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PUBLICATION RECORD

EFFECTIVE DATE	REVISION NUMBER	DESCRIPTION
05/07/2004	00	New document for the INEEL Introduction. Incorporates responses to OCAS comments. First approved issue. Initiated by Norman D. Rohrig.
12/13/2006	01	Approved revision as a result of biennial review. Revised language in the Purpose section as required by NIOSH. Attribution and Annotation section added. Constitutes a total rewrite of document. Incorporates internal, NIOSH, and DOL formal review comments. This revision results in no change to the assigned dose and no PER is required. Training required: As determined by the Task Manager. Initiated by Norman D. Rohrig.
04/26/2007	02	Approved Revision 02 revised to change document owner and to better identify references in the text. This revision results in no change to the assigned dose and no PER is required. Training required: As determined by the Task Manager. Initiated by Jo Ann M. Jenkins.

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ACRONYMS AND ABBREVIATIONS

CFA	Central Facilities Area
DOE	U.S. Department of Energy
EEOICPA	Energy Employees Occupational Illness Compensation Program Act of 2000
IMBA	Integrated Modules for Bioassay Analysis (computer program)
INL	Idaho National Laboratory
IREP	Interactive RadioEpidemiological Program
MDA	minimum detectable activity
mi	mile
NIOSH	National Institute for Occupational Safety and Health
POC	probability of causation
TAN	Test Area North
TBD	technical basis document
U.S.C.	United States Code
§	Section or Sections

1.1 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 for 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 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 causation[1]] 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) define "performance of duty" for DOE employees with a covered cancer or restrict the "duty" to nuclear weapons work.

As noted above, the statute 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 contains an exclusion with respect to the Naval Nuclear Propulsion Program, 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 dosimetry monitoring results are considered valid for use in 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:

- Radiation from naturally occurring radon present in conventional structures
- Radiation from diagnostic X-rays received in the treatment of work-related injuries

[1] The U.S. Department of Labor is ultimately responsible under the EEOICPA for determining the POC.

This site profile documents historical practices at the Idaho National Laboratory (INL) site and can be used to evaluate internal and external dosimetry data for unmonitored and monitored workers and can serve as a supplement to individual monitoring data. This document provides a site profile of the INL that contains technical basis information to be used to evaluate the total occupational radiation dose for EEOICPA claimants.

This site profile can be a tool when performing dose reconstructions for INL workers. The Integrated Modules for BioAssay Analysis (IMBA) computer code is a tool useful for internal dose calculations. Information on measurement uncertainties is an integral component of the NIOSH approach. This document describes how to evaluate uncertainty associated with INL exposure and dosimetry records.

1.1.1 Purpose

The purpose of this Introduction is to provide a summary of the contents of the five technical basis documents (TBDs) that, along with this Introduction, constitute the Idaho National Laboratory Site Profile.

1.1.2 Scope

The site profile consists of six technical basis documents (TBDs): (1) this Introduction, (2) Site Description, (3) Occupational Medical Dose, (4) Occupational Environmental Dose, (5) Occupational Internal Dose, and (6) Occupational External Dosimetry.

Site Description
The Site Description TBD (ORAUT 2005) briefly describes the facilities and processes at INL since the early 1950s. The INL site, located about 50 mi west of Idaho Falls in the Arco desert, covers about 890 mi^2. Many additional offices and a few laboratories are in Idaho Falls, Idaho. Previous names for the INL site were the National Reactor Testing Station (1949-1974), the Idaho National Engineering Laboratory (1974-1997), and the Idaho National Engineering and Environmental Laboratory (1997-2005).

The Central Facilities Area (CFA), formerly a Navy gunnery testing facility, now provides support facilities, central services, and laboratories. Radioactive wastes from the site and from the Rocky Flats Environmental Testing Station are handled and stored at the Radioactive Waste Management Complex. Argonne National Laboratory-West developed and operated reactors at two locations: (1) south of CFA and (2) at the east edge of the site. High-enrichment uranium spent fuel was reprocessed at the Idaho Chemical Processing Plant, and the resultant high-level waste was processed there. The Test Reactor Area supported three large research reactors, several smaller reactors, and several laboratories. Test Area North (TAN) was home to the Aircraft Nuclear Propulsion Program; the Loss of Fluid Test program was later conducted there. Armor for the U.S. Army is constructed at the Specific Manufacturing Capability facility at TAN. Reactor safety tests were conducted at the Special Power Excursion Reactor Test facilities. The Army Reactor Area was used to test reactors and was the site of an accident at Stationary Low-Power Reactor No. 1 (Horan & Gammill 1963).

