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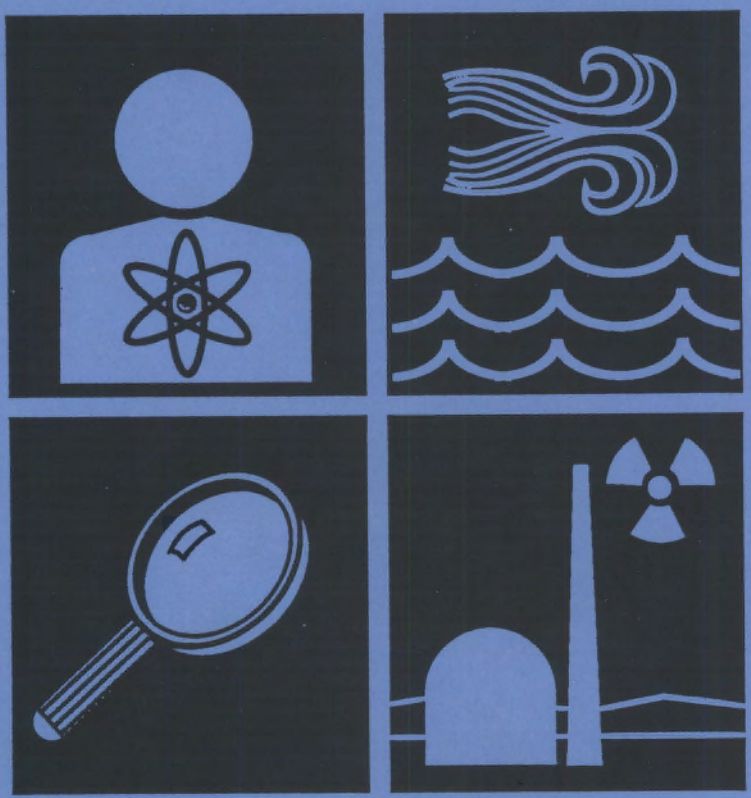
Hanford Environmental Dose Reconstruction Project

Monthly Report

April 1989



Prepared for the Technical Steering Panel

Work supported by
the U.S. Department of Energy
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HANFORD ENVIRONMENTAL DOSE RECONSTRUCTION PROJECT

Monthly Report

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Pacific Northwest Laboratory
Richland, Washington 99352

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HANFORD ENVIRONMENTAL DOSE RECONSTRUCTION PROJECT

Compiled by: B. S. Dennis
B. S. Dennis, Project Coordinator
Hanford Environmental Dose Reconstruction Project

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

Approved By: W. L. Templeton
W. L. Templeton, Manager
Office of Hanford Environment

PREFACE

This monthly report summarizes the technical progress and project status for the Hanford Environmental Dose Reconstruction (HEDR) Project (structure shown in Figure 1) 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 U.S. Department of Energy (DOE) funds the project.

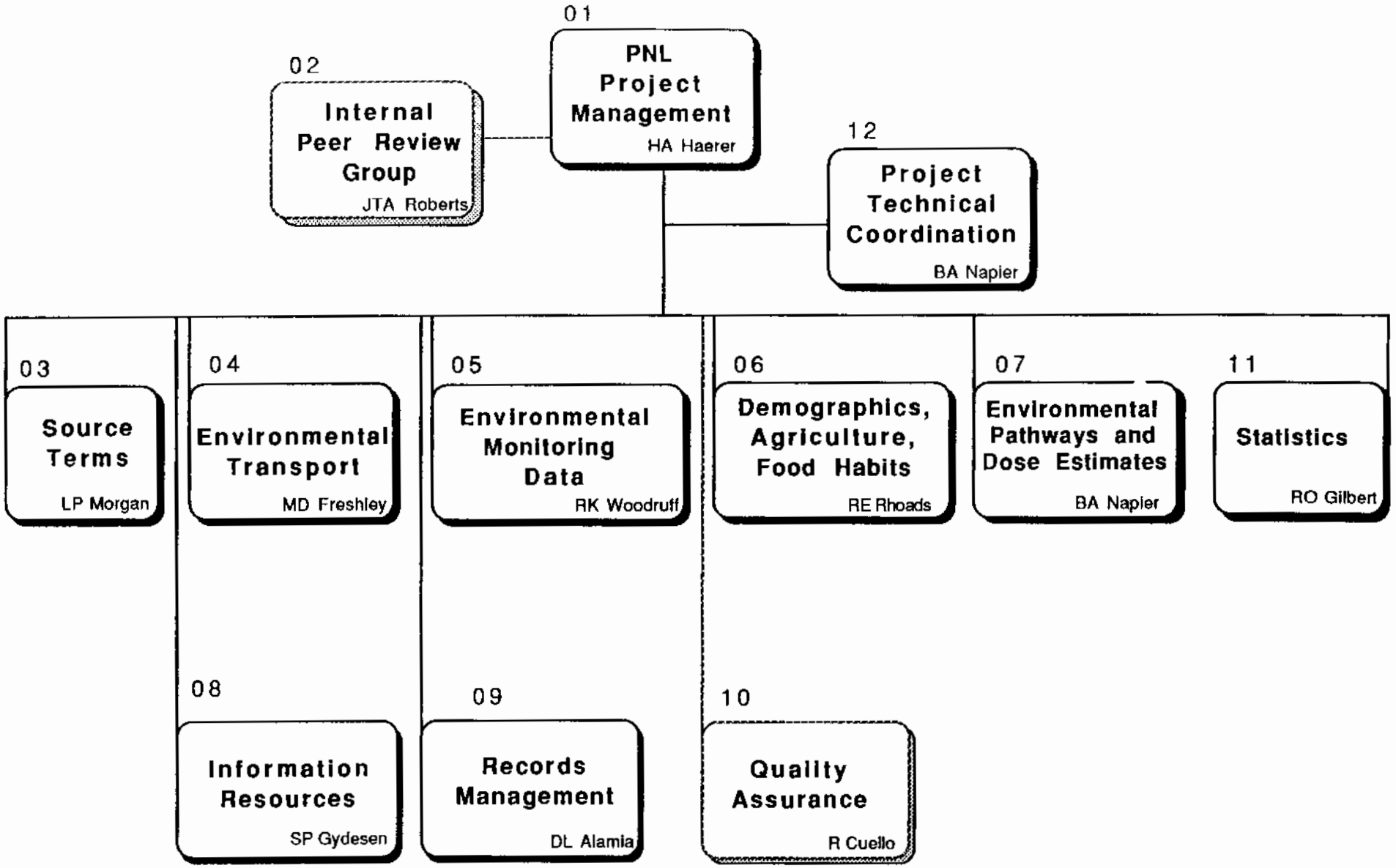

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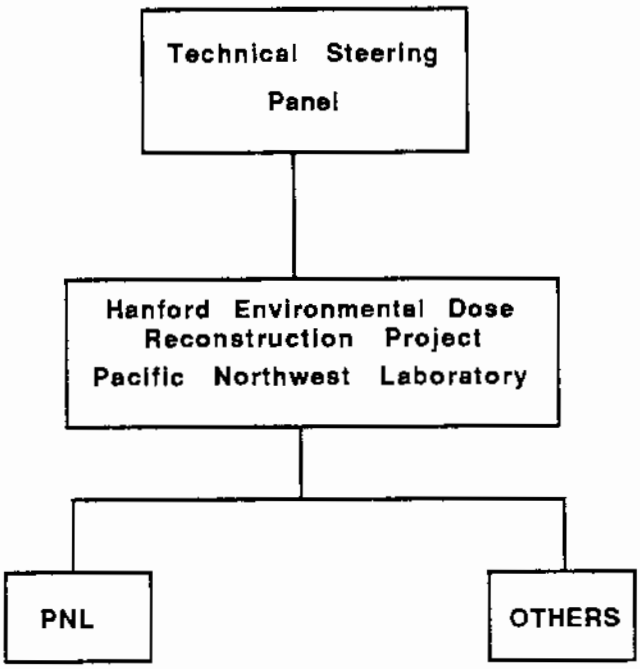
Figure 1. Hanford Environmental Dose Reconstruction Project Organization Structure

EXECUTIVE SUMMARY*

The objective of the Hanford Environmental Dose Reconstruction Project is to estimate the radiation doses that populations could have received from nuclear operations at Hanford since 1944. The project is being managed and conducted by Pacific Northwest Laboratory under the direction of an independent Technical Steering Panel.



