Hanford Environmental Dose Reconstruction Project

Monthly Technical Report

August 1988

Prepared for the Technical Steering Panel

Work supported by
the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute

Battelle
DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor Battelle Memorial Institute, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or Battelle Memorial Institute. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

PACIFIC NORTHWEST LABORATORY
operated by
BATTELLE MEMORIAL INSTITUTE
for the
UNITED STATES DEPARTMENT OF ENERGY
under Contract DE-AC06-76RLO 1830

Printed in the United States of America
Available from
National Technical Information Service
United States Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

NTIS Price Codes
Microfiche: A01
Printed Copy

<table>
<thead>
<tr>
<th>Price</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pages</td>
<td>Codes</td>
</tr>
<tr>
<td>001-025</td>
<td>A02</td>
</tr>
<tr>
<td>026-050</td>
<td>A03</td>
</tr>
<tr>
<td>051-075</td>
<td>A04</td>
</tr>
<tr>
<td>076-100</td>
<td>A05</td>
</tr>
<tr>
<td>101-125</td>
<td>A06</td>
</tr>
<tr>
<td>126-150</td>
<td>A07</td>
</tr>
<tr>
<td>151-175</td>
<td>A08</td>
</tr>
<tr>
<td>176-200</td>
<td>A09</td>
</tr>
<tr>
<td>201-225</td>
<td>A10</td>
</tr>
<tr>
<td>226-250</td>
<td>A11</td>
</tr>
<tr>
<td>251-275</td>
<td>A12</td>
</tr>
<tr>
<td>276-300</td>
<td>A13</td>
</tr>
</tbody>
</table>
HANFORD ENVIRONMENTAL DOSE RECONSTRUCTION PROJECT

Monthly Technical Report

August 1988

Prepared for the Technical Steering Panel

Work supported by
the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Richland, Washington 99352
HANFORD ENVIRONMENTAL DOSE RECONSTRUCTION PROJECT

Approved By: H. A. Haerer, Project Manager
Hanford Environmental Dose Reconstruction Project

Approved By: W. L. Templeton, Manager
Office of Hanford Environment
This monthly report summarizes the technical progress and project status for the Hanford Environmental Dose Reconstruction (HEDR) Project being conducted at Pacific Northwest Laboratory (PNL) under the direction of a Technical Steering Panel (TSP). The TSP is composed of experts in numerous technical fields related to this project and represents the interests of the public. The Department of Energy (DOE) funds the project. The organization for the project is outlined below.

HANFORD ENVIRONMENTAL DOSE RECONSTRUCTION PROJECT
ORGANIZATIONAL STRUCTURE
MANAGEMENT SUMMARY

OBJECTIVE

The objective of the Hanford Environmental Dose Reconstruction (HEDR) Project is to develop estimates of potential radiation doses that the public could have received from radioactive materials released from Hanford operations beginning in 1944.

PROGRESS

This summary report covers progress for the month of August 1988, which includes the following:

- completed a test of record transfers to the Public Reading Room
- initiated a formal decision analysis methodology for the project
- revised the draft work plan to incorporate Technical Steering Panel (TSP) comments and direction
- expanded the atmospheric modeling domain to 150 miles from the Hanford Site
- began developing models of major dairy cow feeding practices in areas around Hanford to aid in estimating doses via the milk pathway
- initiated proposals for obtaining information about demography, milk production and distribution, and Native American population, diet, and lifestyles
- initiated proposal for selecting "dominant" radionuclides
- initiated proposal for selecting study areas.

MAJOR ISSUES AND ACTION TAKEN

None.
PLANNED WORK FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

• continue preparations for the September 1988 meeting of the TSP

• hold workshop with key former Hanford employees concerning environmental sampling and analysis methods

• present proposals for obtaining demographic, milk production and distribution, and Native American population, diet and lifestyle information to the TSP for review, evaluation, and approval

• present proposals for selecting study areas and "dominant" radionuclides to the TSP for review, evaluation, and approval.
CONTENTS

PREFACE ........................................................ iii
MANAGEMENT SUMMARY ........................................ v
TASK 03 SOURCE TERMS ........................................ 3.1
TASK 04 ENVIRONMENTAL TRANSPORT ......................... 4.1
TASK 05 ENVIRONMENTAL MONITORING ....................... 5.1
TASK 06 DEMOGRAPHICS, AGRICULTURE, FOOD HABITS .... 6.1
TASK 07 ENVIRONMENTAL PATHWAYS AND DOSE ESTIMATES .. 7.1
TASK 08 INFORMATION RESOURCES ........................... 8.1
TASK 09 RECORDS MANAGEMENT ............................... 9.1
TASK 10 QUALITY ASSURANCE ................................ 10.1
TASK 11 STATISTICS .......................................... 11.1
TASK 03 SOURCE TERMS

OBJECTIVE

The objective of this task is to develop quantitative estimates of all significant emissions of radionuclides from Hanford operations during the period 1944 to the present.

