12-6-92 JS(2)

PNL-8075
UC-600

Pacific Northwest Laboratory ALARA Report for CY 1990

G. M. Ceffalo
C. L. Oxley
P. A. Wright

May 1992

Prepared for 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

PNL-8075

DISCLAIMER

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 to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831; prices available from (615) 576-8401. FTS 626-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

PNL--8075

DE92 014240

PACIFIC NORTHWEST LABORATORY ALARA REPORT FOR CY 1990

Prepared by Laboratory Safety

May 1992

Prepared for
the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Richland, Washington 99352

SUMMARY

This report provides summary results of the CY 1990 ALARA Program at the Pacific Northwest Laboratory.[a] Information has been included regarding whole-body exposures to radiation, skin contaminations, and the nonradiological ALARA program.

The collective whole-body radiation dose to employees during 1990 was 0.68 person-sievert (68 person-rem).[b] This dose was 85% of the projected dose of 0.80 person-sievert (80 person-rem). There were three PNL employees whose doses were extrapolated to exceed 0.02 sievert (2 rem) during the year, but no workers actually exceeded 0.02 sievert (2 rem) by the end of CY-1990.

There were 31 reported cases of skin contamination for PNL employees during 1989. This number is 78% of the projected total of 40 cases. The majority of these cases (48%) occurred at the 324 facility.

Progress was made on implementing ALARA (as low as reasonably achievable) practices through ALARA goals developed and carried out by the research centers.

The injury accident rates indicate that staff members and the public have been well protected from unacceptable exposure to nonradiological hazards. The motor vehicle accident and loss rates were greatly improved due to employees' abilities to avoid accidents, with rates below U.S. Department of Energy (DOE) averages. There were no PNL fires in 1990 that resulted in damage. Starting in 1988, the industrial health and safety section began publishing accident data and rates for each center, allowing management to monitor safety performance parameters in their organization.

(a) The Pacific Northwest Laboratory is operated by Battelle Memorial Institute for the U.S. Department of Energy.

(b) The total whole-body dose is based only on onsite exposure; however, to make this report as useful as possible to PNL staff, all other data, discussions, conclusions, etc. in this report include both onsite and offsite exposure.

CONTENTS

FIGURES

TABLES

INTRODUCTION

The concept of maintaining exposures to radiation as low as possible (ALAP) was first introduced formally in 1954 by the National Committee on Radiation Protection. DOE 5480.11, "Radiation Protection for Occupational Workers," establishes requirements for DOE contractor ALARA programs and references Health Physics Manual of Good Practices for Reducing Radiation Exposures to Levels that are As Low As Reasonably Achievable (ALARA), which describes possible elements of ALARA programs. Section 10.0 of PNL-MA-6, "Radiation Protection," provides information on PNL's ALARA program. The purpose of this report is to summarize and document activities, accomplishments and results of safety parameters involved in the ALARA Program during CY 1990.

At PNL, applying the ALARA philosophy is not limited to nuclear hazards; PNL applies the ALARA concept to a wide variety of hazards, including exposure to hazardous chemicals and physical hazards (lasers, noise, etc.). Chemical exposure is kept ALARA by substituting less hazardous chemicals, using engineering controls such as ventilation or containment, and using administrative controls and personal protective equipment. Reduced exposure to physical hazards such as lasers or rotating equipment is accomplished by separating people from the hazard through the use of timing, distancing or shielding/guarding.

The ALARA Program is administered by the Occupational and Radiological Safety Section of the Laboratory Safety Department. The research organizations develop ALARA goals; the ALARA coordinator tracks their progress throughout the year. The goals and their status are presented in Appendix A; Appendix B contains the radiological and nonradiological goals for CY 1991.

RADIOLOGICAL ALARA

This section summarizes the portion of the ALARA Program that deals with radiological concerns. It includes information on radiation doses and skin contaminations and identifies the organizations with the highest doses.

RADIATION EXPOSURE

In CY 1990 a total of 0.68 person-sievert (68 person-rem) was received by staff members monitored for compliance with DOE 5480.11 (i.e., multipurpose dosimeter wearers). At the beginning of the year, 0.80 person-sievert (80 person-rem) was projected based on planned activities, primarily those in the 324 and 325 facilities.

Exposure Trends

The distribution of doses among staff members monitored for compliance with DOE 5480.11 (multipurpose dosimeter wearers), is shown in Figure 1. The most frequently occurring dose for staff members during 1990 was 0 millisievert (0 millirem). The average dose for this group during 1990 was 0.44 millisievert (44 millirem), compared to 0.6 millisievert (60 millirem) in 1989. Figure 2 shows the yearly trend in collective whole-body dose for PNL.