The Technical Steering Panel consists of experts in environmental pathways, epidemiology, surface-water transport, ground-water transport, statistics, demography, agriculture, meteorology, nuclear engineering, radiation dosimetry, and cultural anthropology. Included among the members are appointed technical members representing the States of Oregon and Washington, cultural and technical experts nominated by the Indian tribes in the region, and an individual representing the public.

* This Executive Summary was approved by the Technical Steering Panel in September 1988.

The project is divided into the following technical tasks. These tasks address each of the primary steps in the path from radioactive releases to dose estimates:

- source terms
- environmental transport
- environmental monitoring data
- demographics, agriculture, and food habits
- environmental pathways and dose estimates.

The source terms task will develop estimates of radioactive emissions from Hanford facilities since 1944. These estimates will be based on historical measurements and production information.

The environmental transport task will reconstruct the movement of radioactive materials from the areas of release to populations. Movement via the atmosphere, surface water (Columbia River), and ground water will be studied.

The environmental monitoring task will assemble, evaluate, and report historical environmental monitoring data. A major effort of this task is to separate Hanford as a source of radionuclide concentrations in the environment from concentrations due to natural sources and nuclear testing fallout.

The demographics, agriculture, and food habits task will develop the data needed to determine the populations that could have been affected by the releases. Population and demographic information will be developed for the general population within the study area. This information will also be developed for several special population groups including the Native American Tribes in the study area, Army personnel stationed at Hanford, Hanford construction workers, and migrant farm workers.

In addition to population and demographic data, the food and water consumption patterns and sources of food and water for these populations must be estimated since these provide a primary pathway for the intake of radionuclides.

Historical dairy farming practices and milk distribution systems will be studied because milk is a significant pathway for iodine-131 to enter the human body. Cows could have eaten vegetation contaminated with this radionuclide.

The environmental pathways and dose estimates task will use the information produced by the other tasks to estimate the radiation doses populations could have received from Hanford.

Project reports, which have been approved by the Technical Steering Panel, and references used in the reports will be made available to the public in a public reading room. Project progress will be documented in monthly reports, which are available to the public.

MANAGEMENT SUMMARY

PROGRESS

This summary covers progress for the month of April 1989:

- completed the following scheduled milestones:*

  03 Radionuclide List/Decay Schemes
  03 Radionuclide Source Locations/Stacks/Stack Parameters
  03 Radionuclide Release Fractions by Major Facility as Function of Time for Gases, Particulates, Volatiles
  05 Obtain Preliminary River and Sediment Monitoring Data
  07 Milk Transfer Factors-CR (Day/Liter) as Function of Important Variables
  07 Forage-to-Milk Transfer Model-Mathematical Formulation w/Data/Computer Code "Module"
  07 Recommended Form for Deposition Velocity/Interception/Retention Model

- continued revision of Work Plan to reflect phased approach

- began incorporating comments from TSP Source Terms Subcommittee into draft report titled, *Recommendation Regarding Development of Libraries Specific to Hanford Reactors for ORIGEN Code*

- continued internal PNL clearance of draft report titled, *Description of Major Hanford Site Oprations and Facilities, 1944-1972*

- began preparing information to be presented at the May TSP meeting on the Columbia River between Priest Rapids Dam and McNary Dam for the time period 1964 through 1966

- completed a draft report summarizing the approach selected for atmospheric modeling

- continued developing data bases on meteorological and numerical data

- met with representatives of the Colville, Spokane, Yakima, and Nez Perce tribes to discuss contracts, data collection, proposal revisions, and other aspects of the HEDR Project

* All milestones are internal unless otherwise indicated. All internal milestones contribute to the Phase I report.

- verified population estimation methods against QA standards and sent to demographic consultants for review
- continued development of an integrated computational scheme for the calculation of doses as a function of location and time
- revised the QA plan to reflect the current needs of the HEDR Project
- developed a strategy and began writing a report on conducting uncertainty analyses of doses for Phase I
- continued declassifying early-day, Hanford-originated documents of potential interest/use in the HEDR Project.

MAJOR ISSUES AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

- present project status update, an overview of the project computational modeling scheme, and other project information at the TSP meeting scheduled for May 18-20 in Toppenish, Washington
- complete the following milestones in May:

  03 Radionuclide Source Terms from Fuel Processing 1944-1947
  03 Focus Radionuclide Release Fractions on Dominant Radionuclides
  03 Description of Chemical Form and Atmospheric Chemistry of Iodine Emissions
  03 "Best Estimate" of I-131 Contained in Irradiated Fuel at Time of Dissolution, 1944-1945
  05 Develop Concentration Ratios
  06 Native American Traditional Diet Description (Air Pathway)
  06 Census District Boundaries Plotted on Map
  06 Native American Traditional Diet Description (River Pathway)
  07 Create Fish Model
  07 Agricultural Product Soil-to-Plant Transfer Factors
  12 List Dominant Radionuclides

- continue revision of project work plan to reflect phased approach
- continue to add input to numerical data base and define the structure of the HEDR data base

- complete numerous reports regarding source term calculations, iodine emissions and estimations, and Hanford operations
- continue to review environmental monitoring reports
- place contracts with several Indian tribes
- continue to assess the use of historical bioassay data
- continue to declassify reports that address activities from startup to about mid-year 1945
- issue remaining technical procedures
- complete report identifying the strategy and plans for conducting sensitivity/uncertainty analyses for Phase I work
- conduct sensitivity/uncertainty analyses on vegetation measurements and the fish ingestion pathway
- review and develop methods for ensuring that all significant Hanford emissons have been identified.

BUDGET STATUS

Projected expenditures through April 1989	$ 1702K
Actual expenditures through April 1989	$ 1834K

VARIANCE EXPLANATION

The cumulative costs to date exceed the planned costs by less than 10%, but show a slight increase over the last three months in the rate of expenditures. This trend reflects the reprioritization of activities in accordance with the phased approach which was implemented in March 1989. Proposed project activities are being reviewed to bring the rate of expenditures in line with plans.

The Project Technical Coordination (Task 12) milestone, *List Dominant Radionuclides* reflects a deviation from the originally scheduled date. This milestone will list those radionuclides of significant importance to Phase I work and be completed in May.

CAPITAL STATUS

No FY 1989 capital budget.

PROJECT SUMMARY REPORT *

1. IDENTIFICATION NUMBER:	2. PROGRAM/PROJECT TITLE:	3. REPORTING PERIOD:
DE-AC076RLO 1830	HANFORD ENVIRONMENTAL DOSE RECONSTRUCTION	APRIL 1989

4a. PARTICIPANT NAME AND ADDRESS:	4b. CLIENT NAME AND ADDRESS:	5. START DATE:
PACIFIC NORTHWEST LABORATORY P. O. BOX 999 RICHLAND, WA 99352	DOE/RL RICHLAND WA 99352	OCTOBER 1988
		6. COMPLETION DATE: SEPTEMBER 1989

7. FY 89 | 8. MONTHS

9. COST STATUS:

a. $ EXPRESSED IN THOUSANDS

b. BUDGET & REPORTING NO./SUB. ACCT NO.
12578
GEO2210110

c. FIN. NO.

