorable for dose assignment to unmonitored workers.

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Proposed title: Estimation of intakes of depleted through low-enriched uranium for unmonitored workers (non-SEC issue)

Proposed description

Data are available. The issue pertains to the question if uranium doses assignments for unmonitored workers are favorable to the claimant. This is not a SEC issue.

Discussion

SC&A and NIOSH recommend revising the title of this issue to clarify that it pertains to depleted through low-enriched uranium to better differentiate it from Issue Number 4, which pertains to highly-enriched uranium.

**Matrix Issue 7**

Previous title: U-233 intakes

Previous description

Alpha spectrometry data are available. The issue is whether workers who had exposure potential in the post-1983 period were monitored in this way. Remains OPEN and needs to be addressed during DR reviews (this issue remains under active review by NIOSH through onsite research).

Proposed title: No change

Proposed description

This is a SEC issue pertaining to potential sources of U-233 intakes during 1984 through 1990, and the adequacy of Hanford's internal monitoring practices for U-233 in the event such sources existed. It is contingent upon identification of a potential source of U-233 intakes by Hanford workers during 1984 through 1990.

Discussion

NIOSH and SC&A agreed to propose updating the wording of this issue to reflect that, thus far, a source term representing potential intakes of uranium-233 has not been identified at Hanford for the period 1984 through 1990 and the issue was therefore contingent upon whether such a source or sources existed.

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### **Matrix Issue 8**

Previous title: Recycled uranium intake estimation
<u>Previous description</u>
Data from 1970–1972 exist for estimating claimant favorable trace contaminant ratios. NIOSH should use these data instead of late 1980s data. Reviews of DRs need to confirm that this approach is being used.
Proposed title: No change
<u>Proposed description</u>
Pending: see discussion below.

### **Discussion**

SC&A and NIOSH concur that this issue can be resolved by agreement to use trace contaminant ratios for the period 1970 – 1972, and therefore recommend to the Work Group that it be closed for SEC purposes. NIOSH should verify the implementation of this agreement by performing dose reconstruction reviews or the issuance of dose reconstruction work instructions to verify or assure that the previously agreed-upon trace contamination ratios are being used. SC&A and NIOSH therefore propose to the Hanford Work Group that this issue be placed in abeyance pending proof of implementation.

### **Matrix Issue 9**

Previous title: Neptunium-237 intakes, 1958 to 1972
<u>Previous description</u>
Extensive onsite research concluded that Np was handled during the 1984-1990 timeframe in at least three locations: FFTF test assemblies, at PNL and HEDL in research, and at PUREX (storage and maintenance). Substantial progress made, but further NIOSH onsite review continues to characterize the PUREX source term and whether bioassay data exists. This issue remains OPEN for this time period.

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Proposed title: Neptunium-237 intakes
<u>Proposed description</u>
Pending: see discussion below.

Discussion

SC&A and NIOSH are in agreement that concerns over potential Np-237 intakes at FFTF and PNL have been addressed, and the work that has been done to address this issue for the Purex plant was at a point where it could be brought to closure. NIOSH and SC&A therefore recommend to the Work Group that the scope of this issue be defined as a need to document the findings regarding the potential for Np-237 intakes at FFTF, PNL, and Purex during 1984 through 1990 with the expectation that a recommendation for closure of this SEC issue would follow.

**Matrix Issue 10**

Previous title: Tritium intake estimation from 1949 onwards
<u>Previous description</u>
Issue resolved until 1983 and for some workers until 1990 (due to the grant of various SECs). Issue of tritium dose assignment for most workers from 1984 onwards remains OPEN.

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Proposed title: No change
<u>Proposed description</u>
<p>This issue pertains to the question of tritium dose assignment in the event sources of Special Tritium Compounds (STCs) representing a potential for worker intakes are identified at Hanford during the period 1984 through 1990. The issue is resolved until 1983 and for some workers until 1990 through the grant of various SECs. The issue stems from a statement in the Hanford internal dosimetry TBD regarding a potential for metal (zirconium, specifically) tritides to have been associated with work under the Tritium Target Program that began in 1988.</p> <p>In the event a source term for potential intakes of STCs by Hanford workers during 1984 through 1990 is identified, an evaluation of the sufficiency of tritium bioassay data for affected workers would be warranted to determine if ORAUT-OTIB-0066, "Calculation of Dose from Intakes of Special Tritium Compounds", could be applied. If so, this issue would be a matter of dose assignment and not a SEC issue. The SEC status of this issue is therefore conditional, depending on the availability of sufficient tritium bioassay data, in the event a source of STC intakes is discovered.</p>

### Discussion

SC&A and NIOSH propose to the Work Group that the SEC status of this issue be considered conditional depending on if a source of potential worker intakes of special tritium compounds is identified and, if so, if sufficient bioassay data exist for the potentially affected workers.