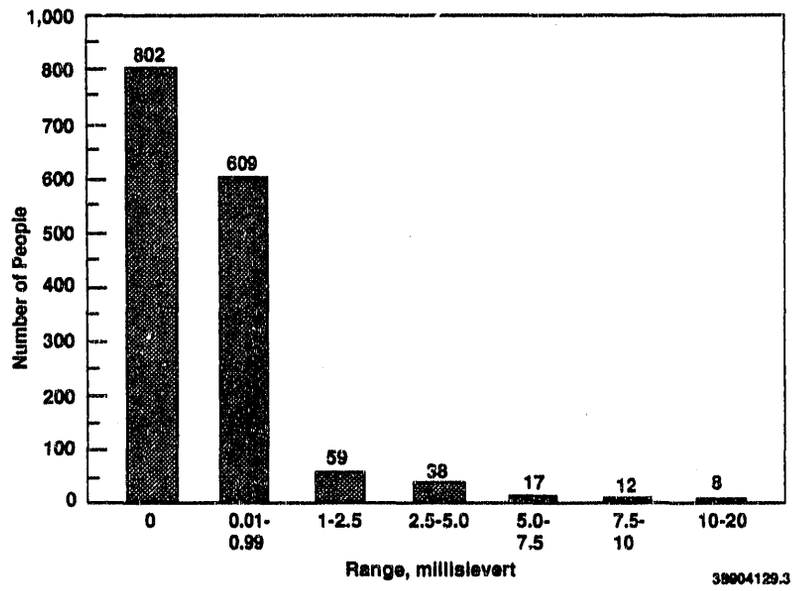


FIGURE 1. Dose Distribution for CY 1990

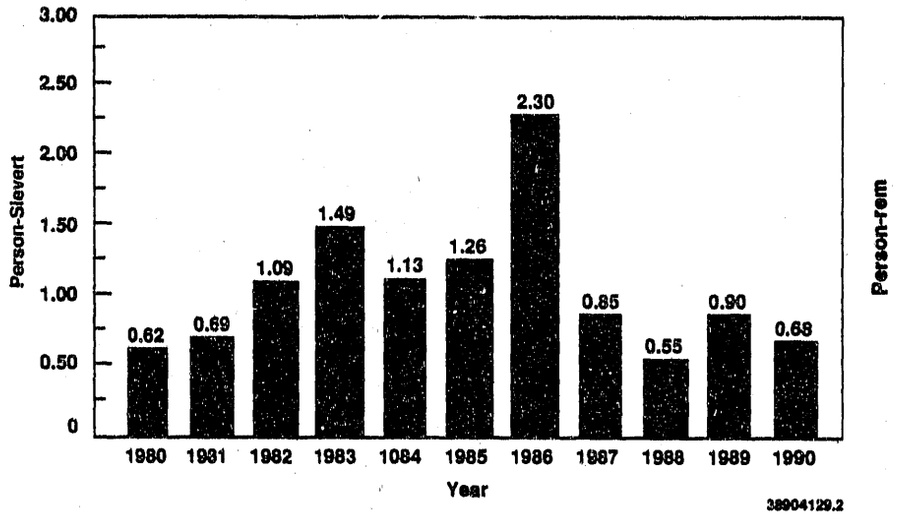


FIGURE 2. Annual Collective Whole-Body Dose for the Last 10 Years

The figure illustrates the dependence of collective dose on the major programs. The dose maximum in 1986 was related to the destructive examination phase of the steam generator project. The collective dose for PNL is expected to remain below 1 person-sievert (100 person-rem) over the next several years, unless significant program changes occur.

Figure 3 shows the yearly trend in total collective whole-body dose incurred by the five centers with the highest collective whole-body doses for the last 3 years.[(a)] Facilities and Operations accounted for approximately 32% of the total CY 1990 PNL collective whole-body dose. The Material and Chemical Sciences, Reactor Technology and Waste Technology Centers accounted for the majority of the balance of the total dose, incurring approximately 24%, 17% and 14% respectively.

All of the centers, except for Facilities and Operations and Health Physics, significantly decreased their doses relative to their 1989 totals. Much of this improvement was due to the fact that a major 1989 project (the

(a) As a result of reorganizations and the reassignment of staff members, it was difficult to compare annual doses assigned to organizations with complete accuracy. These data do, however, provide a fairly good picture of the major doses received by each organization.

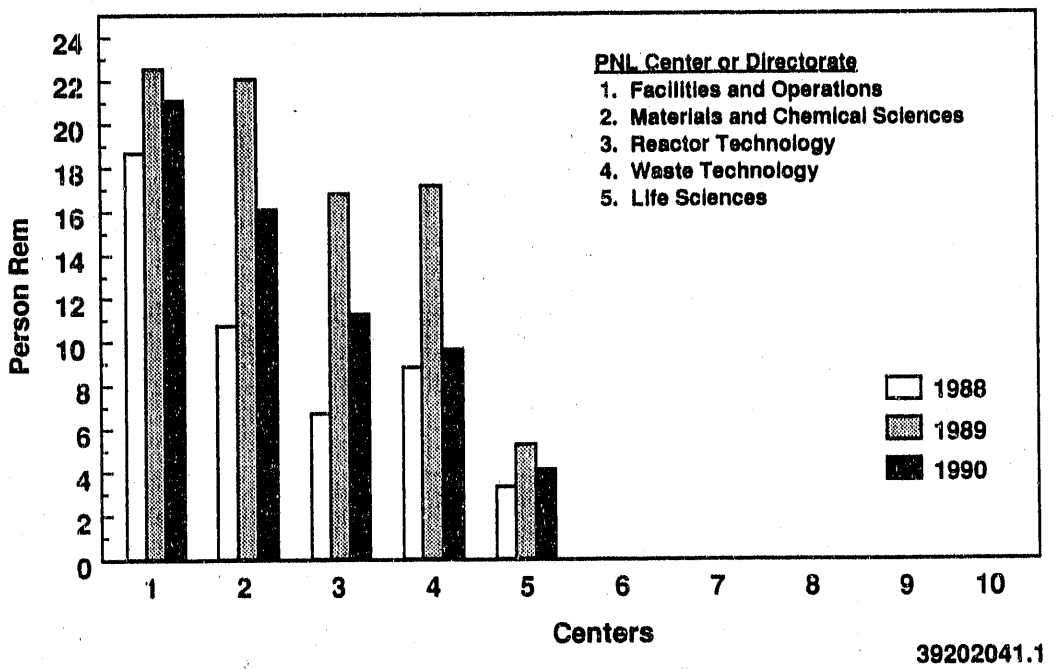


FIGURE 3. Collective Whole-Body Dose for 1988, 1989, and 1990 for the 10 Highest Departments

single-shell-waste characterization) which caused significant evenly distributed doses was completed. Other factors that may have improved the dose totals were the accomplishment of many ALARA goals (see Appendix A, "Status of CY 1990 ALARA Goals"), conducting pre-job ALARA meetings and the relative total work load of the centers. Departments in the Facilities and Operations Center as well as Health Physics have remained consistent at their present dose levels over the past few years, mostly due to the unavoidable routine requirements of their jobs: performing radiation protection duties, detector and dosimeter calibrations, and facilities and equipment maintenance.

The departments incurring the highest doses in Facilities and Operations during 1990 were Laboratory Safety and 300 Area Crafts Services; approximately 13% and 14% of the PNL total, respectively. Recommendations were made that these departments develop annual ALARA goals. The Analytical Chemistry Laboratory of Materials and Chemical Sciences had 15% of the total number of exposures. Post-Irradiation Examination Services of Reactor Technology received 11% of the total, while Waste Process Engineering of Waste Technology accounted for 9% of the total. The majority of the doses for all of these

departments were attributed to work in the 324 and 325 Buildings. As with their respective centers, most departments showed significant decreases in total doses during 1990.