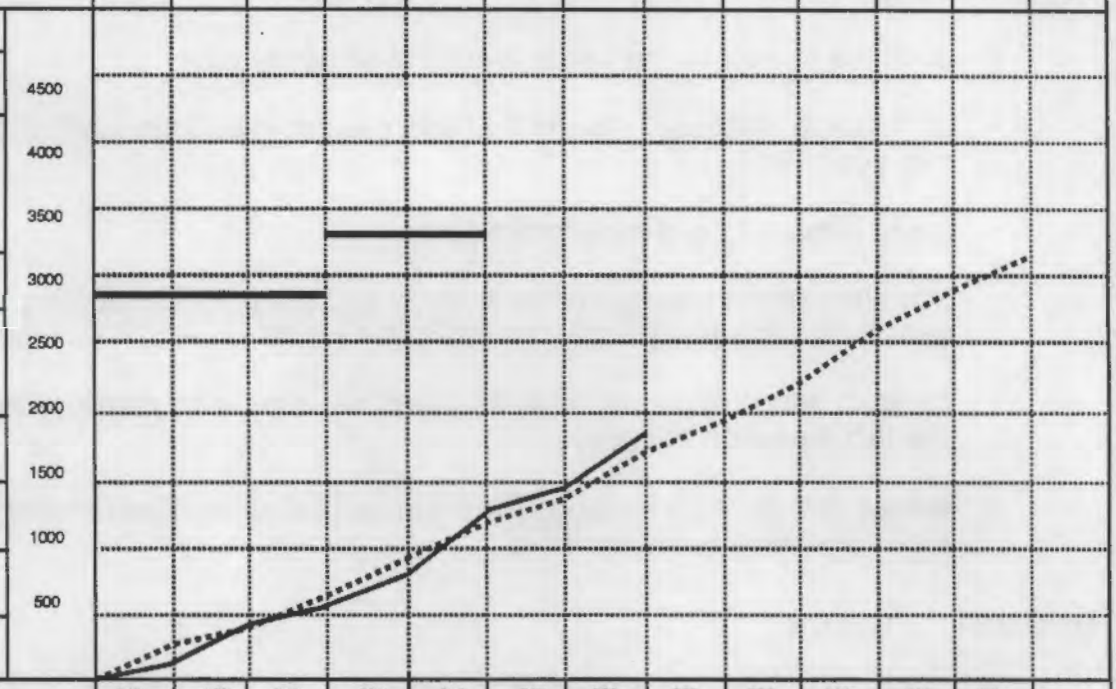
d. ACTUAL COSTS PRIOR YEARS
3016

e. FY BUDGET
3289

f. TOTAL BUDGET

g. FY FUNDS AUTH
3289

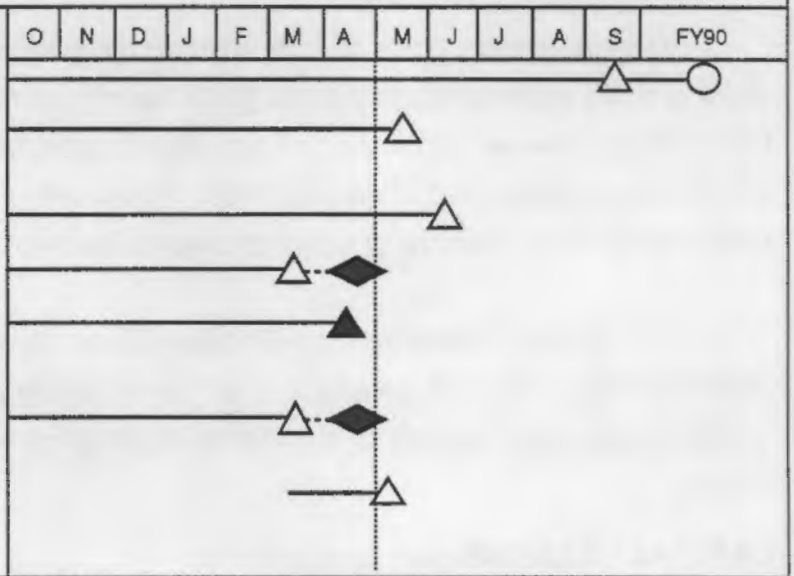
h. TOTAL FUNDS AUTH
5822



COSTS	O	N	D	J	F	M	A	M	J	J	A	S	FY90
I. PLANNED	203	162	312	253	212	260	300	260	320	280	320	400	
J. ACTUAL	193	178	275	180	398	241	362						
K. VARIANCE	10	-16	37	73	-186	19	-62						
L. CUM PLANNED	203	365	677	930	1142	1402	1702	1962	2282	2562	2882	3282	
M. CUM ACTUAL	193	371	646	834	1231	1472	1834						
N. CUM VARIANCE	10	-6	31	96	-89	-70	-132						

10. LEGEND: PLANNED ------ ACTUAL ——— PROJECTED ..... FUNDS AUTH. ——— 90% FUNDS SPENT ▷

11. MILESTONES



01 Phase I Report

03 Radionuclide Source Terms from Fuel Processing 1944-1947

03 Dissolution Dates for Purex 1984-1986

03 Radionuclide List/Decay Schemes

03 Radionuclide Source Locations/Stacks/Stack Parameters

03 Radionuclide Release Fractions by Major Facility as Function of Time for Gases, Particulates, Volatiles

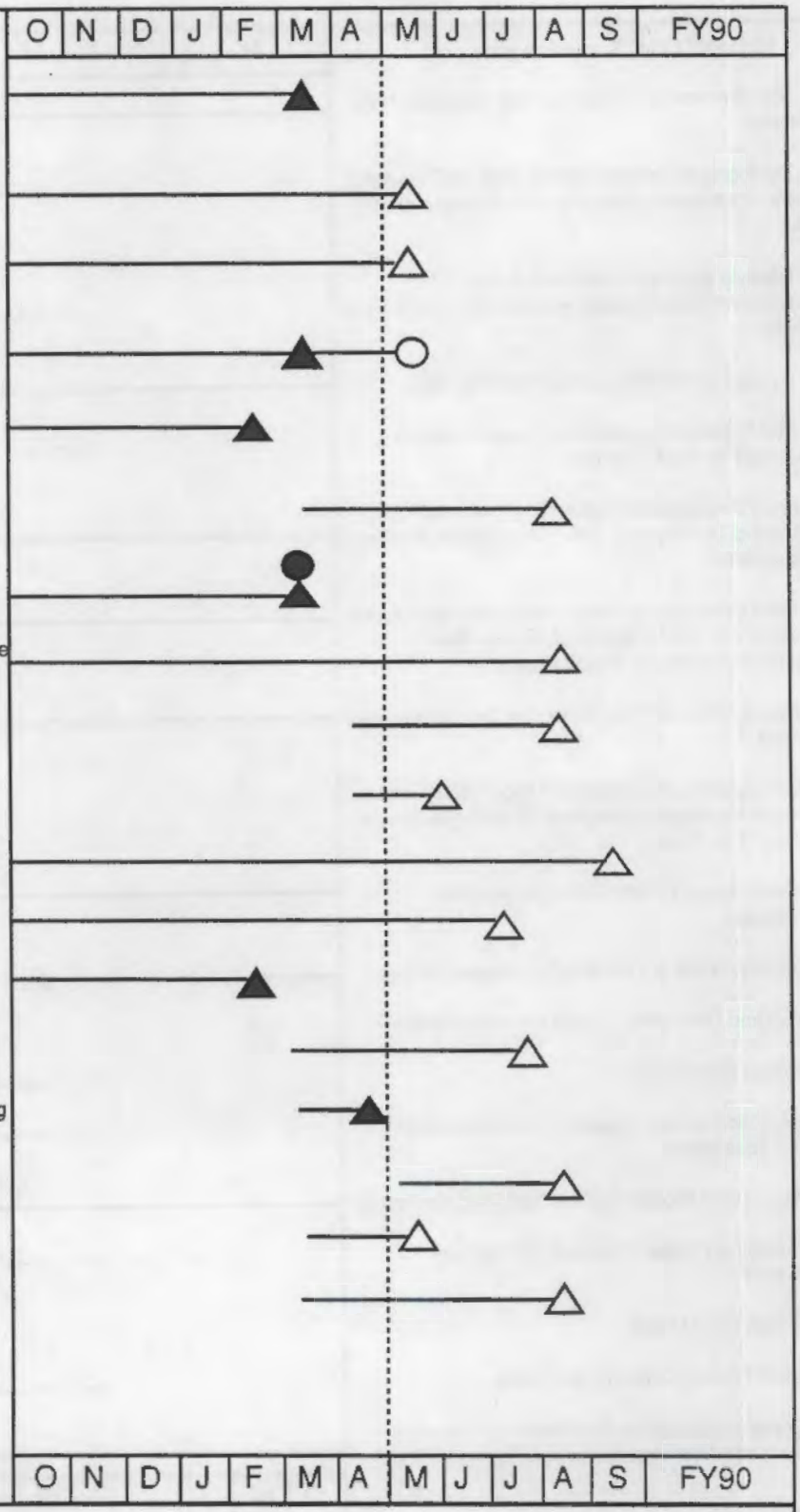
03 Focus Radionuclide Release Fractions on Dominent Radionuclides

