

1.0 Introduction

1.1 The Hanford Internal Dosimetry Program

The Hanford Internal Dosimetry Program (IDP) was initiated in late 1944. By 1946, a routine program had been established at Hanford to assess and document occupational doses to employees from intakes of radionuclides.

The IDP is a sitewide service program operated by the Pacific Northwest National Laboratory (PNNL) for all Hanford U.S. Department of Energy (DOE) and DOE-contractor personnel. The program is funded by Hanford Site contractors and is subject to oversight by the DOE Richland Operations Office (RL) [and the DOE Office of River Protection \(ORP\)](#). It is administered and staffed by Radiation & Health Technology.

Historically, the *Hanford Site Services Handbook* (DOE 1993) assigned, by charter, the following responsibilities to PNNL:

- assessing and documenting occupational doses from intakes of radionuclides
- determining compliance with applicable internal dose standards
- administering the routine bioassay monitoring program required by site contractors
- providing technical guidance to contractors on internal dosimetry matters
- establishing models for evaluating internal radionuclide deposition
- performing or initiating actions for prompt evaluation of the internal exposure of personnel involved in accidents or emergencies.

The *Site Services Handbook* was rescinded in 1995, and the IDP now provides the above functions, as specified by the Hanford contractors through letters of instruction, memoranda of agreement, and statements of work.

1.2 Program Services

The IDP provides the following services for the benefit of all site employees:

- administering the routine bioassay monitoring program for internally deposited radionuclides
- investigating and documenting evaluations of potential intakes for exposure record files and contractor staff
- arranging for excreta analysis services and ensuring that the Analytical Services Laboratory conforms to the technical requirements of the analytical services contract

- [maintaining accreditation for indirect radiobioassay services under the Department of Energy Laboratory Accreditation Program \(DOELAP\). DOELAP accreditation for direct radiobioassay measurements is maintained by the In Vivo Monitoring Program.](#)
- selecting and applying appropriate models, procedures, and practices for evaluating internal radionuclide deposition and the resulting dose
- guiding and supporting Hanford contractors in technical matters regarding internal dosimetry.

Additional specialized services are provided as negotiated with individual contractors.

The IDP is committed to providing cost-effective, quality service that meets or exceeds DOE regulations, uses methods and practices recommended by appropriate national and international organizations, actively explores needed improvements in technology and techniques, and meets DOE guidance to the extent practicable subject to agreement by Site contractors.

1.3 Limitations of Service

IDP capabilities are limited by the degree to which contractors use the available services. The IDP provides consultation and advisory services to contractors for developing and establishing bioassay programs. However, the contractor bears the direct responsibility for ensuring that workers receive adequate and appropriate bioassay monitoring. This includes identifying needs for bioassay monitoring and determining when potential [intakes](#) have occurred. The IDP is not responsible for initially reviewing air sampling data or other workplace monitoring data to identify potential intakes. However, review of such data by the IDP is considered germane to an investigation of a potential intake once a potential intake has been identified.

Air sampling, contamination surveys, and other field monitoring techniques provide the primary means of identifying evidence of potential intakes at Hanford facilities. [Bioassay](#) monitoring is considered the primary means for confirming intakes, but a secondary means of initially identifying intakes.

It is assumed that each contractor communicates to the workers the need for bioassay measurements and the need to address questions regarding measurements. The IDP staff discuss measurement results with workers on an individual basis if so requested by the contractor, and also deal with specific questions if contacted directly by workers. It is the intent of the IDP that the contractor dosimetry organization be the focal point for all communication with workers regarding dosimetry needs and concerns.

The IDP provides bioassay services that, if properly used, should be capable of identifying and evaluating an intake resulting in a committed effective dose equivalent (CEDE) of 100 mrem [or less](#). However, the capability for such sensitivity depends, in some cases, on prompt identification of potential intakes by the contractor, using workplace monitoring and personnel survey techniques. Periodic bioassay monitoring does not necessarily provide adequate sensitivity to detect intakes resulting in a 100-mrem CEDE.

1.4 Program Direction

Direction for the IDP comes from 10 CFR 835 [and the Hanford Radiological Health and Safety Document \(DOE 2001\)](#). The DOE Internal Dosimetry Program Guide (DOE 1999) is used as general guidance for meeting the requirements of 10 CFR 835. However, in some cases, alternate methods may be used that provide similar protection or more cost-effective compliance with 10 CFR 835.