Observing the centers' and departments' trends of collective dose totals over the years indicates that the levels are directly related to the number of projects involving work with radioactive materials. The number of projects involving radiation work and the relative amount of this type of work load have been historically variable, making it somewhat difficult to adjust or weight the collective doses for comparison of different years. Personnel and organizational groups may be reassigned to other jobs or organizational groups continuously throughout the year, making it relatively difficult to accurately assign doses to specific projects and work. Considering these obstacles involved in accurate trend analysis, the 1990 collective dose totals for PNL have shown typical or expected values in comparing with the recent years' totals (after 1986).

Quarterly Exposure Evaluations

Procedures for identification, tracking and evaluation of job tasks of staff members receiving potentially excessive whole-body and/or extremity doses remained in place in 1990. Three staff members exceeded the criteria for special evaluations. Supervisors of staff members with doses that indicate potential to exceed annual limits received a quarterly exposure evaluation request (and form) for each staff member with a high dose. The supervisor evaluates the tasks being performed by the individual(s), and records pertinent information on the exposure evaluation form so that ALARA practices can be implemented wherever possible. Radiological Engineering reviews the supervisor's evaluation and initiates follow-up actions as appropriate. The whole-body and extremity quarterly doses used as criteria for evaluation are those values that extrapolate to year-end doses of 0.02 sievert (2 rem) for the whole-body and 0.30 sievert (30 rem) for the extremities. As shown in Table 1, eight PNL staff members exceeded the criteria for evaluation during 1989. In 1990, three individuals exceeded the limit in first quarter; however, no one exceeded the limit for the year.

TABLE 1. Number of Staff Members Whose Extrapolated Year-End Dose Exceeded 0.02 Sievert

Quarter	CY 89	CY 90
1st	6	3
2nd	1	0
3rd	1	0
4th	0	0

SKIN CONTAMINATION

In CY 1990, PNL had a total of 31 cases of skin contamination (see Appendix D). Figure 4 shows the historical trend of yearly skin contaminations for the period 1986-1990. Figure 5 provides a breakdown of skin contamination cases in 1990 by facility since 1986. Most of these cases (14) occurred in the 324 facility. At the beginning of the year, 30 cases were projected based on planned activities.

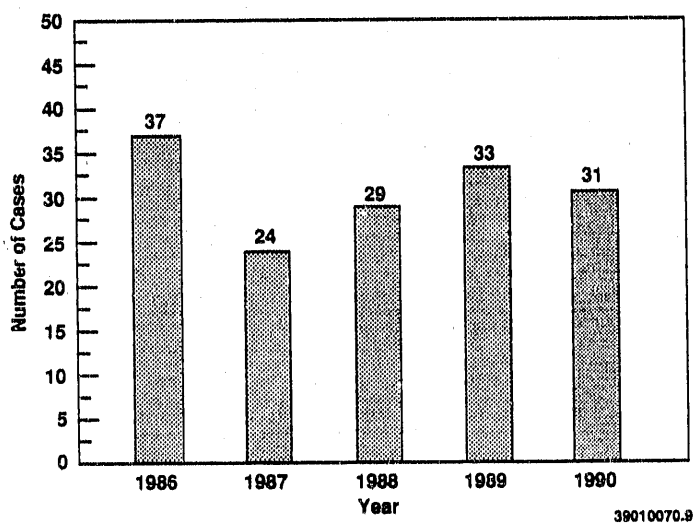


FIGURE 4. Annual Incidence of Skin Contaminations from 1986 through 1990

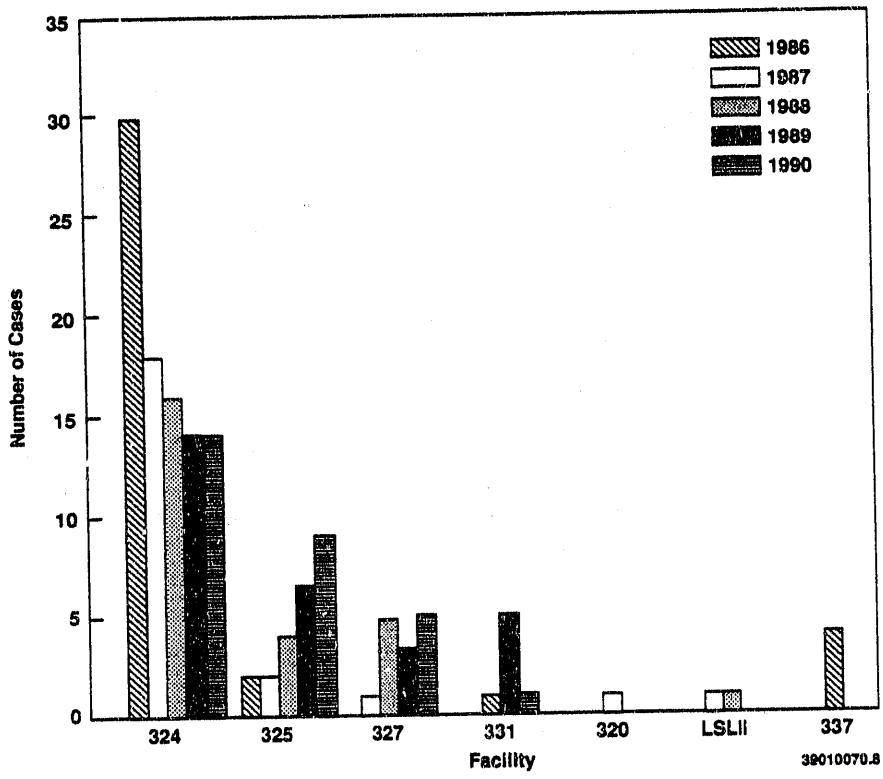


FIGURE 5. Annual Totals of Skin Contamination Cases by Facility

NONRADIOLOGICAL ALARA

During CY 1990, the Laboratory had an average of 3326 full-time staff members who worked approximately 3-4 million hours on PNL-related programs. This section discusses the nonradiological safety performance of staff members for CY 1990.

FIRST-AID CASES

The Laboratory Safety Department investigated 145 first-aid cases during CY 1990. Each reported occupational injury or illness was investigated by Laboratory Safety staff members, and corrective actions were recommended to line management as appropriate to prevent recurrence. Criteria defined by the U.S. Department of Energy (DOE) or the State of Washington are used to classify the injury or illness and determine required documentation.

