ORAU Team **Dose Reconstruction Project for NIOSH** Assignment of Missed Neutron Doses Based on Dosimeter Records	Document Number: ORAUT-OTIB-0023 Effective Date: 03/07/2005 Revision No.: 00 Controlled Copy No.: _____ Page 1 of 4
Subject Expert: Steven E. Merwin Document Owner Approval: Signature on File Date: 03/02/2005 Edward F. Maher, Task 5 Manager Concurrence: Signature on File Date: 03/05/2005 Richard E. Toohey, Project Director Approval: Signature on File Date: 03/07/2005 James W. Neton, Associate Director for Science	Supersedes: None

RECORD OF ISSUE/REVISIONS

ISSUE AUTHORIZATION DATE	EFFECTIVE DATE	REV. NO.	DESCRIPTION
Draft	12/01/2004	00-A	New technical information bulletin to provide information to allow ORAU Team dose reconstructors to determine when it is appropriate to assign neutron doses to workers at DOE sites using the LOD/2 method. Initiated by Steven E. Merwin.
Draft	12/16/2004	00-B	Incorporates NIOSH review comments. Initiated by Steven E. Merwin.
Draft	02/25/2005	00-C	Incorporates additional NIOSH review comments. Initiated by Steven E. Merwin.
03/07/2005	03/07/2005	00	First approved issue. Initiated by Steven E. Merwin.

1.0 PURPOSE

The purpose of this Technical Information Bulletin (TIB) is to provide information to allow ORAU Team dose reconstructors to determine when it is appropriate to assign neutron doses to workers at DOE sites using the LOD/2 method.

2.0 BACKGROUND

According to OCAS-IG-001, missed doses are to be assigned using the "Limit of Detection (LOD)/2 method," which was originally proposed by the National Research Council in their evaluation of film badge dosimetry for compensation of atomic veterans. The method involves the assignment of a dose equal to the LOD divided by 2 for each dosimetry measurement that is recorded as zero, below the limit of detection, or below a reported threshold. According to the IG, this method is recommended "since this scheme has been used in other compensation programs and has been shown to result in a slight positive bias."

Workers who were unmonitored for external radiation exposure are not assigned missed dose using the LOD/2 method; rather, they are assigned either external on-site ambient doses, if they were non-radiological workers and would not have been exposed to workplace radiation sources; or unmonitored doses (using co-worker studies or some other approach) if a potential for exposure existed.

The assignment of missed neutron doses is somewhat more complex. In the early years at most DOE sites, neutron doses were not measured reliably, so missed neutron doses are assigned based on neutron-gamma ratios, co-worker studies, or some other approach. As stated in the IG, "An exception to the [LOD/2] method is needed for unreasonably high neutron exposures. Therefore, when the neutron missed dose central estimate (nLOD/2) would exceed 75% of the photon dose (dosimeter dose + missed dose), the exposure should be treated as unmonitored exposure and radiation survey data combined with stay times (frequency of exposure) should be used to estimate the missed dose."

3.0 APPLICATIONS AND LIMITATIONS

The guidance in this TIB applies to cases in which the neutron monitoring devices in use at the site produced results that were considered the dose of record. It does not apply to periods during which the monitoring was unreliable and some method other than the monitoring data (e.g., neutron-gamma ratios) is normally used to assign neutron dose based on information in the site TBD or other reliable source.

4.0 REFERENCES

1. NIOSH (National Institute for Occupational Safety and Health), *External Dose Reconstruction Implementation Guideline*, Rev. 0, OCAS-IG-001, Office of Compensation Analysis and Support, Cincinnati, Ohio, 2002.

5.0 ANALYSIS

As described in OCAS-IG-001, the LOD/2 method results in a positive bias for photon exposures. By definition, this bias is extreme if there was no potential for photon exposure (e.g., a worker downtown in an administrative building who did not visit the site). By and large, however, workers who were issued dosimeter badges at DOE sites had a potential for photon exposure, and photon radiation

sources were generally omnipresent at the sites so the issuance of dosimeter badges is considered an indicator of the potential for exposure. Thus, even though the LOD/2 method for assigning missed dose is claimant favorable in general, and highly claimant favorable for employees with limited or no potential for exposure (i.e., employees with all or mostly zeroes in the records), this approach has been prescribed in the IG upon analysis of alternative approaches.

Regarding neutron exposures, however, at some DOE sites and during certain eras, neutron dosimeters were included in the site dosimetry badges as a matter of administrative practice rather than as an indicator of a potential for neutron exposure. Thus, some employees have a string of zeroes in the neutron column in their monitoring records even though there may have been little or no exposure potential based on their work locations. Additionally, at a few DOE sites zeroes may be included in the records as an administrative practice even though monitoring did not occur. Therefore, not only are there instances in which the LOD/2 method results in unreasonably high neutron doses, as acknowledged in the IG, but also instances in which the method is not applicable because it could result in the assignment of neutron doses even though there was no potential for neutron exposure.

6.0 GUIDANCE

Workers who were monitored for neutrons using reliable dosimeters should generally be assigned missed doses in accordance with OCAS-IG-001 (i.e., using the LOD/2) method for any null results. As described in the IG, however, an exception to the method is needed for unreasonably high neutron doses.

Missed neutron doses do not need to be assigned if both of the following conditions are met:

1. The neutron missed dose central estimate (nLOD/2) would exceed 75% of the photon dose (dosimeter dose + missed dose).

2. Based on the employee's work location(s) and relevant information in the site TBD or other documentation (e.g., neutron source term information, neutron survey results, and the potential for neutron exposures), the dose reconstructor determines that the employee's neutron dose was zero or incidental relative to the external dose assigned.

If both of the above conditions are met, dose reconstructors should include appropriate explanatory language in the dose reconstruction (DR) report. This should include a discussion in the DR report of the available information regarding work locations and the rationale for the conclusion that neutron doses could not have exceeded incidental levels.