PROGRESS

Activities this reporting period included the following:

• provided input to task/project scheduling and budget for FY 1989
• continued to add records and documents to the database
• continued to more precisely define the fission product inventory of iodine-131 and its emissions from the separations plants for 1945.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

• complete the calculations to more precisely define the fission product inventory of iodine-131 and its emission from the Separations Plants during 1945
• continue to survey documents for information about facility operations and emissions
• begin estimating the airborne releases from production reactors.
OBJECTIVE

The objective of this task is to reconstruct the movements of radioactive materials from operating areas to potentially exposed populations via the atmosphere, surface water, and ground water.

PROGRESS

The atmospheric dispersion review committee, which provides input to the atmospheric transport subtask, met on August 4, 1988. Progress on wind field modeling was reviewed. Alternatives for modeling atmospheric transport over large distances were discussed.

Monthly average krypton-85 concentrations at nine locations on and adjacent to the Hanford Site for 1984 and the first 3 months of 1985 are being compared with air concentrations estimated with the atmospheric transport model.

Additional activities concerning atmospheric transport included the following:

- expanded the atmospheric transport model domain
- continued a preliminary sensitivity and uncertainty analysis
- continued data entry for early Hanford meteorological data
- expanded the atmospheric model domain from 25 miles to 150 miles from the Hanford Site.

The review of reports pertaining to the distribution and transport of radio-nuclides in the Columbia River continued. Most of the review is concentrated on the reach from the Hanford Site to McNary Dam.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.
WORK PLANNED FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

- continue collecting and evaluating surface-water data with emphasis on radionuclide measurements
- continue input to sensitivity/uncertainty analyses
- continue entry of early Hanford meteorological data into the computer database
- initiate preliminary atmospheric modeling within the expanded domain (150 miles from Hanford).
TASK 05  ENVIRONMENTAL MONITORING

OBJECTIVE

The objectives of this task are to assemble, evaluate, and report historical environmental monitoring data and to use the data to estimate the contributions of Hanford operations to radionuclide concentrations in environmental media.

PROGRESS

Development of a document review database continued. Planning also continued for the implementation of a task-level local area network to facilitate the development, use, and maintenance of the document database.

Preparations began for technical discussions with key former Hanford employees. The focus of the meeting will be to address questions about environmental sampling and analysis methods used in the first few years of operations.

Planning began for preparing a preliminary inventory of the key terrestrial (i.e., vegetation, air, soil, crops, animals, etc.) data available for the period 1944 - 1957 and the key Columbia River data (i.e., water, drinking water, sediments, fish and biota, marine mussels, etc.) available for the period 1944 - 1972.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

• conduct a technical meeting with key former Hanford employees

• prepare an inventory of the available monitoring data for the period 1944-1957 for the air and terrestrial media and 1944-1972 for Columbia River data
• continue to bring the document review database to operational status
• continue to evaluate the early vegetation data for errors and uncertainty.
Objectives

The objective of this task is to develop the population and agricultural data needed to estimate the population doses that may have resulted from releases of radioactive materials from Hanford operations.

Progress

Development began of models for the major dairy cow feeding practices used in the area surrounding Hanford. These models will help in the estimation of population doses transmitted by way of milk.

Estimates of aboriginal food consumption for Plateau Indians were developed. These estimates will be used in a sensitivity analysis that will be conducted on Native American diet and lifestyles.

Letters were sent to three tribes (Nez Perce, Umatilla, and Yakima) to express our appreciation for their cooperation.

Additional activities this reporting period included the following:

- completed a rough draft of the proposed demographic methods
- met with a TSP member to discuss options for estimating food consumption
- examined employee records as possible sources of demographic information
- revised a proposed approach to reconstructing milk production and distribution in the study area.