LEGEND: SCHEDULED △ TO TSP ○ TIME LINE ——— PROPOSED DEVIATION - - - - - - - TIME NOW:
COMPLETED ▲ ● DEVIATION ◇ PROGRESS ——— APPROVED DEVIATION ::::::::

12. NAME/SIGNATURE OF PARTICIPANTS PROG/PROJ MANAGER & DATE
H A Haerer

PROJECT SUMMARY REPORT

11. MILESTONES, continued



LEGEND:

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COMPLETED ▲ ● DEVIATION ◇ PROGRESS ═══ APPROVED DEVIATION ·····

12. NAME/SIGNATURE OF PARTICIPANTS PROG/PROJ MANAGER & DATE

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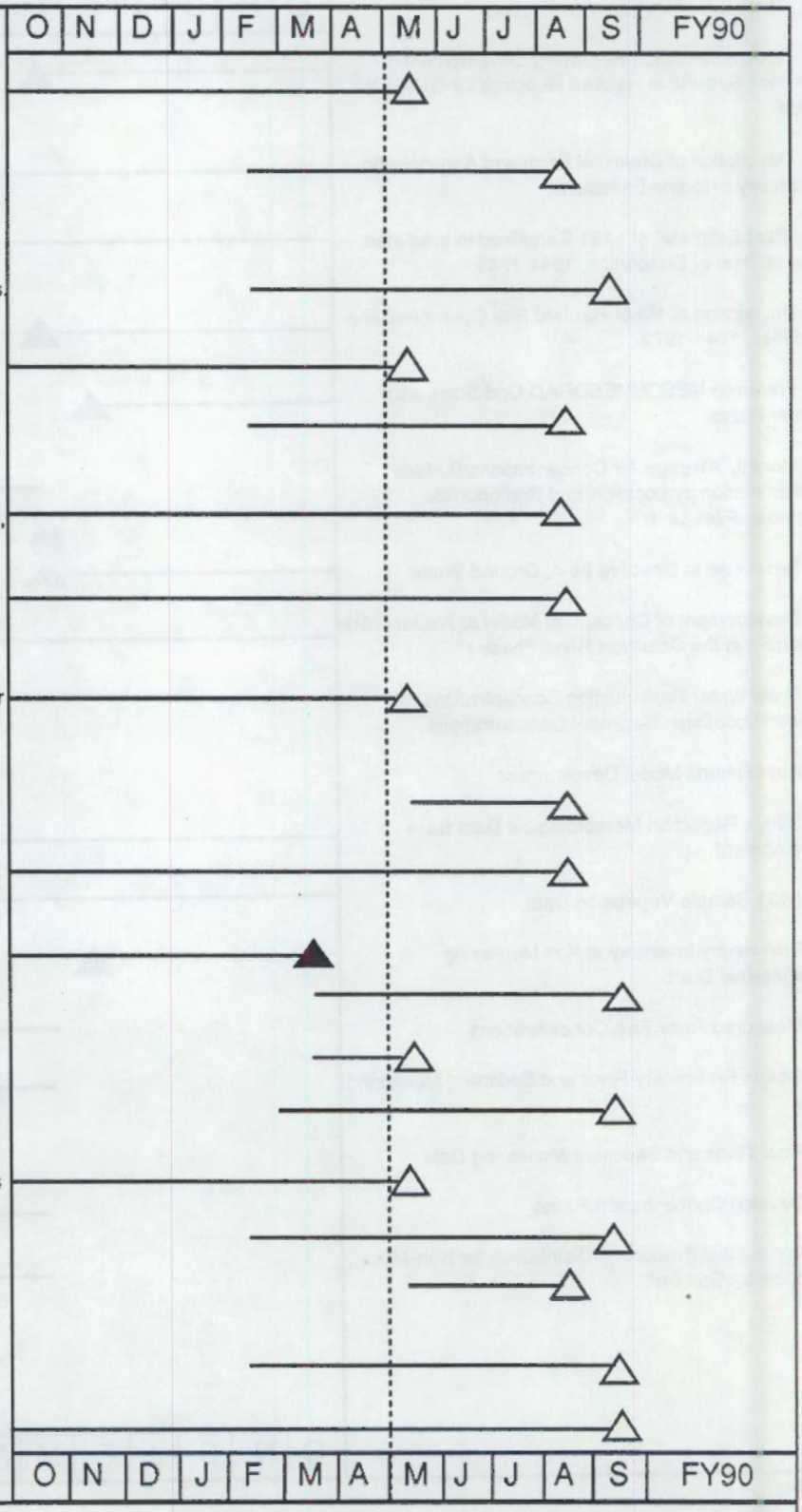
PROJECT SUMMARY REPORT

11. MILESTONES, continued



LEGEND:

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COMPLETED ▲ ● DEVIATION ◇ PROGRESS ▬▬ APPROVED DEVIATION ▪▪▪▪▪

12. NAME/SIGNATURE OF PARTICIPANTS PROG/PROJ MANAGER & DATE

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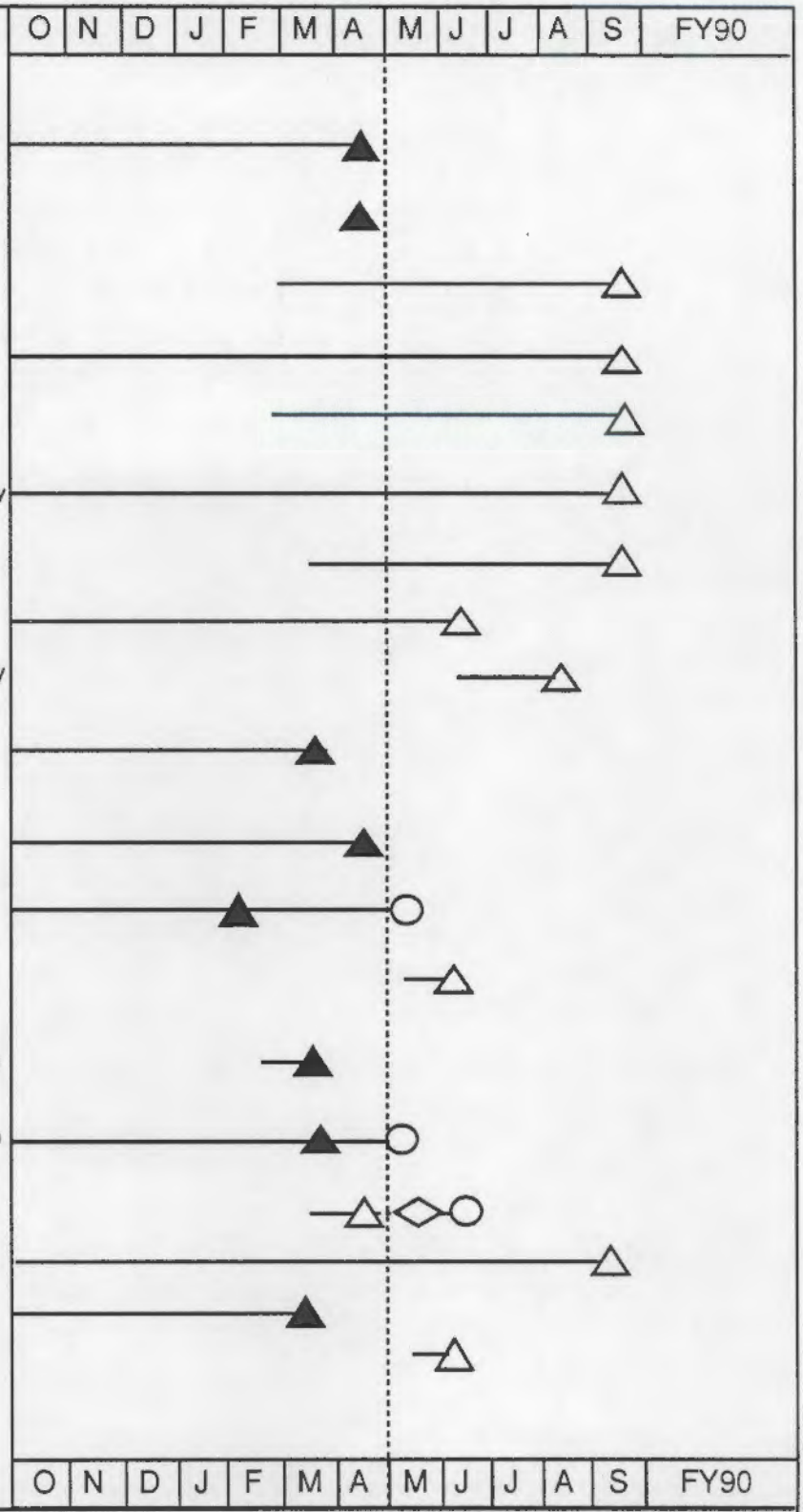
PROJECT SUMMARY REPORT