RECORDABLE INJURIES AND ILLNESSES

Occupational injuries are considered recordable if they are severe enough to require medical attention beyond first aid (e.g., prescription medication, sutures, treatment of broken bones, lost workday cases, etc.). All occupational illnesses are considered recordable. Recordable injuries and illnesses are investigated jointly by the Laboratory Safety Department and line management. During CY 1990, staff members incurred 35 recordable injuries. This number resulted in a recordable injury incidence rate of 2.05 recordable injuries or illnesses per 200,000 work hours. The 1990 rate nearly doubled from that of 1989, but the increase was primarily due to a change in the mandatory criteria for determining the recordability of injuries and illnesses. This rate is compared to past PNL rates and to DOE's Richland Operations Office (DOE-RL) in Figure 6.

LOST WORKDAY INJURIES

An injury or illness is considered a lost workday case if the staff member misses an entire, regularly scheduled, work shift due to an occupational accident. These injuries are considered more serious than most other recordable injuries since the consequences include significant lost time.

Staff members sustained 19 lost workday cases during 1990, which resulted in a lost workday case incidence rate of 1.11 lost workday cases per 200,000 work hours. This rate is compared to past PNL rates and to DOE-RL averages in Figure 7.

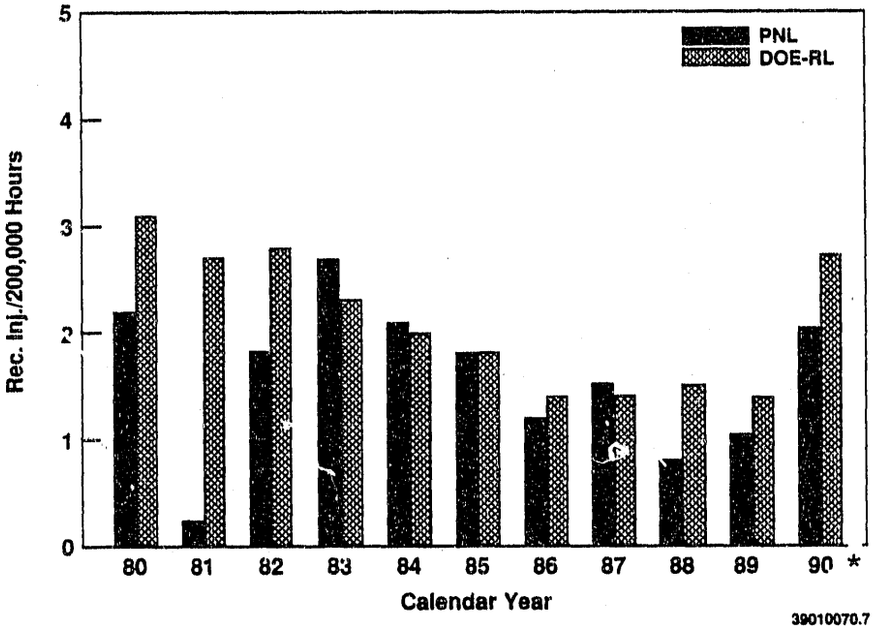


FIGURE 6. PNL Recordable Injury Incidence Rate

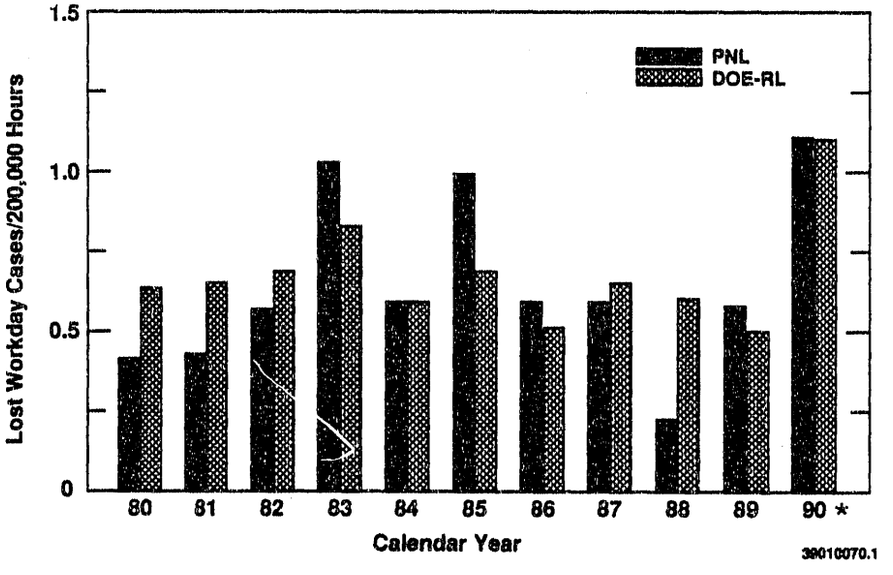


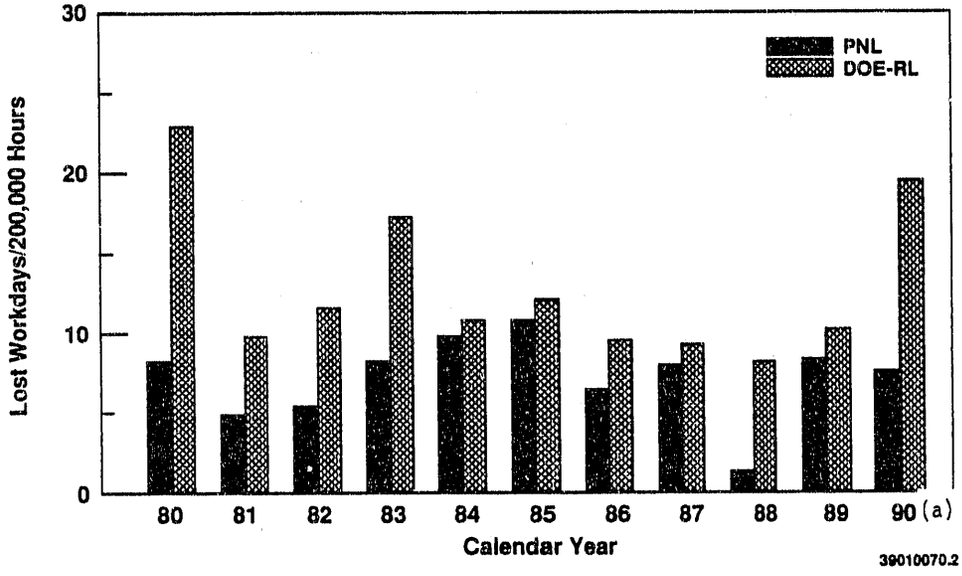
FIGURE 7. PNL Lost Workday Case Incidence Rate

The 19 lost workday cases resulted in 72 lost workdays and 59 days of work restriction. These lost and restricted workdays resulted in a lost workday incidence rate of 7.67 lost workdays per 200,000 work hours. This rate is compared to past PNL rates and to DOE-RL averages in Figure 8.