Major Problem Areas and Action Taken

None.
PLANNED WORK FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

- present general population and milk production, processing, and distribution proposals to the TSP
- develop a position paper on survey options for food consumption and milk industry surveys
- prepare a proposed approach for inferring milk intake
- complete preliminary prototypical models of the major dairy cow feeding practices used in the study area
- begin analysis of data on local fodder crops
- begin using USDA consumption studies to estimate food consumption for this area
- present proposals to the TSP during the September meetings to outline future work required to obtain information on population, diet, and lifestyles of the Indian tribes in the study area.
TASK 07  ENVIRONMENTAL PATHWAYS AND DOSIMETRY

OBJECTIVE

The objectives of this task are to use information developed by Tasks 03 through 06 to determine the concentrations of radionuclides in environmental media, and to use these data to estimate the potential exposures and resultant radiation doses to individuals and groups from past releases of radioactive materials from Hanford operations.

PROGRESS

The selection of "dominant" radionuclides released to the atmosphere and Columbia River was initiated. Environmental dosimetry computer codes are being used to help define the relative impact of each nuclide.

Preliminary classifications of the basic food types to be investigated for the Native American populations were determined.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Planned work for subsequent months includes the following:

• continue surface-water sensitivity studies
• continue determining dominant radionuclides
• continue determining key food pathways
• present a proposed approach to selecting dominant radionuclides to the TSP for review, evaluation, and approval.
TASK 08 INFORMATION RESOURCES

OBJECTIVE

The objectives of this task are to meet HEDR project information needs and to develop and maintain a microcomputer-based tracking and retrieval system.

PROGRESS

Activities this reporting period included the following:

• continued adding to the Information Resources Tracking Database
• provided documents to the task leaders and the TSP.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Planned work for subsequent months includes the following:

• continue adding input to the Information Resources Tracking Database
• address methods for using the Hanford General Usage Network (GUN).
TASK 09  RECORDS MANAGEMENT

OBJECTIVE

The objectives of this task are to provide storage and control of completed project records, maintain an automated inventory of all project documentation, and provide a reference service to project staff and others.

PROGRESS

Activities this reporting period included the following:

- developed procedures for duplication and transfer of completed project reports and supporting documents to the Public Reading Room at the Federal Office Building

- completed the first records transfer to the Public Reading Room

- continued to receive and process project records.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

- continue processing incoming project records.
TASK 10 QUALITY ASSURANCE

OBJECTIVE

The objectives of this task are to ensure continuous quality assurance (QA) support and coordination with all project tasks. These objectives are met through the identification and documentation of QA requirements in the form of a QA Plan and periodic monitoring of project activities during the life of the project to ensure compliance with these requirements.

PROGRESS

Revision 2 of the QA Plan was issued. The following statement was added to the QA Plan because of a recommendation from the TSP:

"All technical reports shall contain a summary of the quality assurance requirements that were followed. This summary should be brief and concise and should only address the QA requirements pertinent to the work/data addressed in the report."

Upcoming task activities continued to be reviewed so a surveillance plan can be drafted. This surveillance plan will help assure control of activities and should provide meaningful surveillance to the tasks.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Planned work for subsequent months includes the following:

• assist in implementation of QA program requirements

• help the Task Leaders prepare for the upcoming internal audit by performing surveillances and providing Quality Engineering assistance.
TASK 11 STATISTICS

OBJECTIVE

The objective of this task is to provide statistical modeling and analysis support for all HEDR tasks including sensitivity/uncertainty analyses of dose-estimation models.

PROGRESS

Activities this reporting period included the following:

- obtained commitments from PNL staff for Statistics Task activities in FY 1989
- prepared the FY 1989 budget for the Statistics Task
- began planning the project sensitivity/uncertainty analysis workshop to be held in Richland in early CY 1989
- began revising the report of the preliminary sensitivity/uncertainty analyses for doses from iodine-131 via the air transport pathway.

PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Planned work for subsequent months includes the following:

- conduct a sensitivity/uncertainty analysis on a preliminary model for estimating doses for individuals and populations exposed via the aquatic pathway
- conduct a sensitivity/uncertainty analysis workshop in early CY 1989
- assist the Environmental Monitoring Task with estimating (with quantified uncertainties) the proportion of environmental radionuclide concentrations that originated from Hanford as opposed to fallout from worldwide atmospheric tests
- assist the Demographics, Food Habits, and Agriculture Task to develop surveys for estimating (with quantified uncertainties) lifestyles, food consumption habits, dairy practices, and milk distribution patterns.