11. MILESTONES, continued



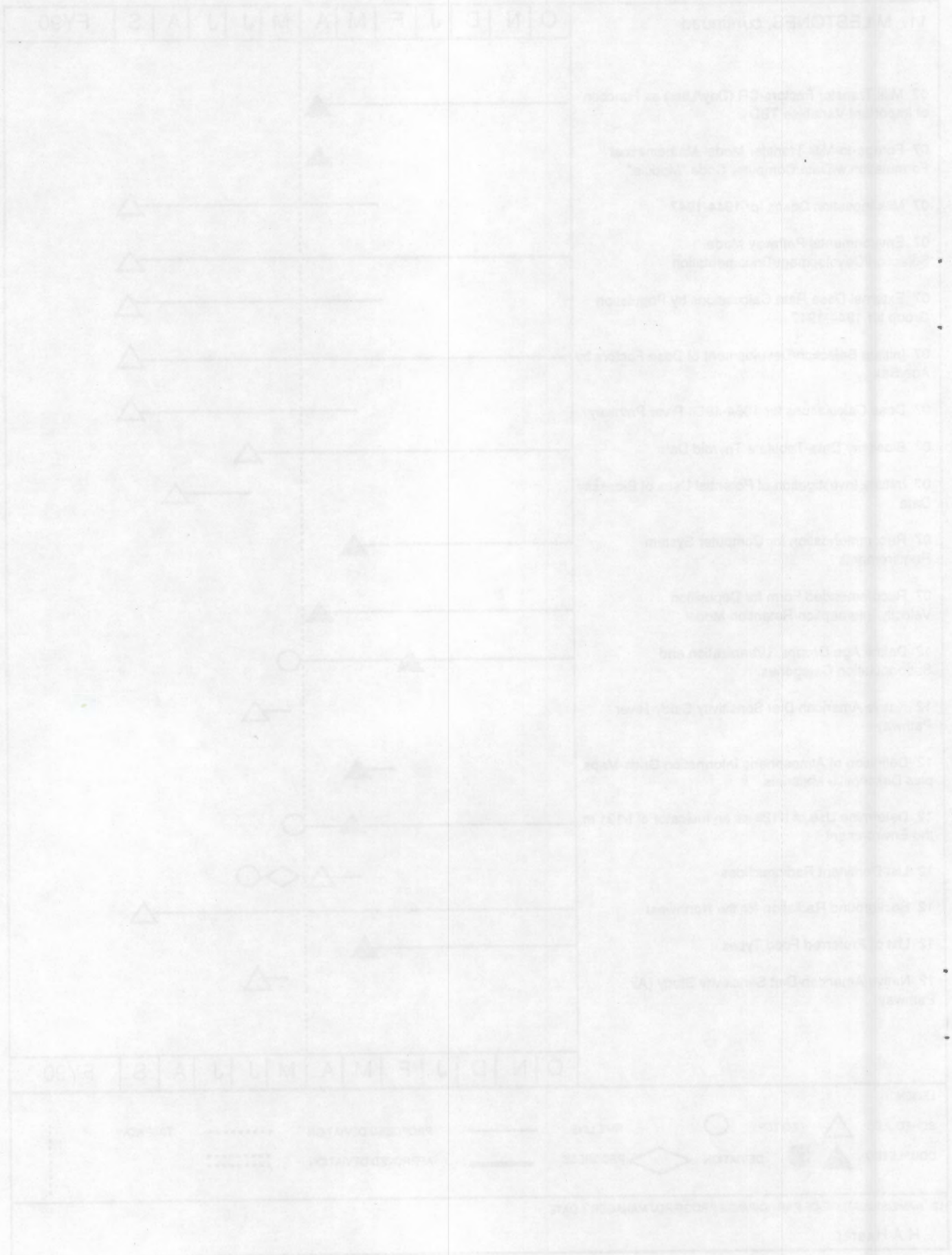
LEGEND:

SCHEDULED TO TSP TIME LINE PROPOSED DEVIATION TIME NOW

COMPLETED DEVIATION PROGRESS APPROVED DEVIATION

12. NAME/SIGNATURE OF PARTICIPANTS PROG/PROJ MANAGER & DATE

H A Haerer



CONTENTS

FIGURES

Source Terms

OBJECTIVE

Source terms are the amount and type of radioactive materials released to the environment. Members of the Source Terms Task will develop estimates of radioactive emissions since 1944 from Hanford facilities based on historical measurements and production information. Source term estimates will be used by Environmental Transport Task members to reconstruct the concentrations of radionuclides in the environment.

Uncertainty in calculated and measured data can result from many factors. Uncertainties in measured emissions may result from early measurement techniques; for calculated emissions, the from differences in the published variables that are used to perform calculations. By comparing the uncertainty in the available data, task staff will determine the most accurate method for developing source terms. For time periods where measured values do not exist, source terms must be calculated from available information. The proposed methods and results of this task will be reviewed, evaluated, and approved by the TSP.

PROGRESS

Activities for this reporting period included the following:

- scheduled a working session with members of the TSP's Source Term Subcommittee for May 18, 1989. Task activities, status of activities, and schedule for completion of task activities will be discussed.

- allocated task funding in accordance with authorized Phase I activities

Milestone 03, *Radionuclide Source Locations/Stacks/Stack Parameters*, due April 1989:

- identified the major source locations of radionuclide emissions to the atmosphere at the Hanford Site. Source locations are primarily stacks associated with production reactors (100 Area), the Plutonium Recycle Test Reactor (300 Area), fuel processing facilities (200 Areas), and the process engineering facility (324 Building) in the 300 Area. Stack heights, diameters, and stack flows were obtained.

Milestone 03, *Description of Major Hanford Site Operations and Facilities, 1944-1972*, due March 1989:

- continued internal PNL clearance of the draft report completed in March 1989. The internal PNL milestone was completed; the report will be submitted to the TSP in May 1989.

Milestone 03, *Radionuclide List/Decay Schemes*, due March 1989:

- identified significant radionuclides released to the atmosphere and prepared a draft report describing their decay schemes

Milestone 03,*Radionuclide Release Fractions by Major Facility as Function of Time for Gases, Particulates, Volatiles*:

- prepared a preliminary report on the fraction of various radionuclides released to the atmosphere from fuel processing plants, 1944-1947

Milestone 03, *Radionuclide Source Terms from Fuel Processing, 1944-1947*, due May 1989:

- prepared a preliminary draft table of atmospheric emissions from fuel processing, 1944-1947; data were obtained from Hanford Site documents

Milestone 03, *Dissolution Dates for PUREX 1984-1986*, due June 1989:

- continued to identify the sources of information necessary to determine the fuel dissolution dates at the PUREX Plant, 1984-1986. This information will be used to help calibrate the atmospheric transport model.

Milestone 03, *Recommendation Regarding Development of Libraries Specific to Hanford Reactors for ORIGEN Code*:

- began revising the draft report completed in March 1989 to incorporate informal review comments received from the TSP's Source Terms Subcommittee during the March working session

Milestone 03, *Description of Chemical Form and Atmospheric Chemistry of Iodine Emissions*, due May 1989:

- began preparing a report describing the chemical form and atmospheric chemistry of iodine emissions at the Hanford Site

Milestone 03, *Best Estimate of Iodine-131 Contained in Irradiated Fuel at Time of Dissolution, 1944-1945*, due May 1989:

- began preparing a report documenting the calculated estimates of iodine-131 contained in irradiated fuel at the time of its dissolution, 1944-1945.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

- complete PNL clearance of the draft report titled *Uncertainties in HEDR Source Term Calculations Using ORIGEN 2*
- complete the report describing the chemical form and atmospheric chemistry of iodine emissions at the Hanford Site
- complete the report documenting the calculations estimating the quantity of iodine-131 contained in irradiated fuel at the time of its dissolution, 1944-1945
- complete PNL clearance of the draft report titled *A History of Major Hanford Operations Involving Radioactive Material*
- continue acquiring and documenting information regarding radioactive emissions to the atmosphere from fuel processing, 1944-1947
- continue obtaining information for determining fuel dissolution dates at the PUREX Plant, 1984-1986
- prepare a preliminary report focusing on the radionuclide release fractions of the dominant radionuclides
- continue data input to task numerical data base.

