



**ORAU TEAM
Dose Reconstruction
Project for NIOSH**

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New Total Rewrite Revision Page Change

FOR DOCUMENTS MARKED AS A TOTAL REWRITE, REVISION, OR PAGE CHANGE, REPLACE THE PRIOR REVISION AND DISCARD / DESTROY ALL COPIES OF THE PRIOR REVISION.

PUBLICATION RECORD

EFFECTIVE DATE	REVISION NUMBER	DESCRIPTION
09/09/2004	00	New technical basis document for the Mound Site – Introduction. First approved issue. Initiated by Jeffrey S. Vollmer.
03/13/2009	00 PC-1	Approved page change initiated to remove information pertaining to Monsanto Chemical Company, the subject of a class of employees added to the Special Exposure Cohort. These changes occurred on pages 6 and 7. NIOSH required language was revised on page 5 in Section 1.0. Added references on pages 5, 6, and 7 and added the Reference Section on page 8. No changes occurred as a result of formal internal review. Incorporates formal NIOSH review comments. No sections were deleted. Training required: As determined by the Task Manager. Initiated by Donald N. Stewart.

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ACRONYMS AND ABBREVIATIONS

AEC	U.S. Atomic Energy Commission
EEOICPA	Energy Employees Occupational Illness Compensation Program Act
IMBA	Integrated Modules for Bioassay Analysis (program)
IREP	Interactive RadioEpidemiological Program
NIOSH	National Institute for Occupational Safety and Health
ORAU	Oak Ridge Associated Universities
TBD	technical basis document

1.0 INTRODUCTION

Technical basis documents and site profile documents are not official determinations made by the National Institute for Occupational Safety and Health (NIOSH) but are rather general working documents that provide historic background information and guidance to assist in the preparation of dose reconstructions at particular sites or categories of sites. They will be revised in the event additional relevant information is obtained about the affected site(s). These documents may be used to assist NIOSH staff in the completion of the individual work required for each dose reconstruction.

In this document the word “facility” is used as a general term for an area, building, or group of buildings that served a specific purpose at a site. It does not necessarily connote an “atomic weapons employer facility” or a “Department of Energy [DOE] facility” as defined in the Energy Employees Occupational Illness Compensation Program Act [EEOICPA; 42 U.S.C. § 7384l(5) and (12)]. EEOICPA defines a DOE facility as “any building, structure, or premise, including the grounds upon which such building, structure, or premise is located ... in which operations are, or have been, conducted by, or on behalf of, the Department of Energy (except for buildings, structures, premises, grounds, or operations ... pertaining to the Naval Nuclear Propulsion Program)” [42 U.S.C. § 7384l(12)]. Accordingly, except for the exclusion for the Naval Nuclear Propulsion Program noted above, any facility that performs or performed DOE operations of any nature whatsoever is a DOE facility encompassed by EEOICPA.

For employees of DOE or its contractors with cancer, the DOE facility definition only determines eligibility for a dose reconstruction, which is a prerequisite to a compensation decision (except for members of the Special Exposure Cohort). The compensation decision for cancer claimants is based on a section of the statute entitled “Exposure in the Performance of Duty.” That provision [42 U.S.C. § 7384n(b)] says that an individual with cancer “shall be determined to have sustained that cancer in the performance of duty for purposes of the compensation program if, and only if, the cancer ... was at least as likely as not related to employment at the facility [where the employee worked], as determined in accordance with the POC [probability of causation¹] guidelines established under subsection (c) ...” [42 U.S.C. § 7384n(b)]. Neither the statute nor the probability of causation guidelines (nor the dose reconstruction regulation, 42 C.F.R. Pt. 82) define “performance of duty” for DOE employees with a covered cancer or restrict the “duty” to nuclear weapons work (NIOSH 2007a).

The statute also includes a definition of a DOE facility that excludes “buildings, structures, premises, grounds, or operations covered by Executive Order No. 12344, dated February 1, 1982 (42 U.S.C. 7158 note), pertaining to the Naval Nuclear Propulsion Program” [42 U.S.C. § 7384l(12)]. While this definition excludes Naval Nuclear Propulsion Facilities from being covered under the Act, the section of EEOICPA that deals with the compensation decision for covered employees with cancer [i.e., 42 U.S.C. § 7384n(b), entitled “Exposure in the Performance of Duty”] does not contain such an exclusion. Therefore, the statute requires NIOSH to include all occupationally-derived radiation exposures at covered facilities in its dose reconstructions for employees at DOE facilities, including radiation exposures related to the Naval Nuclear Propulsion Program. As a result, all internal and external occupational radiation exposures are considered valid for inclusion in a dose reconstruction. No efforts are made to determine the eligibility of any fraction of total measured exposure for inclusion in dose reconstruction. NIOSH, however, does not consider the following exposures to be occupationally derived (NIOSH 2007a):

- Background radiation, including radiation from naturally occurring radon present in conventional structures
- Radiation from X-rays received in the diagnosis of injuries or illnesses or for therapeutic reasons

¹ The U.S. Department of Labor (DOL) is ultimately responsible under the EEOICPA for determining the POC.

1.1 PURPOSE

This technical basis document (TBD) represents support to the ORAU Team on documentation of historic practices at the Mound Laboratory site in Miamisburg, Ohio. It is an evaluation of internal and external dosimetry data, site monitoring and other pertinent data for unmonitored and monitored workers for use as a supplement to individual monitoring data.

The purpose of this document is to provide a Mound Laboratory Site Profile that contains technical basis information to be used to evaluate the total occupational dose for EEOICPA claimants.