Additional technical guidance is found primarily in the recommendations and standards of the International Commission on Radiological Protection (ICRP), the National Council on Radiation Protection and Measurements (NCRP), the American National Standards Institute (ANSI), the Health Physics Society (HPS), and the DOE.

[Specific requirements for individual contractors or clients are contained in Statements of Work or equivalent requirement documents.](#)

1.5 Program Relationships

The IDP works closely with Hanford contractor dosimetry organizations to provide a comprehensive internal dosimetry service. However, the IDP has no direct responsibility to ensure protection of workers, to monitor or conduct surveillance of work environments, to operate facilities, or to assure worker cooperation with bioassay measurement requests. Such items are considered to be the responsibility of the contractor.

The IDP also interfaces with other sitewide service programs operated by PNNL, including the Hanford Radiation Records Program (HRRP), the In-Vivo Monitoring Program, and the Hanford External Dosimetry Program.

The IDP is a member of the Hanford Personnel Dosimetry Advisory Committee (HPDAC), an advisory body consisting of DOE-RL, contractor, and dosimetry program representatives. The HPDAC has been established to review substantive current issues and proposed changes to Hanford personnel dosimetry programs. Its purpose is to identify technical, political, and/or administrative issues necessary to maintaining long-term continuity of such programs, and to ensure technical quality and consistency of dosimetry practices. Decisions and recommendations made by the HPDAC are not binding on the IDP, but they carry significant weight.

1.6 Contents of This Manual

This document, the *Hanford Internal Dosimetry Program Manual*, is one of three programmatic documents of the IDP. The other two are the *Methods & Models of the Hanford Internal Dosimetry Program* (PNL-MA-860) and the *Hanford Internal Dosimetry Procedures Manual* (PNL-MA-565). The purposes, scopes, and interrelationships of these three documents are described in Chapter 9.0.

This manual also describes

- the policies upon which the design and operation of the IDP are based (Chapter 2.0)
- the intake and dose assessment process and methods, and good practice recommendations for Hanford contractors to follow in implementing IDP policies in their radiation protection programs (Chapter 3.0)
- internal dose recording and reporting practices (Chapter 4.0)
- recommendations for participation in a bioassay monitoring program, including measurement types, frequencies, and associated minimum detectable intakes or doses (Chapter 5.0)
- the available bioassay services and instructions for obtaining these services (Chapter 6.0)
- the IDP response to potential [intake](#) incidents (Chapter 7.0)
- the quality assurance and quality control features of the IDP (Chapter 8.0)
- the program and technical assessment documents and their management and control practices (Chapter 9.0).

In addition, Appendix A lists screening levels for routine bioassay measurements. Appendix B contains tables of data field codes used in the Radiation Exposure (REX) database. Appendix C describes the methods that the Analytical Services Laboratory uses to analyze samples, and Appendix D contains copies of the instructions for each type of sample bioassay kit.

A list of acronyms and abbreviations used in this manual [and](#) a glossary of important technical terms, are provided at the end of this document.

1.7 Document Control

Controlled document versions of this manual are administered by IDP. Uncontrolled copies of this manual may be provided for technical or general information, but are not updated and may not reflect the current manual revisions. This manual is also available in an electronic format online at the following URL. <http://www.pnl.gov/eshs/pub/pnnl552.html>.

1.8 [References](#)

[10 CFR 835. 1999. Department of Energy, *Occupational Radiation Protection*. U.S. Code of Federal Regulations.](#)

[Pacific Northwest National Laboratory \(PNNL\). *Methods and Models of the Hanford Internal Dosimetry Program*, PNNL-MA-860. Richland, Washington. \(Internal manual.\) Available at URL <http://www.pnl.gov/eshs/pub/pnnl860.html>](#)

Pacific Northwest National Laboratory (PNNL). *Hanford Internal Dosimetry Procedures Manual*, PNL-MA-565. Richland, Washington. (Internal manual.)

U.S. Department of Energy (DOE) – Richland Operations Office. 1993. *Hanford Site Services Handbook*. RL 1400.1, Richland, Washington.

U.S. Department of Energy (DOE). 1999. *Implementation Guide for Internal Dosimetry Program Guide*. DOE G441.1-3, Washington, D.C.

U.S. Department of Energy (DOE) – Richland Operations Office. 2001. *Hanford Radiological Health and Safety Document*. DOE/RL-2002-12, Richland, Washington.