Environmental Transport

OBJECTIVE

Members of the Environmental Transport Task will reconstruct the movement of radioactive materials (the source term information) from the areas of release to the accessible environment. Movement via the atmosphere, Columbia River, and ground water will be studied.

To track the releases to the atmosphere from the Hanford Site, meteorological data are needed including wind speed, wind direction, and other data that affect the dispersion of the releases. Mathematical models will be applied to these meteorological data and the source term data to calculate concentrations of radionuclides in the air and on the ground. The TSP will review, evaluate, and provide direction concerning the proposed models.

Reconstruction of the transport of radionuclides in the Columbia River will be based primarily on historical studies of the Columbia River and its tributaries. Computer models will be used to reconstruct radionuclide concentrations in the river for time periods when data were limited or unavailable.

The movement of radionuclides in the ground water will be initially reconstructed by using ground-water monitoring data to estimate the contribution to the surface-water pathway. As in the case of the surface-water pathway, some modeling might be required where data are lacking.

PROGRESS

Activities for this reporting period included the following:

- began preparing a summary of available information for the Columbia River between Priest Rapids Dam and McNary Dam for a poster to be presented to the TSP. Source term, hydrologic, monitoring, demographic, recreational, water use, and dosimetry information for the 1964 to 1966 time period will be displayed.

Milestone 04, "Development of Conceptual Model of Radionuclide Transport in the Columbia River/Phase I," due August 1989:

- continued evaluating several reports in preparation for summary of the conceptual model of flow and radionuclide transport in the Columbia River

- provided source-term discharge, hydrographs, and radionuclide transport information for input to the poster presentation

Milestone 04, "Atmospheric Model Development," due June 1989:

- completed a draft report summarizing the selection of an approach to modeling the transport and diffusion of radionuclides released to the atmosphere by Hanford Site operations. The draft report is undergoing technical peer review.

- continued developing the atmospheric model for Phase I work

- continued studies on relating the local Hanford Site wind field patterns to regional wind field information. The ability to translate regional wind field information into more detailed descriptions of wind field patterns near the Hanford Site will allow more detailed descriptions of winds at the Site during the 1940s and 1950s than is currently available.

Milestone 04, "Status Report on Meteorological Data Base Development," due September 1989:

- continued developing the meteorological data base by entering meteorological data from the National Climatic Data Center.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

WORK PLANNED FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

- continue entering meteorological data into the computer data base

- complete internal review of the draft document summarizing the selection of an approach to modeling the transport and diffusion of radionuclides released to the atmosphere

- continue atmospheric transport model development for Phase I work

- review environmental monitoring data of the Columbia River provided by Environmental Monitoring Data Task members, to identify gaps in the data in space and time

- continue preparing a poster summarizing available information about the Columbia River between Priest Rapids Dam and McNary Dam for 1964 through 1966.

Environmental Monitoring Data

OBJECTIVE

Members of the Environmental Monitoring Task will assemble, evaluate, and summarize key historical measurements of the concentrations of radionuclides in the environment around Hanford. Radionuclide concentrations have been measured at various times in such media as air, drinking water, foods, fish, the Columbia River, soil and in other sample materials. These measurements will be evaluated to estimate their accuracies and then used by Environmental Pathways and Dose Estimates Task staff to estimate radiation doses and by Environmental Transport Task staff to calibrate computer models. A major objective of this task is to separate Hanford operations as a source of radionuclide concentrations from concentrations resulting from natural sources and fallout from worldwide atmospheric tests. Methods to attain this objective will be proposed to the TSP for review, evaluation, and approval.

PROGRESS

Activities for this reporting period included the following:

Milestone 05, *Obtain Preliminary River and Sediment Monitoring Data 1964-66*, now complete:

- distributed preliminary data to other tasks to assist in technical scoping and preliminary assessments

Milestone 05, *Develop Preliminary Inventory of Key Monitoring Data/Internal Draft*, due February 1989, now complete for Phase I:

- continued adding to the inventory as new information arises in the course of other work

Milestone 05, *Determine Fish Concentration Ratios 1964-66*, due May 1989:

- continued collecting fish flesh concentration data and summarizing it into a data base

Milestone 05, *Determine Vegetation Iodine-131 Concentrations*, 1945-47, due June 1989:

- provided preliminary information concerning biases in vegetation data to Statistics Task members to provide a basis for technical scoping of the effort to quantify uncertainties in early vegetation data
- began attempting to trace reported vegetation data to original laboratory record sheets

Milestone 05, *Determine Measured Fish Concentrations 1964-66*, due August 1989:

- continued preparing a preliminary data summary by year, season, river section and species for the years 1963-1966
- continued preparing preliminary raw data for Statistics Task members for technical scoping.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTH

Work planned for subsequent months includes the following:

- continue reassessment and revision of draft report on vegetation biases
- begin evaluating monitoring data for radionuclides in river water, sediment and fish to identify and evaluate biases
- complete exploratory effort to verify reported vegetation results.

Demographics, Agriculture, Food Habits

OBJECTIVE

Task members will develop the demographic, food consumption, and food production information needed to estimate doses.

Demographic information will be developed for the general population and for several special population groups that are not adequately represented by the U.S. Census, including Native American tribes, Army personnel stationed at Hanford, some Hanford construction workers, and migrant workers.

In addition to demographic data, the sources and quantities of food and water consumed must be estimated, because food and water provide pathways for the intake of radionuclides.

Airborne radionuclides from the plant stacks may have been deposited on fruits and vegetables. Consumption of these foods provided a pathway for radionuclide transport to humans. The pathways will be studied. In addition, milk produced from cows represents a significant food pathway for iodine-131 if the cows were fed vegetation contaminated with radionuclides. Dairy farming practices and milk distribution systems will be studied to locate the populations that may have consumed potentially contaminated milk.

Consumption of contaminated fish and shellfish is also a food pathway for exposure to radioactive materials. Estimates of the amount of potentially contaminated fish and shellfish consumed from the Columbia River and ocean bays will be developed through an extensive review of numerous past studies.

Treated Columbia River water was used by some community members downstream from Hanford. Drinking this water provided a pathway for exposure to radioactive materials. To estimate the doses from this pathway, it is necessary to know the communities using the water, the amount of water withdrawn, the treatment process, the travel time through the system, and the amount of water consumed. Irrigation water usage downstream from Hanford will also be studied because the radioactive materials in the river water could have been deposited on crops consumed by people or animals.

Recreational users of the river could also have been exposed to radiation from the river and shoreline. Food and lifestyle habits of Native Americans that differentiate them from the general population will also be considered. Methods to collect data and to estimate population densities and food consumption have been proposed to the TSP for review, evaluation, and approval.

PROGRESS

Activities for this reporting period included the following:

Milestone 06, *Native American Traditional Diet Description (Air Pathway)* and *Native American Traditional Diet Description (River Pathway)*, due May 1989:

- attended the Northwest Citizens Symposium on Hanford Waste Clean-up to discuss the HEDR Project with representatives of the Yakima and Umatilla Tribes
- met with tribal council members and technical staff on the Colville Indian Reservation on April 17, 1989 to discuss the Indefinite Quantity (IQ) contract and HEDR data collection
- met with tribal council members and technical staff on the Spokane Reservation on April 24, 1989 to discuss the IQ contract and other aspects of the HEDR Project
- met with representatives of the Yakima Indian Nation in Richland on April 25, 1989 to discuss the HEDR Project
- met with tribal technical staff on the Nez Perce Reservation on April 26, 1989 to discuss the revision of the proposal that they had submitted to PNL

Milestone 06, *Milk Production/Distribution/Consumption for 1944-1947 for Each Grid Cell*, due August 1989:

- held planning meeting to develop strategy for workshop on expert judgment
- began reviewing Columbia Basin Irrigation Project information
- identified key contacts who can provide milk distribution information for Umatilla and Morrow counties

- began initial computer modelling of milk information in conjunction with members of the Environmental Pathways and Dose Estimates and Statistics Tasks

Milestone 06, *Demographic Information for 1944-1947 by Age Group, Urbanization Category, and Subpopulation by Year* and *Demographic Information for 1964-1966 Number and Age/Urbanization/Subgroup for River Recreation, Drinking River Water*, due August 1989:

- checked all three of our population estimation methods according to quality assurance standards, and produced estimates using the three methods. The estimates and documentation of the final methods were sent to our demographic consultants for review.