MOTOR VEHICLE ACCIDENTS

Staff members drove government vehicles approximately 0.83 million miles without an accident during 1990. PNL's motor vehicle accident rate for 1990 was 0 accidents per million miles, as compared to 6.67 accidents per million miles in 1989. These rates are compared to past PNL rates and to DOE-RL averages in Figure 9.

The motor vehicle loss rate for 1990 of $0.00 per thousand miles compares to $14.51 per thousand miles in 1989. This rate is compared to past PNL and DOE-RL rates in Figure 10.



(a) In 1990, PNL began using BLS criteria, resulting in slightly higher numbers of recordable occurrences.

FIGURE 8. PNL Lost Workday Incidence Rate

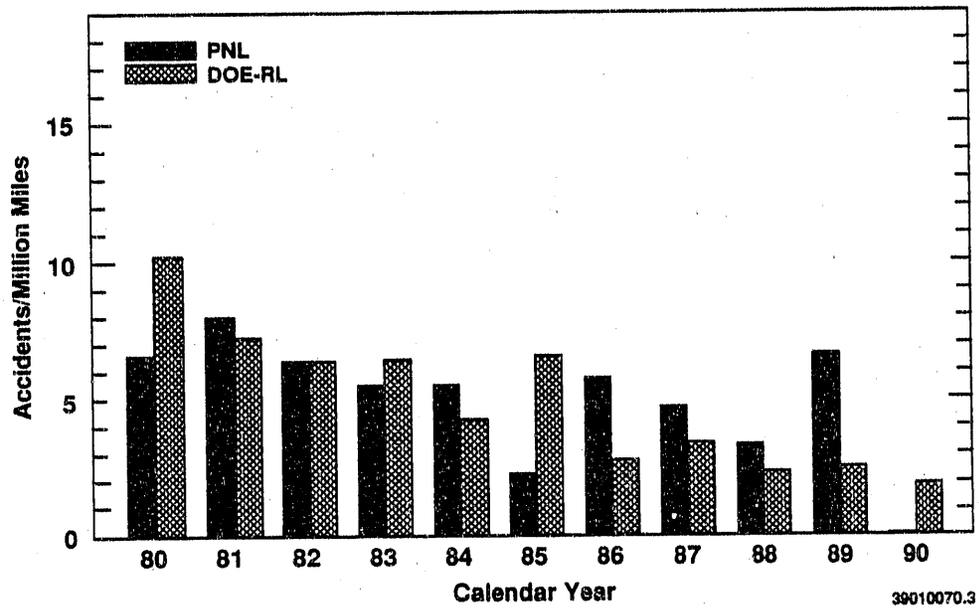


FIGURE 9. PNL Motor Vehicle Accidents Per Million Miles

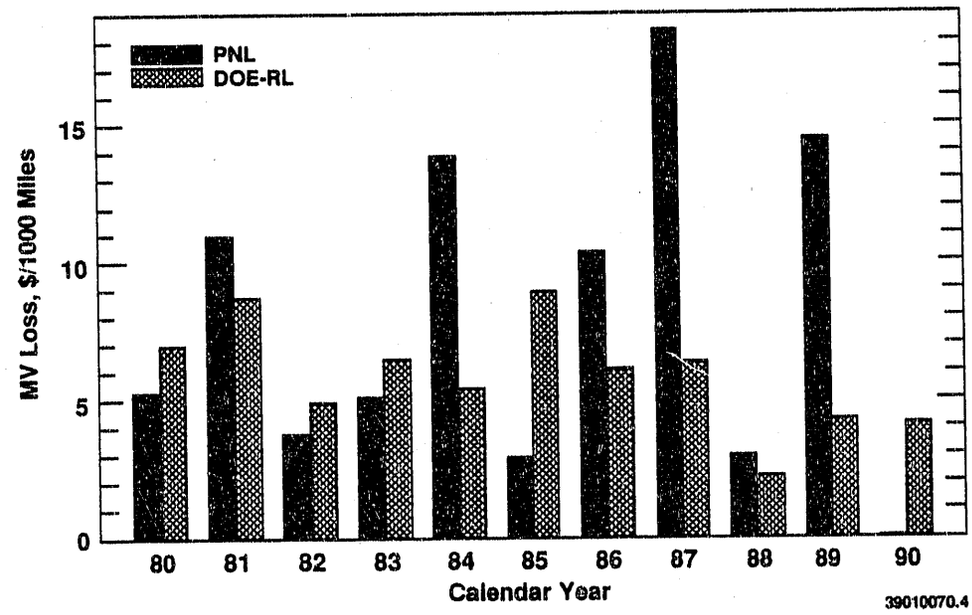


FIGURE 10. PNL Motor Vehicle Loss Rate

PROPERTY DAMAGE AND FIRES

During CY 1990, PNL work resulted in one nonfire property-loss accident and $3,300 in losses. This is a property damage rate of 0.09 for CY 1990. This rate is compared to other PNL property-loss rates and to DOE-RL averages in Figure 11.

There were no fires damaging PNL property in 1990, resulting in a fire-loss rate of 0. This rate is compared to other PNL fire-loss rates and to DOE averages in Figure 12.

ACCIDENT INVESTIGATION

All accidents, injuries, illnesses, motor vehicle accidents, fires, and property damage are investigated by Laboratory Safety. Accidents with serious consequences are investigated and documented in detail. Management involvement is required in the response and investigation of accidents and in the establishment and implementation of corrective action. These activities ensure that appropriate actions are taken to prevent recurrence of the accident, and they demonstrate PNL's commitment to providing a safe and healthful workplace.