1.2 SCOPE

The Mound Laboratory played an important role in the U.S. nuclear weapons program. Mound Laboratory activities were originally established in Dayton, Ohio, in the summer of 1943. The Monsanto Chemical Company operated the Dayton Laboratory at Units I, II, III, and IV. Of these, Units III and IV were created to produce large quantities of polonium. Operational experience at Units III and IV demonstrated the need for a specialized facility for polonium production and associated activities. This need led to the design and construction of the Mound Laboratory, initially known as Unit V of the Dayton Laboratory. The Mound Laboratory was initially occupied in 1948, and various research programs were begun; polonium production work was transferred to the new facility in 1949. The site's role grew to include nuclear weapons component development and production, and such secondary missions as radioactive waste management and recovery, the use of radioactive materials for nonweapons purposes and the purification of nonradioactive isotopes for scientific and commercial research. This TBD contains supporting documentation to assist in the evaluation of worker dose from these processes at the Mound Laboratory, using the methodology in NIOSH implementation guides (NIOSH 2002 and 2007b).

Consideration of potential exposures and dose reconstruction methods for Monsanto Chemical Company operations are outside the scope of the Mound Laboratory TBD.

Methods and concepts of measuring radiation exposure to workers have evolved since the beginning of Mound operations in 1948. This TBD provides supporting technical data to evaluate the total Mound occupational dose that can reasonably be associated with the worker's radiation exposure. This dose includes occupational internal and external exposures, occupationally required diagnostic X-ray examinations, and onsite exposure to site environmental releases. Consistent with NIOSH implementation guidance (NIOSH 2002 and 2007b), this document identifies how to adjust the historic occupational dose to account for current scientific methods and protection factors.

In addition, this TBD presents technical basis methods used to prepare the Mound worker dose records for input to the NIOSH Interactive RadioEpidemiological Program (IREP) and the Integrated Modules for Bioassay Analysis (IMBA) computer codes used to evaluate worker dose. Because information on measurement uncertainties is an integral component of the NIOSH approach, this document describes how the uncertainty is evaluated for the Mound exposure and dose records.

This TBD describes Mound facilities and processes and historic information related to worker internal and external exposures. Attachments contain critical data and tables required by dose reconstructors to suffice as a standalone document.

This document also supplies supporting technical data used in the evaluation of the occupational dose that may be reasonably associated with a Mound Laboratory workers claim. The source of exposure may have resulted from external and internal radiation sources, required medical x-rays and to onsite releases and ambient exposure. Doses that may have occurred to unmonitored workers or that may have been missed by monitoring are included in this evaluation. Over time, improvements to

monitoring devices and techniques as well as new protection standards have been developed. This document also captures these historical changes.

The doses are evaluated using the NIOSH Integrated Modules for Bioassay Analysis (IMBA) and the Interactive RadioEpidemiological Program (IREP) computer codes. As part of these evaluations uncertainties associated with the assessment are an integral part of the NIOSH process. Therefore uncertainty analysis of Mound Laboratory exposure is also an essential part of these documents. This site profile is divided into five major sections, Site Description, Occupational Medical Dose, Occupational Environmental Dose, Occupational Internal Dose and Occupational External Dose. Each section has associated Attachments with relevant data that can be used by the dose reconstructor to evaluate claims.

The Site Description describes facilities and processes and potential radiation sources utilized during the history of the Mound Laboratory and are presented in section 2. The tables showing radionuclides of concern and operational histories of the different facilities and sites are presented in this section. This document provides processes, radioisotope forms and other information that may be useful in the completion of dose reconstructions. The dose reconstructor would use this data when monitoring data or other methods of evaluating dose are inadequate (ORAUT 2006a).

Section 3 presents information crucial in evaluating Occupational Medical Doses. This includes radiation doses due to medical x-rays that were required for pre-employment, for annual examinations, and for other prescribed examinations. Any changes to techniques or equipment employed at Mound Laboratory are also presented in this section. This section presents the pertinent details to help assist dose reconstructors in determining doses resulting from Occupational Medical sources at Mound Laboratory (ORAUT 2006b).

Section 4 is the Occupational Environmental Dose section. This information can be used to reconstruct radiation doses to unmonitored workers. The releases of radionuclides from buildings at Mound Laboratory are related to the methods used to calculate doses to unmonitored workers. Potential internal exposures are presented that might have resulted from air dispersion of radionuclides from the buildings, ground level releases during construction or deconstruction activities and resuspension of radioactive contaminated soil. External radiation sources, from various site facilities, are evaluated for their contribution to this environmental dose. Methodology and equipment for estimating these doses over the years have changed and these changes are taken into account in evaluating doses to unmonitored workers. Section 4 presents the details needed in calculating doses to unmonitored workers at Mound Laboratory (ORAUT 2004a).

Occupational Internal Doses are presented in Section 5. The most significant radionuclides are presented in this section. This section also describes historical changes in monitoring methods and equipment. These changes are presented to aid the dose reconstructors in evaluating internal dosimetry records. Tables showing MDA and other pertinent monitoring details are presented for both in vitro and any in vivo bioassay techniques that may have been utilized. This section presents information that is needed in assisting the dose reconstructor in calculating doses to monitored workers (ORAUT 2004b).

Section 6 outlines the details of the Occupation External Dose that will aid the dose reconstructor in evaluating external exposure to monitored workers at Mound Laboratory. Historical techniques and practices are presented and discussed in this section as well as radiation protection standards and practices that may have affected the dosimetry program. Tables are included that give historical exchange frequencies, techniques, exposure levels and other details that will aid the dose reconstructor in evaluating external exposure. The pertinent information that can be utilized by dose reconstructors in evaluating External Dose is in this section (ORAUT 2004c).

REFERENCES

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