Milestone 06, *Food Consumption Parameters 1944-1947 for Each Food Type by Age, Sex, Urbanization, Category, Subpopulation,* and *Food Consumption Parameters 1964-1966 Kg/Mo Consumed for Each Food Type by Age, Sex, Urbanization Category, Subpopulation*, due August 1989:

- processed data tapes from 1977 Food Consumption Surveys, which were conducted by the U.S. Department of Agriculture

- coded foods into HEDR-related food categories

Milestone 06, *Location and Quantity of Irrigation Water Withdrawals*, due August 1989:

- collected information on water withdrawals from the Columbia River prior to January 1, 1967. The Washington State Department of Ecology (Spokane office) sent water withdrawal information to HEDR staff. Staff visited the Department of Ecology's office in Yakima to collect data.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

- place Indefinite Quantity contracts with several tribes

- develop rough estimates of Native American diet from published sources

- incorporate external reviewer comments and complete a final report on the population estimates for the HEDR study

- review methods for identifying differences in regional and seasonal food consumption with representatives from the Statistics Task

- complete Phase I food consumption estimation process by mid-June 1989.

Environmental Pathways and Dose Estimates

OBJECTIVE

Task members will use calculated and measured concentrations of radionuclides provided by members of the Environmental Transport Task and the Environmental Monitoring Data Task to calculate doses to populations, typical individuals, and specific individuals. These calculations will include doses via direct transfer of radionuclides from concentrations in air and water to people (via breathing, drinking, immersion, etc.). The calculations will also include doses via radionuclide concentrations in air and water transferred through environmental pathways, such as soil, plants, animals, and fish, to people. All significant decisions on exposure models and input parameters will be presented to the TSP for review, evaluation, and approval.

PROGRESS

Activities for this reporting period included the following:

Milestone 07, *Recommended Form for Deposition, Velocity Interception/Retention Model*, due April 1989, complete:

- defined the method to be used in Phase 1 of calculating deposition of radionuclides and interception on vegetation from atmospheric releases. A two-part calculation will be used: the atmospheric dispersion model will incorporate a bulk deposition model that includes consideration of meteorological conditions and radionuclide type (i.e., noble gas, reactive gas, or particle); the interception model will be a filtration model considering plant type, biomass, and time of year.

Milestone 07, *Milk Transfer Factors as Function of Important Variable*, completed:

- developed preliminary milk transfer factors (final values will be part of final dose calculations)

Milestone 07, *Forage-to-Milk Transfer Model - Mathematical Formulation with Data/Computer Code Module*, completed:

- developed forage-to-milk transfer model as part of integrated computational scheme

Milestone 07, *GIS and Data Base System Recommendation*, due September 1989:

- continued development of an integrated computational scheme for the calculation of doses as a function of location and time. This computational scheme provides a framework for the development of the numerical data bases required of the other technical tasks. The scheme applies concepts of matrix algebra, and includes the ability to calculate dose uncertainties as an integral part of the overall computation.

- began recruiting staff members to prepare the computer codes necessary to implement the integrated computational scheme

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

- continue identifying dominant radionuclides, key food pathway definitions, radiation dose factors, and model selection and rationale

- continue defining the overall structure of the necessary HEDR data base and data processing equipment needed for smooth project integration

- continue establishing a subtask on the use of historical bioassay data.

Information Resources

OBJECTIVE

Members of the Information Resources Task will work with the other task members to meet information needs, including ensuring that all data referenced in the reports are publicly available and establishing a microcomputer-based tracking system for ready retrieval of historical information.

PROGRESS

Activities for this reporting period included the following:

- declassified 26 early-day, Hanford-originated documents of potential interest/use in the HEDR Project and provided them to appropriate task leaders and the public domain
- provided the DOE-RL Public Reading Room with approximately 15 Hanford-Site originated documents of potential interest/use in the HEDR Project. Approximately 200 remain to be sent.
- edited the bibliography for the Source Terms Task document entitled *A History of Major Hanford Operations Involving Radioactive Material*
- identified key, early-day memorandum addressing the extensive meteorological studies made at Hanford during 1943-44
- identified several memoranda that address activities during December 1945 that explain the higher concentrations of iodine-131 in vegetation data
- added new citations to the tracking system.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Planned work for subsequent months includes the following:

- continue to add input to the information resources tracking data base

- continue to provide documents to the DOE-RL Public Reading Room in an orderly, timely fashion

- develop a list of Hanford-originated raw data logs/notes of potential interest/use to the HEDR Project

- declassify, with or without deletions, duPont operating history volumes that address activities from startup to about mid-year 1945

- identify and collect documents that address effluent releases from 1964-66 and tabulate reactor "downtime" dates in 1966

- identify and collect significant documents that address silver reactor capabilities, performance, and incidents, especially at the Redox Plant

- continue to identify and collect documents and/or data of potential interest/use to the HEDR Project that address activities during the years from reactor startup through 1949.

Records Management

OBJECTIVE

Members of the Records Management Task 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 the TSP.

PROGRESS

Activities for this reporting period included the following:

- processed 100 project documents totaling 781 pages
- transferred 15 documents totaling 269 pages to the DOE-RL Public Reading Room.

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
- continue transferring processed project records to the DOE-RL Public Reading Room.

Quality Assurance

OBJECTIVE

The objective of this task is to ensure continuous quality assurance (QA) support and coordination with all project tasks. This objective is 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

Activities for this reporting period included the following:

- performed a surveillance on the supporting documentation for the iodine-131 infant thyroid analysis (1946). Documentation checked included input and output of the application of the computer software and hand calculations. Compliance to applicable QA requirements was adequate.
- issued training assignments for the HEDR staff in the Demographics, Agriculture, Food Habits Task
- developed guidelines for identifying the QA requirements addressed in work described in HEDR Project reports
- revised the QA Plan to reflect the current needs of the HEDR Project; the revised QA Plan will be included in the revised project work plan
- attended a media communication skills course that provided for positive interaction with the news media and the public
- prepared input on the QA Task for the revised project work plan.

MAJOR PROBLEM AREAS AND ACTIONS TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

- assist in implementing QA program requirements for HEDR staff training and software control requirement identification
- perform surveillance of software control requirements
- issue revised QA Plan (OHE-3, Revision 3) as part of the revised project work plan
- issue remaining HEDR procedures: HEDR-TP-3, *HEDR Documentation of Critical Decisions* and HEDR-TP-4, *HEDR Data Quality Objectives.*

Statistics

OBJECTIVE

Task members will provide statistical support to members of technical tasks and will be responsible for the development and application of sensitivity and uncertainty analyses. Sensitivity analyses will identify parameters that have the greatest influence on the dose estimates. Using sensitivity analyses results project staff can focus project resources where the benefit in terms of accurate dose estimates is greatest. Uncertainty analyses enable the task leaders to determine the extent to which the accuracy and precision of the dose estimates are influenced by certain levels of accuracy and precision in the many input parameters.

PROGRESS

Activities this reporting period included the following:

- the following work contributes to a milestone of the Environmental Pathways and Dose Estimates Task, *Preliminary Dose Estimates, Air Pathway 1944-1947,* to be completed in September 1989:

    - developed a strategy for conducting uncertainty analyses of doses for Phase I . The strategy involves estimating doses and uncertainties of doses via the use of matrices that correspond to submodels of the dose estimation model. Both the doses and their uncertainties will be obtained using a single code using computer simulations.

    - began writing the computer code that will estimate doses and their uncertainties

    - began writing a report that identifies the strategy and plans for conducting sensitivity/uncertainty analyses during Phase I work

    - developed plans for using probability encoding using a probability wheel to develop subjective cumulative distribution functions to characterize the uncertainty of selected parameters of the dose model. This method, which involves structured interviews of experts, will be used with people who are knowledgeable about milk distribution in the Phase I study area.