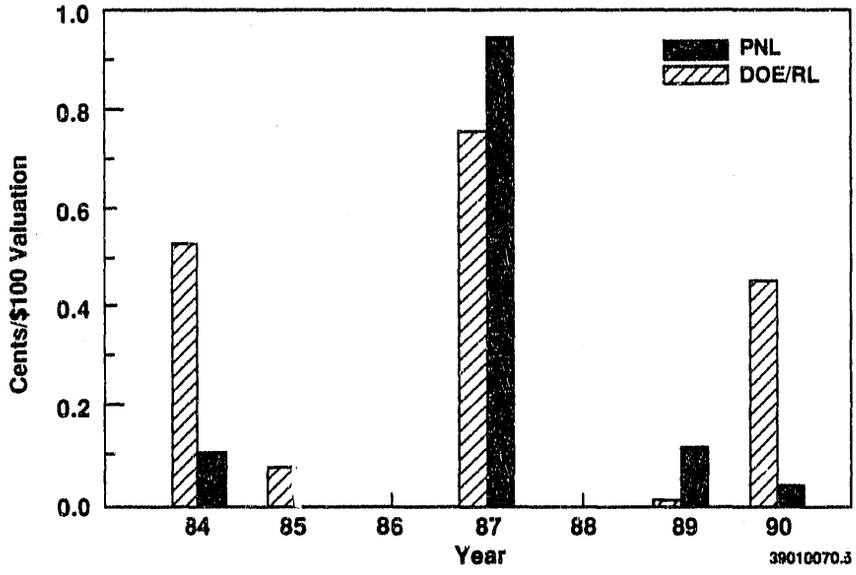


FIGURE 11. PNL Property Damage Loss Rate

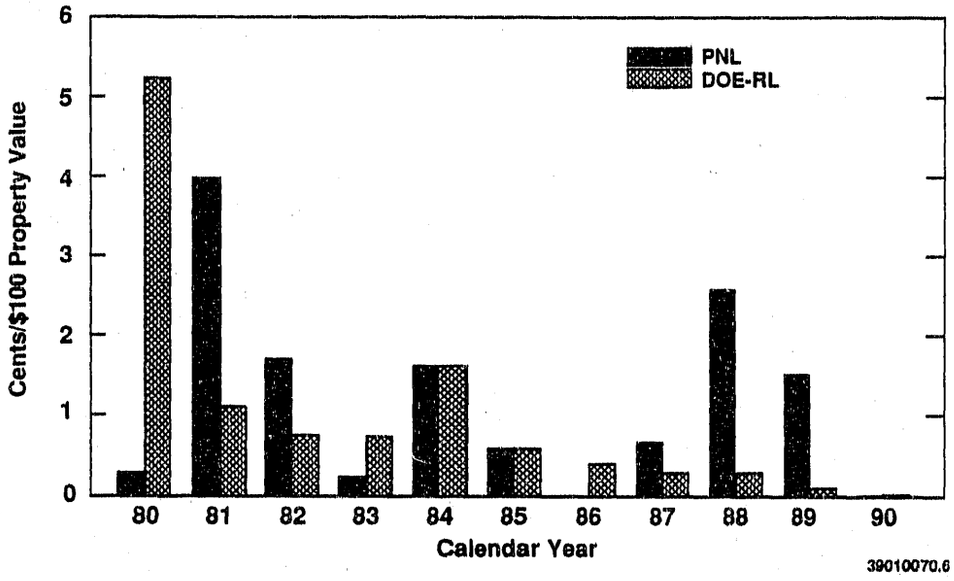


FIGURE 12. PNL Fire Loss Rate

IMPLEMENTATION OF ALARA

Progress was made during 1990 on the implementation of ALARA as evidenced by the development and achievement of ALARA goals by the operational organizations. The final status of the 1990 ALARA goals is given in Apperdix A. The radiological ALARA goals for 1991 are given in Appendix B.

Audits of radiological ALARA requirements are conducted routinely for specific facilities with significant potential for causing exposures. These ALARA audits are part of a comprehensive safety audit of the facility, designed to evaluate and improve total safety performance. In addition, the ALARA contest was continued in 1990 to increase the awareness of the ALARA philosophy among staff members.

APPENDIX A

STATUS OF CY 1990 ALARA GOALS

APPENDIX A

STATUS OF CY 1990 ALARA GOALS

Center	Goal	Status
Waste Technology 324	Establish a monthly reporting system for individual staff exposure rates.	A request has been submitted to implement a system to provide the required exposure data. This system has been initiated. This goal is considered completed.
	Implement a Hot Cell Waste Disposal System for radioactive operations within the Waste Technology Center.	The Westinghouse HC-200 Cask/Disposal Lines System has been selected for implementation. Disposal lines and grout containers have been procured and received. Planned implementation of the HN-200 Cook/Lines Disposal System is in May 1990. The utilization of the HC-200 Cask/Disposal System is underway. The goal is considered completed.
Laboratory Safety 324	Monitor the RPT dose in the 324 facility to determine which activities contribute the most dose. The dose versus activity data will be evaluated quarterly and methods will be evaluated for reducing dose for those activities contributing the major portion of dose.	RPT exposures were monitored and the activities which contributed the most dose were identified. Improvements for reducing dose are being developed. The goal is considered complete.
Materials and Chemical Sciences 306W	Develop disposal process for depleted uranium scrap and reduce inventory. Initiate disposal by 4/1/90. Stay current with generation by 9/30/90.	Process developed; SDAR approved. Forty drums grouted and packaged. The process is current (no significant backlog).
	Relocate or dispose of ThO_2 located in Room 141 to reduce dose rate in Laboratory #151. Completion by 7/1/90.	A disposal request has been submitted through PNL Safeguards for this material. No direction has yet been received. This goal has been carried over to CY 1991.
325	Shield filters in Room 40 to reduce dose rate at front face of 325A hot cells. Completion by 4/1/90.	Work authorized, expected to be complete by 4/1/91. This goal has been carried over to CY 1991.
	Reduce high background stored material in Lab 327.	Complete. This goal replaced a previously stated goal to remove high dose, rate-fixed contamination in concrete curbing back-side 325A hot cells.