### Matrix Issue 11

Previous title: Promethium-147
<u>Previous description</u>
<p>Contrary to the TBD, Pm-147 occurred during 1972–1975. NIOSH intake assignment is not claimant favorable. Incidents are documented. NIOSH needs to address dose reconstruction for Pm-147 incidents.</p>

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Proposed title: No change
<u>Proposed description</u>
Pending: see discussion below.

Discussion

SC&A and NIOSH are in agreement that this issue is not applicable for the period 1984 onward and therefore recommend to the Work Group that it be closed. It was thought that a recommendation for closure of this issue had previously been made, but a review of transcripts from prior meetings of the Hanford Work Group did not identify such.

**Matrix Issue 12**

Previous title: Sr-90, Cs- 137, MFP intake estimation
<u>Previous description</u>
Extensive data are available. This issue is CLOSED. In reviewing DRs, a check needs to be made if workers exposed during incidents have adequate bioassay data. Data adequacy for coworker models needs to be established.

Proposed title: No change
<u>Proposed description</u>
Pending: see discussion below.

Discussion

SC&A and NIOSH recommend to the Work Group that this issue be held in abeyance until the verification issues are addressed to ensure implementation. This is not a SEC issue.

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### **Matrix Issue 13**

Previous title: Tank farm alpha contamination
<u>Previous description</u>
Site expert interviews indicate that tank farm exposures, including alpha-emitting radionuclide intakes (such as those from resuspension), may have been missed. This issue remains OPEN for most workers from 1984 onward, except those granted an SEC from 1984-1990.
Proposed title: No change
<u>Proposed description</u>
Pending: see discussion below.

### **Discussion**

SC&A and NIOSH are in agreement that this issue is subsumed by other matrix items (e.g. numbers 3, 7, 9, and 12) and therefore recommend to the Work Group that it be deleted.

### **Matrix Issue 14**

Previous title: Plutonium intake estimation
<u>Previous description</u>
Coworker models need to be evaluated from an SEC standpoint (e.g., adequacy of the REX database for coworker models). This applies from 1984 onward for most workers. Coworker models need to be examined regarding adequacy of data.
Proposed title: No change
<u>Proposed description</u>
No change.

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### Discussion

SC&A and NIOSH are in agreement that this issue should remain open as a SEC issue until review of the applicable Hanford coworker methods against the new implementation guide is completed.

### **Matrix Issue 16**

Previous title: Cm-244
<u>Previous description</u>
Exposure potential existed until at least 1978. No data for 1973. Sparse up to 1983. Coworker model may be feasible for 1984– 1990. NIOSH has not given adequate justification for using Pu data for Np intake.

Proposed title: No change
<u>Proposed description</u>
Pending: see discussion below.

### Discussion

SC&A and NIOSH are in agreement that this issue is not applicable for the period 1984 onward and therefore recommend to the Work Group that it be closed.

### **Matrix Issue 18**

Previous title: External exposure geometry
<u>Previous description</u>
Site expert evidence indicates significant geometry issues in some circumstances that may prevent film badge or TLD from registering relevant organ dose. This is a site profile issue.

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Proposed title: No change
<u>Proposed description</u>
This issue pertains to external exposure geometries, and the use of appropriate correction factors, for different job types. This is a site profile issue. It is not a SEC issue.

Discussion

SC&A and NIOSH are in agreement that this is a complex-wide issue, i.e. that it applies to sites beyond Hanford.

**Matrix Issue 19**

Previous title: Lack of adequate monitoring: Petitioner issue
<u>Previous description</u>
Coworker model adequacy from the SEC point of view needs to be evaluated in general and specifically in light of petitioner affidavits. External data are adequate. Internal data addressed in other matrix items.

Proposed title: No change
<u>Proposed description</u>
This is a petitioner issue pertaining to the use of coworker models in the Hanford site profile. Coworker methods will be reviewed against the NIOSH implementation guide for coworker models once it becomes finalized.

Discussion

SC&A and NIOSH are in agreement that at this time this is not a SEC issue.

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## **Matrix Issue 20**

Previous title: Skin contamination
<u>Previous description</u>
Site expert interviews indicate unusual potential for skin exposure in some maintenance work. This needs to be evaluated against available data.

Proposed title: No change
<u>Proposed description</u>
This is a SEC issue pertaining to the adequacy of monitoring data for skin contamination that resulted from radiological incidents involving primary cooling water at the Hanford N Reactor. Site data indicate considerable potential for skin contamination during maintenance work at N Reactor.

## **Discussion**

SC&A and NIOSH agree this issue should remain as a standalone SEC issue.

## **Matrix Issue 21**

Previous title: Missing records – routine (Petitioner issue)
<u>Previous description</u>
SEC-specific analysis for Hanford is needed to verify that the approaches specified are bounding doses (or more accurate than bounding doses) for all members of the proposed class. Review of box labels of destroyed records indicates vast majority are not relevant or pre-July 1, 1972. Some boxes do not have clear date for contents. Some boxes may have had relevant data. Unclear if duplicates exist.