The Site Description TBD provides information about the facilities and identifies unusual events that took place at INL facilities (ORAUT 2005).

Occupational Medical Dose
The Occupational Medical Dose TBD (ORAUT 2007) provides information about the dose that individual workers received from X-rays that were required as a condition of employment. These X-rays included chest X-rays taken during preemployment and during periodic physical exams. The frequency of required X-rays varied over time and as a function of the worker's age. Both the X-ray equipment and the techniques used for taking chest X-rays covered by this TBD have changed over the years. These factors have been taken into account in determining the dose that a worker would have received from the X-ray. When there was a doubt about the technique used, assumptions that are favorable to claimants were made to ensure that the dose has not been underestimated. Important parameters include the tube current and voltage, exposure time, source-to-skin distance, and view (posterior-anterior or lateral). Doses to other exposed organs from the chest X-ray have been calculated. The uncertainty associated with the calculated dose takes into account the uncertainty associated with each of the parameters mentioned above. Tables list doses received by organs in the body for convenient reference by dose reconstructors (ORAUT 2007).

Occupational Environmental Dose
The Occupational Environmental Dose TBD (ORAUT 2004) provides the maximum dose to the whole body and body organs that workers could have received when working outside buildings at a given location at INL from inhalation of radioactive materials in the atmosphere, from direct radiation from effluent plumes, and from direct exposure to radionuclides and radiation sources that might have become incorporated in the soil.

The radionuclide concentrations at INL areas are based principally on measurements of stack effluents coupled with ground-level maximum annual average air concentrations provided by the National Oceanic and Atmospheric Administration. Of the 56 radionuclides assigned to the annual effluent list, nine radionuclides (^{144}Ce, ^{131}I, ^{147}Pm, ^{238}Pu, $^{239/240}$Pu, ^{106}Ru, ^{89}Sr, ^{90}Sr, and ^{91}Y) have been demonstrated to contribute about 95% of the total internal dose by a screening process using dose conversion factors from the International Commission on Radiological Protection (ORAUT 2004). Annual intakes of these radionuclides were calculated with standard breathing rates and exposure times.

Annual external whole-body dose to workers from ambient radiation and from submersion in the annual radioactive material concentration is provided by the measurement of direct gamma values at the INL facility fences (ORAUT 2004).

Occupational Internal Dose
The Occupational Internal Dose TBD (ORAUT 2006a) discusses the internal dosimetry program at INL.

This TBD contains a comprehensive default table to guide internal dose reconstruction in cases with minimal data. In addition, the TBD discusses *in vitro* minimum detectable activities (MDAs), analytical methods, and reporting protocols for radionuclides at INL. As expected, these parameters varied somewhat over the years for each of the radionuclides evaluated although the capabilities were relatively consistent through the history of the site. The primary radionuclides of concern are those associated with spent high-enriched fuels – mixed fission products (from a variety of reactor types), mixed activation products, plutonium (with a predominance of ^{238}Pu), americium, and uranium (high-enriched and depleted) (ORAUT 2006a). This TBD discusses *in vivo* MDAs, analytical methods, and reporting protocols for X- and gamma-ray emitting radionuclides.

This TBD presents information for workers who could have been exposed in the early days, but had no confirmed intakes. This could have occurred under circumstances in which monitoring programs

were not required or when the monitored readings were below detection limits. The document discusses methods for evaluating potential doses that fall in this category and provides additional data for the evaluation of the worst-case scenario and for unmonitored workers (ORAUT 2006a).

Occupational External Dosimetry

The Occupational External Dosimetry TBD (ORAUT 2006b) discusses the program for measuring skin and whole-body doses to workers. This document describes dose reconstruction parameters, practices, and policies, and dosimeter types and technologies for measuring doses from different types of radiation. Discussion includes evaluation of doses measured from exposure to beta, gamma, and neutron radiation. Tables provide test results for various dosimeters exposed to different exposure geometries, radiation types, and energies. Sources of bias, workplace radiation field characteristics, responses of beta/gamma and neutron dosimeters in workplace fields, and adjustments to the recorded dose measured by these dosimeters during specific years are discussed in detail.

Missed dose is discussed as a function of dosimeter type, year, and energy range. In addition, the document describes the use of external dosimetry technical basis parameters to facilitate the efforts of dose reconstructors (ORAUT 2006b).

1.2 ATTRIBUTIONS AND ANNOTATIONS

All information requiring identification was addressed via references integrated into the reference section of this document.

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