Center	Goal	Status
Reactor Technology 324 SMF	Dispose of unused and/or obsolete processing and test equipment currently stored in the SMF operating gallery. This equipment is potentially radiologically contaminated, and timely disposal will reduce the potential for personnel contamination and radiation exposure.	Approximately 90% of the unused or excess equipment previously stored in the SMF operating gallery has been excessed, transferred to the loan pool, returned to the proper equipment custodian, or disposed of as radioactive waste. The remaining equipment items are being retained to support future tentatively scheduled in-cell examination programs.
	Remove and dispose of miscellaneous irradiated test specimens which are currently stored both in SMF East cell and SMF South cell. These specimens have no further experimental use, and their disposal will result in significant lower radiological exposure to SMF operating personnel during cell entries.	Transfer of all remaining specimens containing Special Nuclear material to the 327 Building has been completed, leaving the SMF with no current inventory of SNM. Most of the remaining irradiated archive samples have either been disposed of as radioactive waste or transferred to 327 for interim storage. Disposition of the remaining samples will be determined based upon guidance from the appropriate experimenters.
327 Postirradiation Testing Laboratory	Reduce radiation exposure levels to personnel working in the area of the 327 Building B Cell and D Cell by cleaning ducts and/or drain line or adding additional steel shielding. This would reduce extremity dose rates to personnel by 50 to 75% in these areas.	Additional shielding was placed under the cell to reduce readings; this is an interim correction until the ducts' and drain lines' interior surfaces can be decontaminated. Vendor information was reviewed and a purchase requisition for the purchase of a high pressure cleaner was initiated. Cleaning of ducts and/or drain lines will be carried over as a 1991 goal.
	Remove accumulated non-TRU radioactive waste from 324 SMF and 327 Building hot cells. Prepare and ship waste to caisson burial. Continued removal of waste will result in lowered radiation exposure by 25% to both operations personnel and customers working at the various hot cells.	High-energy irradiated materials are processed rapidly and stored or moved to areas that provide additional shielding before continuing with the processing of the low-energy materials. These actions have reduced the exposure levels at the hot cell operating station by a 5 to 1 ratio.
327 Postirradiation Testing Laboratory	Continue to develop a suitable method and an approved procedure for cleaning the interior of the individual hot-cell ventilation ducts. Successful cleaning of these ducts will substantially reduce radiation zone levels in the 327 Building basement area by 50 to 75%.	Awaiting arrival of the high-pressure washer. Goal will be carried over as a 1991 goal.

Center	Goal	Status
	Review chemical inventory and reduce where appropriate; continue updating facility MSDS files and chemical database and provide key information to the staff. Provide state and federal Environmental Compliance schooling opportunities for the Hazmat custodian to assist with chemical control and disposal.	Complete. Hazardous Material Custodian continues to review and reduce chemical inventory as appropriate.
Earth and Environmental Sciences	Develop and implement a program for review of hazardous waste generation activities which will encourage waste minimization, pollution control and reduction of cost associated with waste disposal.	Program implementation completed.
	Review projects to determine necessity for chemical exposure monitoring. Implement engineering or protective clothing controls where necessary to remain below the permissible chemical exposure limit.	A program has been established to perform the project reviews and evaluate the need for monitoring. Implementation of the program has begun and is a continual and ongoing task.
Applied Physics	Develop and implement a Laboratory Management Plan for the center. The plan will cover safety, hazardous materials, security, the responsibilities of all staff members, and will require the identification of the resources for plan implementation.	Plan developed and implemented.
	Laboratory quality and housekeeping inspections will be performed on a bimonthly basis. The results of the inspections will be reviewed with department managers.	Inspections and reviews of inspection results have been performed.

APPENDIX B

RADIOLOGICAL ALARA GOALS FOR CY 1991

APPENDIX B

RADIOLOGICAL ALARA GOALS FOR CY 1991

Center/Dept.	Goal
Waste Technology 324	Reduce dose to hot-cell operations technicians by 20% from CY 1990. This will be accomplished by reviewing dose reduction techniques, such as time, distance, and shielding at the pre-job ALARA meetings. Reduce quantity of secondary waste products generated by programmatic activities by 50% from CY 1990. Reduce the number of skin contamination events of Waste Technology Center staff by 25% from CY 1990. This will be accomplished by reviewing, during the pre-job ALARA meetings, proper dressing/undressing techniques.
Laboratory Safety 324	Improve pencil dosimeter program for RPTs assigned to the 324 facility. This program will allow the RP to more closely track RPT exposure as a function of work performed.
Materials and Chemical Sciences 306W	Continue to pursue the relocation or disposal of ThO_2 located in Room 141 to reduce dose rate in Laboratory 151. A Material Request was submitted to Safeguards on 5/7/90, but this CY 1990 goal was not completed since no disposition instructions were received. Locate material storage and waste barrels for depleted uranium metal turnings in a central location within the specialty machine shop in Room 132. This location is to be, at a minimum, ten feet away from any equipment/machinists' work station and will reduce background exposure to all program personnel. Previous storage areas were more convenient to both program machinists and the project's technical staff, but their random placements throughout the shop placed larger-than-necessary quantities of radioactive material next to the work stations.

Center/Dept.	Goal
	Modify to increase the physical size of the radiation area in Room 132 to allow for the transport of radioactive material from the heat treatment area in Room 152 to the specialty shop (Room 132). This would allow the large roll-up door between the two bays to be opened to more easily transport material to and from the material processing areas without the use of roller carts. Material will be loaded onto one cart, then moved directly to its next processing/machining station while remaining within a radiation area.
Materials and Chemical Sciences 325	Reduce the dose rate at the front face of the 325A hot cells by providing adequate shielding in the face and ducts under the floor, and changing the filters on the ducts.
	Reduce radiological exposure to personnel during radiochemical analysis of waste tank samples by implementing a recently developed analytical procedure for the analysis of transuranic elements in single shell tank and double shell tank samples. This procedure replaces four previously used procedures, thereby reducing considerably the total quantity of radioactive sample required. In addition, the period of time that staff members will be in contact with the sample during the analytical process has also been reduced. As funding permits, additional procedure development activities to reduce staff exposure will be undertaken.
Reactor Technology 324 SMF	Return cesium chloride capsule not needed for performance evaluation of cesium chloride encapsulation programs to the Waste Encapsulation and Storage Facility. Removal of the capsules will facilitate operation in both SMF South and East cells and reduce exposure risks to personnel.
	Shield manipulator through tubes to reduce exposure to building occupants. Shielding will effectively decrease exposure to acceptable levels.

Center/Dept.	Goal
327	Convert Model G and Model E manipulator Z-motion tape to cable. The number of repairs/ replacements will be reduced, as will fewer change-outs, which will result in lower personnel exposure.
	Clean the interior of D and F-Cells' ventilation ducts. Successful cleaning of the ducts will reduce radiation levels in the basement area by 50 to 75%.
	Review 327 Post-Irradiation Testing Laboratory safe operating and technical procedures and revise, as necessary, to include requirements for preplanning meeting, ALARA meeting outline, and chemical/radiological ALARA information where applicable.