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Proposed title: No change
<u>Proposed description</u>
Pending – see discussion below.

### Discussion

SC&A and NIOSH agree there is no clear indication of destroyed records, and that such evaluations are a standard part of the SEC evaluation process as required in the NIOSH Dose Reconstruction implementation guide and implementing procedures. SC&A and NIOSH therefore recommend that this issue be deleted.

### Matrix Issue 22

Previous title: Missing incident records
<u>Previous description</u>
DOE files of claimants who have affidavits in the Petition need to be examined. Data completeness for incidents needs to be checked. This also links to potential destruction of records and existence of duplicate records. Specific incidents need to be evaluated, including a criticality in the 1950s.
Individual DOE-supplied claimant records examined contain almost all incidents mentioned in CATIs or in REX database. The REX database is not detailed regarding incidents. No pattern of omitting incidents from personnel records was detected.

Proposed title: Radiological incidents
<u>Proposed description</u>
This is a SEC issue pertaining to the question if sufficient bioassays were taken for potential worker internal exposures from minor radiological incidents.

### Discussion

The title and description of this issue has been updated to reflect the period 1984 through 1990 that is currently under evaluation.

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### **Matrix Issue 23**

Previous title: REX database adequacy and representativeness for coworker models
<u>Previous description</u>
Coworker models are based on the REX database. The representativeness of the REX database for estimating coworker doses needs to be examined in the SEC context. This issue is addressed in the other matrix items.

Proposed title: No change
<u>Proposed description</u>
Coworker models are based on the REX database. The representativeness of the REX database for estimating coworker doses needs to be examined in the SEC context. This issue will be encompassed through review of the Hanford coworker methods against the NIOSH implementation guide for coworker models.

### Discussion

SC&A and NIOSH agree that this issue will be covered by the review of the Hanford coworker methods against the NIOSH implementation guide for coworker models that will be performed once the guide is finalized.

### **Matrix Issue 25**

Previous title: Miscellaneous radionuclides (e.g., Cr-51, Ru-106, Ce-144, Co-60)
<u>Previous description</u>
Adequacy of the TBD approach for bounding doses needs to be assessed. Some radionuclides have adequate data from 1983 or 1984 (e.g., Co-60). Coworker model is needed for MFP and activation products for the 200 Area, including tank farm workers, and in waste handling and processing buildings in the 300 Area.

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Proposed title: No change
<u>Proposed description</u>
This issue involves a review of the methods presented in the Hanford site profile for assigning internal dose from fission and activation product nuclides, including the use of any coworker methods. Coworker methods will be reviewed against the NIOSH implementation guide for coworker models once it becomes finalized. This is not a SEC issue otherwise.

Discussion

In 2011 SC&A noted that more complete radionuclide monitoring seemed to have been initiated in 1983 or 1984 to cover the more unusual radionuclides present at Hanford. SC&A and NIOSH agree that this issue involves a need to examine coworker models for data adequacy and claimant favorability for most workers from 1984 onward for assigning internal dose from fission and activation product nuclides, including the use of any coworker methods. SC&A and NIOSH further agree that coworker methods will be addressed by the review of the Hanford coworker methods against the NIOSH implementation guide for coworker models that will be performed once the guide is finalized.

**Matrix Issue 26**

Previous title: Data completeness
<u>Previous description</u>
The ER cites individual dose records and other sources of data. Principal reliance is on individual dose records for the most part. Completeness of individual dose records may need investigation. This item has been subsumed into the other matrix items.

Proposed title: No change
<u>Proposed description</u>
Pending – see discussion below.

Discussion

SC&A and NIOSH agree that the concerns raised in this issue are an integral part of the SEC evaluation process via the SEC implementation guide and associated procedures. SC&A and NIOSH therefore recommend to the Work Group that this issue be deleted.

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### **Matrix Issue 27**

Previous title: Building 324 leaks
<u>Previous description</u>
There were leaks of high-level waste in B-Cell, Building 324, including a major spill, reportedly in 1986. Decontamination of B cell began in the late 1980s. SC&A conducted interviews. HP coverage was reportedly good. Mixed fission product monitoring data exist for the mid-1980s when the major B-Cell spill occurred. Some specific radionuclides may not have data. There were earlier leaks under A- and C-Cells. The soil under B-Cell was found to be contaminated in 2010. NIOSH should verify whether the workers involved, including those dealing with the A- and C-Cell leaks, were monitored and whether the data that exist can be used with claimant-favorable assumptions to estimate the incident-related doses.

Proposed title: No change
<u>Proposed description</u>
No change.

### **Discussion**

SC&A and NIOSH agree that this SEC issue has been thoroughly investigated and is now at a stage where it needs to be fully documented to close out remaining items.