

4/18/72  
Ident. No.

Schedule 189a  
Justification for Operating Costs & Equipment Obligations

Idaho

Field Office or Laboratory

1. Budget Activity No. 06 02 06 00		2. Office ID		3. Project Title Controlled Environmental Release Test (CERT) Program					
4. Method of Reporting				5. Person in Charge Principal Investigator Adrian H. Dahl Paul G. Voillequé & O. Doyle Markham					
6. Contractor				7. Working Location NRTS		8. State Ida	9. Type 2.AEC Lab	10. Contr.	11. Tax
12. Reactor Applica		13. Coolant		14. Division 1 RDT 2 SNS 3 NR 4 B&M X		15. Lead Branch		16. PPB Identification	
18. Contract Term-Begin From Month Day Year				19. Contract Term-End To Month Day Year				20. Termination Date of Funding Month Day Year	
21. Man Years				FY 1972		FY 1973		FY 1974	
Scientific				1.0		1.0		1.0	
Other Direct				.5		.5		.5	
Total Direct (No Fractions)				1.5		1.5		1.5	
22. Costs (In Thousands)									
a) Personal Services . . . . .				24		25		26	
1) Personnel Benefits . . . . .				3		3		3	
b) Materials and Supplies . . . . .				3		3		5	
c) Support Services . . . . .									
d) Fuel Fabrication .2 . . . . .									
e) Reactor Fabrication .4 . . . . .									
f) Irradiations .6 . . . . .									
g) R&D Subcontracts . . . . .									
h) Expendable Equipment . . . . .									
i) Computer Services . . . . .				2		1		2	
Total - Direct Costs . . . . .				32		32		36	
j) Administrative Expense . . . . .				3		3		4	
k) NRTS Expense . . . . .									
TOTAL COSTS . . . . .				35		35		40	
23. Goods & Services on Order (In Thousands) . . . . .				-0-		-0-		-0-	
24. Equipment									
a) E&R Classification: . . . . .				xxx		xxx		xxx	
b) Equipment Obligations (In thousands). . . . .				5		5		5	
c) Equipment Costs (In thousands) . . . . .				5					

Contractor Ref. No. ID-22 Page No. 1

72, 73, 74;  
74, 75, 76;  
73, 74, 75;

NOTE: Reduced for provenancing

REPOSITORY INEL  
COLLECTION CERT  
BOX No. Box 8 of 8 REEL CFA 690 Room 212  
Etc: Budget Accts, Final DAF-3-3-18  
FOLDER Schedule 189A Justification for Operating Costs and Equipment Obligations for Idaho Field Office Laboratory, Controlled Environmental Release Test (CERT) Program

4/18/72

Ident. No.

Schedule 189a  
Justification for Operating Costs & Equipment Obligations

Idaho  
Field Office or Laboratory

1. Budget Activity No. 06 02 06 00		2. Office ID		3. Project Title Controlled Environmental Release Test (CERT) Program					
4. Method of Reporting				5. Person in Charge Adrian H. Dahl Paul G. Voillequé & O. Doyle Markham Principal Investigator					
6. Contractor				7. Working Location NRTS		8. State Ida	9. Type 2.AEC Lab	10. Contr.	11. Tac
12. Reactor Applica		13. Coolant		14. Division 1 RDT <input type="checkbox"/> 2 SNS <input type="checkbox"/> 3 NR <input type="checkbox"/> 4 B&M X		15. Lead Branch		16. PPB Identification	
						17. Materials Code			
18. Contract Term-Begin Month Day Year From <input type="text"/>				19. Contract Term-End Month Day Year To <input type="text"/>				20. Termination Date of Fundin Month Day Year <input type="text"/>	
21. Man Years						FY 1972	FY 1973	FY 1974	
Scientific						1.0	1.0	1.0	
Other Direct						.5	.5	.5	
Total Direct (No Fractions)						1.5	1.5	1.5	
22. Costs (In Thousands)									
a) Personal Services . . . . .						24	25	26	
1) Personnel Benefits . . . . .						3	3	3	
b) Materials and Supplies . . . . .						3	3	5	
c) Support Services . . . . .									
d) Fuel Fabrication .2 . . . . .									
e) Reactor Fabrication .4 . . . . .									
f) Irradiations .6 . . . . .									
g) R&D Subcontracts . . . . .									
h) Expendable Equipment . . . . .									
i) Computer Services . . . . .						2	1	2	
Total - Direct Costs . . . . .						32	32	36	
j) Administrative Expense . . . . .									
k) NRTS Expense . . . . .						3	3	4	
TOTAL COSTS . . . . .						35	35	40	
23. Goods & Services on Order (In Thousands) . . . . .						-0-	-0-	-0-	
24. Equipment									
a) B&R Classification: . . . . .						xxx	xxx	xxx	
b) Equipment Obligations (In thousands). . . . .						5	5	5	
c) Equipment Costs (In thousands) . . . . .						5			

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Schedule 189a  
Justification for Operating Costs & Equipment Obligations