    - prepared a computer code that will be used to evaluate the dose from ^{32}P, ^{65}Zn, and ^{239}Np via the ingestion of fish

- subjected the QA documentation for computer codes used thus far by the Statistics Task to an audit by the quality assurance engineer assigned to the HEDR Project. The documentation passed the audit.

- temporarily delayed two activities: 1) The statistical analysis of the spatial variations in iodine-131 measurements on native vegetation that were taken in 1945-1947 and 2) assessing the uncertainties in correction factors to be applied to iodine-131 measurements taken in 1945-1947. These delays will allow time for further checking of the correction factors that may have been applied to the data at the time of collection/reporting. This work contributes to a milestone of the Environmental Monitoring Data Task, *I-131 Sample Vegetation Data,* to be completed in June 1989.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

Work planned for subsequent months includes the following:

- develop a detailed outline for Statistics Task input to the Phase I summary report of the HEDR Project

- complete the report that identifies the strategy and plans for conducting sensitivity/uncertainty analyses during Phase I work

- meet with a member of the TSP on May 17 to discuss progress of the Statistics Task

- attend a meeting of the National Cancer Institute Task Group on Exposure of American People to iodine-131 from Nevada Test Site Fallout, at the Environmental Measurements Laboratory, New York City, on May 2-3, 1989

- develop estimates of uncertainties in parameters as input to sensitivity/uncertainty analyses for Phase I studies, using probability encoding or other methods as appropriate

- conduct preliminary dose estimation and sensitivity/uncertainty analyses for the fish ingestion pathway for the radionuclides ^{32}P, ^{65}Zn, and ^{239}Np

- analyze iodine-131 measurements on native vegetation collected in 1945-1947 to determine temporal and spatial variation in the data

- conduct sensitivity/uncertainty analyses to identify the uncertainty in correction factors being developed to obtain valid iodine-131 measurements of vegetation for 1945-1947

- review and develop methods for ensuring that all significant Hanford emissions have been identified.

Project Technical Coordination

OBJECTIVE

The objective of the Project Technical Coordination Task is to provide a general technical overview of the project to ensure that appropriate information is generated from the technical tasks for performing the final dose calculations.

PROGRESS

This task was formally created this month in response to an emerging need for a separate project function for coordinating the significant volume and variety of data generated by members of technical tasks. The data are used as input by members of the Environmental Pathways and Dose Estimates Task to estimate doses to people.

Activities this month focused on formalizing task activities, most of which were transferred from an existing subtask of the Environmental Pathways and Dose Estimates Task. In addition, a report was generated on the feasibility of using iodine-129 as an indicator of iodine-131 in the environment.

MAJOR PROBLEM AREAS AND ACTION TAKEN

None.

PLANNED WORK FOR SUBSEQUENT MONTHS

- coordinate surface-water sensitivity study
- complete the process of selecting dominant radionuclides.

APPENDIX A

Communications Log

COMMUNICATIONS LOG - APRIL 1989

INITIATED BY	CONTACT	AFFILIATION	TYPE	SUBJECT
PNL/W. Haerer	John Till	TSP, Chairman	Telephone	Ongoing discussions re:HEDR Project
PNL/W. Haerer	Mary Lou Blazek	TSP, Vice Chairperson	Telephone	Ongoing discussions re:HEDR Project
PNL/W. Haerer	Bernard Shleien	TSP, Secretary	Telephone	Ongoing discussions re:HEDR Project
PNL/M. Hattrup	Sue Billings	Wash Dept of Ecology	Telephone	Water withdrawals from the Columbia River
PNL/M. Hattrup	Ted Olson	Wash Dept of Ecology	Telephone	Water withdrawals from the Columbia River
PNL/R. Gilbert	Steve Simon	University of N. Carolina	Telephone	Attendance at HEDR meeting in May
TSP/M. Robkin	Larry Morgan	PNL	Telephone	Request for working meeting of Source Terms Subcommittee and HEDR staff
TSP/M. Robkin	Larry Morgan	PNL	Telephone	Discuss hours of working meeting

(45) Pacific Northwest Laboratory

D. L.	Alamia	K3-70
G. L.	Andrews	P7-80
W. F.	Bair	K4-14
D. S.	Broussard	K1-67
D. B.	Cearlock	K1-42
T. D.	Chikalla	K1-74
T. T.	Claudson	K1-45
R.	Cuello	P7-50
G. H.	Cunningham	K1-59
J. M.	Davidson	K1-66
J. W.	Falco	K6-78
M. D.	Freshley	K6-96
R. O.	Gilbert	K6-45
S. P.	Gydesen	P8-55
H. A.	Haerer	K6-89
M. S.	Hanson	K1-51
J.	Johnson	K3-53
W. E.	Kennedy	K3-54
R. C.	Liikala	K1-57
L. G.	Morgan	K2-35
B. A.	Napier	K3-54
T. A.	Nelson	K1-55
T. L.	Page	K5-16
R. E.	Rhoads	K6-64
J. T. A.	Roberts	K1-40
R. L.	Skaggs	K6-77
R. G.	Stevens	K6-45
J. A.	Stottlemyre	K6-94
W. L.	Templeton	K1-30
W. R.	Wiley	K1-46
R. K.	Woodruff (2)	K5-D9
Project Office Files(5)		K6-89
Records Center		K3-70
Technical Library (2)		
Public Reading Room (5)		A1-65

(18) Technical Steering Panel

D. S.	Barth	A. H.	Murphy
W. A.	Bishop	V.	Nguyen
M. L.	Blazek	D. W.	Price
G. G.	Caldwell	M. A.	Robkin
S. N.	Davis	G. S.	Roessler
N. J.	Germond	B.	Shleien
P. C.	Klingeman	A. P.	Slickpoo
K. J.	Kopecky	J. E.	Till
R. L.	Morrill	D. E.	Walker

(1) ATSDR

J. D. Mulder

(1) University of North Carolina

S. Simon

(15) DOE Richland Operations Office

J. H.	Anttonen, AMR	A5-10
R. F.	Brich, SED (2)	A5-55
R. A.	Holten, SED	A5-55
J. R.	Hunter, OPD	A6-55
J. J.	Keating, AMS	A6-54
M. J.	Lawrence, MGR	A7-50
E. E.	Pride, OCC	A4-52
A. J.	Rizzo, AMO	A6-53
R. M.	Rosselli, AMA	A7-70
R. R.	Tibbatts, FRD	A7-88
M. W.	Tiernan, SED (2)	A5-55
K. J.	Wheeless, COM	A7-75
M. J.	Zamorski, OPD	A6-55

(1) Hanford Environmental Health Foundation

S. E. Dietert H1-03

(2) Westinghouse Hanford Company

G. D. Carpenter H4-15
D. E. Wood H4-51

(3) DOE Office of Scientific
and Technical Information
Technical Information Center
P. O. Box 62
Oak Ridge, TN 37830

(1) Brookhaven National Laboratory

A. P. Hull

(10) Department of Ecology

J. S. Stohr

(2) Wash State DSHS

R. R. Mooney
D. Oliver

(1) Canadian Embassy

T. D'Arcy McGee

(1) Golder Associates

W. J. Roberds

(1) Centers for Disease Control

J. Ruttenber

(1) Idaho Dept of Health & Welfare

F. R. Dixon

(1) Colorado Dept of Health

E. Magione

(8) Tribal Representatives

E. Stensgar
M. Tonasket
G. Nenema
A. V. Pinkham
J. V. Flett
E. H. Patawa
A. Jackson
M. Sampson

(6) DOE - Headquarters

Forrestal Bldg
1000 Independence Ave
Washington, DC 20585

Attn:	J. Antizzo, EH-232	Room G-089
	A. Fingeret, GC-22	Room 6H-087
	J. Holl, MA-295	Room 7E-054
	C. Morris, DP-3	Room 4A-045
	J. Tseng, EH-20	Room 4A-045
	R. Geiger, EH-231	Room 3G-089
	M. Leifer, EH-232	Room 3G-089

(6) DOE - Headquarters

Germantown, MD 20545

Attn:	C. Bastin, NE-471	Room F-416
	B. Goldsmith, ER-73	Room E-222
	D. Nelson, EH-33	Room G-144
	G. Sherwood, NE-12	Room E-478
	V. Trice, DP-122	Room A-222
	L. Waldo, DP-122	Room A-222