APPENDIX C

PROJECTIONS FOR CY 1991

APPENDIX C

PROJECTIONS FOR CY 1991

Projections for CY 1991 are 70 person-rem whole-body and 30 skin contamination cases. These projections are based upon planned work activities for CY 1991.

APPENDIX D

SKIN CONTAMINATION CASES DURING CY 1990

APPENDIX D

SKIN CONTAMINATION CASES DURING CY 1989

Date	Orginization Code	Facility	Room	Cause	Affected Area	Comments
01/19/90	792B	327	Canyon	Person. Error	Finger Tips	Took glove off to handle a piece of metal to work on.
01/19/90	792B	327	Canyon	Unknown	Skin area: base of jaw	Had contamination on T-shirt.
03/14/90	792B	324	Air Lock Cask Area	Cloth. Fail.	R Knee	Implemented use of knee pads. Samples of pants revealed significant ^{137}Cs and ^{90}Sr contamination.
03/14/90	791B	325	603	Contamination on waste container handle	L Finger Tips	Follow-up survey of area revealed contamination on waste container handle.
03/16/90	792B	324	123	Radon-natural	L palm	None.
04/05/90	7W24	324	Greenhouse	Person. Error	Hair	Rubbed head against inside wall; not wearing head protection.
04/05/90	793A	324	18	Person. Error	Top of head	Contaminated head while directing workers to come out of greenhouse.
05/31/90	7E41	314	HB50	Unknown	Palms	Possibly caused by handling sample container.
06/15/90	7E50	325	309	Unknown	Palms	None
07/02/90	7E01	325	312	Unknown	R hand	Involved in sink decontamination.
07/25/90	792B	325	Cask Handle	Cloth. Fail.	R arm	Possible previous contamination on coveralls.
07/25/90	791E	325	32	Unknown	L thumb	None
07/27/90	792B	324	Airlock	Cloth. Fail.	L forearm	Profuse sweat enhanced clothing failure.
08/01/90	7W25	327	Canyon	Person. Error	Rear thigh, calf and nose.	Broke a line into cell and over-pressured.
08/05/90	7W23	324	Airlock	Person. Error	L knee	Plastic torn while working in airlock.
08/08/90	7932	331	SE Exit 1st. Flr	Unknown	Hands	None
08/15/90	792B	327	Outside Building	Unknown	R palm	Possibly caused by handling air sampler probe.
08/22/90	792B	306W	132	Unknown	R palm	None

Date	Organization Code	Facility	Room	Cause	Affected Area	Comments
08/28/90	7C18	325	517	Unknown	Fingers, L hand	Working with ^{99}Tc inside hood.
09/13/90	792B	324	B Gallery	Person. Error	L thumb	Failed to contact RPT before start.
09/24/90	792B	325	711 Fan Rm	Unknown	L palm	Suspect radon decay products.
10/23/90	793A	324	SMF Gallery	Person. Error	L palm	Cross-contamination while surveying and while undressing.
10/23/90	7R32	324	Decon Rm.	Person. Error	R eye, nose, upper lip, R thumb	Procedural problems.
10/23/90	792B	324	139	Contamination Door Handle	L palm	Handle possibly contaminated from egress of SMF after contaminants were spread in area.
10/23/90	7W25	324	Decon Rm	Person. Error	Hair and nose	Procedural problems.
10/23/90	7R31	EDF	Lab	Unknown	Nose	None.
11/16/91	792B	324	B-Cell Airlock	Unknown	Neck	Possibly contaminated while undressing.
11/29/90	792B	324	Change	Cloth. Fail.	L wrist	Profuse sweat contributed to contamination.
12/4/90	7933	324	Change	Unknown	R middle finger	Possible mishandling of stack monitor check source.
12/12/90	7E15	325	400	Person. Error	L hand fingers	Reached in hood to move equipment while not wearing glove.
12/20/90	7E15	325	400	Person. Error	Forearms and fingers	Contamination from lab coat was transferred to arms while removing coat.

PNL-8075
UC-600

DISTRIBUTION

No. of Copies

OFFSITE

12 DOE/Office of Scientific and Technical Information

ONSITE

DOE Richland Field Office

Hanford Environmental Health Foundation

M. A. McKinney, H1-53

Westinghouse Hanford Company

J. F. Dickman (5), S0-15

Pacific Northwest Laboratory

83
R. C. Adams, K6-52
W. J. Bair, K1-50
W. J. Bjorklund, P7-68
J. D. Bright, P7-08
D. S. Broussard, K1-67
D. P. Carlisle, P7-74
G. M. Ceffalo (5), P7-78
R. L. Cheatham, K7-10
T. D. Chikalla, P7-75
T. T. Claudson, B1-40
G. H. Cunningham, K1-59
R. L. Dodd
J. W. Falco, K6-78
A. M. Fillion, P7-78
M. D. Freshley, K6-77

No. of Copies

M. F. Gillis, K1-50
M. J. Graham, K6-80
J. M. Hales, K6-04
R. J. Hall, K1-73
P. E. Hart, K7-02
M. A. Hensyel, P7-78
D. P. Higby (20), P7-78
T. Hikido, P7-70
J. M. Hobbs, P7-78
G. R. Hoenes, P7-78
J. N. Holloway, K1-36
J. R. Houston, A3-60
B. M. Johnson, K1-78
J. R. Johnson, K3-53
A. F. Johnston, K1-44
E. L. Kelley, K6-78
R. R. King, P7-70
M. L. Knotek, K1-48
D. E. Knowlton, P7-40
W. W. Laity, K2-50
L. M. Martucci, P7-35
J. L. McElroy, P7-46
G. L. McVay, K2-45
C. L. Oxley (5), P7-78
B. D. Robertson, P8-01
J.T.A. Roberts, K1-73
D. A. Seaver, K6-61
B. D. Shipp, K1-73
R. L. Skaggs, K6-77
T. S. Tenforde, K1-50
M. T. Thomas, K2-12
R. E. Wildung, P7-54
W. R. Wiley, K1-46
G. L. Work, K7-02
P. A. Wright, P7-78
Publishing Coordination
Technical Report Files (5)

END

DATE FILMED

7/9/92