IDAHO

Field Office or Laboratory

1. Budget Activity No.:	2. Office:	3. Project Title:
06 02 06 00	ID	Controlled Environmental Release Test (CERT) Program

26. Dates and Titles of Publications:

- a. E. H. Markee, Jr., and C. A. Hawley, Jr., "Controlled Environmental Radioiodine Tests (CERT) at the National Reactor Testing Station", in Proceedings of the Eighth AEC Air Cleaning Conference, TID-7677, pp 392-400 (1963).
- b. C. A. Hawley, Jr., et al. Controlled Environmental Radioiodine Tests at the National Reactor Testing Station, IDO-12035 (June, 1964).
- c. C. A. Hawley, Jr. and E. H. Markee, Jr., "Controlled Environmental Radioiodine Tests," in Proceedings of the Fifth AEC Symposium on Radioactive Fallout from Nuclear Weapons Tests, CONF-765, pp 821-835 (November, 1965).
- d. C. A. Hawley, Jr. (ed.), Controlled Environmental Radioiodine Tests at the National Reactor Testing Station, 1965 Progress Report, IDO-12047 (February, 1966)
- e. D. F. Bunch, (ed.), Controlled Environmental Radioiodine Tests, Progress Report Number Two, IDO-12053 (August, 1966).
- f. D. F. Bunch, "The Comparative Environmental Hazards from a Release of Methyl Iodide or Elemental Iodine," in Proceedings of the Ninth AEC Air Cleaning Conference, CONF-66094, pp 1169-1174 (January, 1967).
- g. D. F. Bunch, (ed.), Controlled Environmental Radioiodine Tests Progress Report Number Three, IDO-12063 (January, 1968).
- h. C. A. Pelletier and J. D. Zimbrick, "Kinetics of Environmental Radioiodine Transport through the Milk-Food Chain", Proceedings of the Health Physics Society Midyear Topical Symposium, January 26, 1968 on Environmental Surveillance in the Vicinity of Nuclear Facilities, W. C. Reinig, editor.
- i. J. D. Zimbrick and P. G. Voillequé, (eds.) Controlled Environmental Radioiodine Tests at the National Reactor Testing Station, Progress Report Number Four, IDO-12065 (December, 1968).
- j. E. H. Markee, Jr. and D. R. Adams, "Some Processes Affecting the Transfer of Radioiodine Gas", paper presented at the Ninth Conference on Agricultural Meteorology, September, 1969. To be published in Atmospheric Environment.
- k. C. A. Pelletier, P. G. Voillequé and E. H. Markee, Jr. "An Environmental Chamber for Mass Transfer Studies", paper presented at the 16th Annual Meeting of the Institute of Environmental Sciences (April, 1970).
- l. P. G. Voillequé, D. R. Adams, and John B. Echo, "Transfer of Krypton-85 from Air to Grass", Health Physics, 19, 835(1970).

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IDAHO

Field Office or Laboratory

1. Budget Activity No.: 06 02 06 00	2. Office: ID	3. Project Title: Controlled Environmental Release Test (CERT) Program
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26. Dates and Titles of Publications: Continued

- m. E. H. Markee, Jr., "Studies of the Transfer of Radiiodine Gas to and from Natural Surfaces", NOAA Technical Memorandum ERL ARL-29 (April, 1971).
- n. D. R. Adams and P. G. Voillequé, "Effects of Stomatal Opening on the Transfer of  $^{131}\text{I}_2$  from Air to Grass", Health Physics, 21, 771(1971).
- o. B. R. Moss, P. G. Voillequé, E. L. Moody, D. R. Adams, C. A. Pelletier, and D. Hoss, "Effects of Feeding Sudangrass on Iodine Metabolism of Lactating Dairy Cows", to be published in the Journal of Dairy Science.

27. Scope:

The CERT program is a study of the processes whereby airborne contaminants are deposited on and removed from natural and man-made surfaces. Physical and biological processes and variables are studied in the laboratory and in the field. The program considers primarily the behavior of radioactive contaminants but other contaminants such as  $\text{SO}_2$  have and will be studied; the results of studies on certain radioactive contaminants (e.g., particulate materials) are directly applicable to non-radioactive contaminants.

28. Relationship with other Projects:

The CERT program is directly related to the reactor safety program and to other programs which are necessarily concerned with the behavior of radionuclides in the environment. The findings of the CERT program can be used in estimating the consequences of potential accidents and to evaluate the actual hazards of planned or unplanned releases to the atmosphere.

Data on the collection efficiencies of air filters for various radioactive substances which have been determined as part of the CERT research have been utilized by the environmental monitoring program on and around the National Reactor Testing Station. Similar information has been utilized in the Independent Measurements Program conducted by the Health Services Laboratory (HSL) for the Division of Compliance.

The CERT program is also related to the HSL particle counting and sizing work and radioactive particle studies. The development of techniques of aerosol generation and size distribution determination has been coordinated with similar work required for the Experimental Cloud Exposure Study (EXCES) undertaken by the Laboratory for the Division of Reactor Development and Technology.

The results of the CERT program are applicable to conventional air pollution problems. Field tests have been carried out in cooperation with Dr. A Clyde Hill who heads a program on air pollution at the University of Utah.

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Justification for Operating Costs & Equipment Obligations

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Field Office or Laboratory

1. Budget Activity No.:	2. Office:	3. Project Title:
06 02 06 00	ID	Controlled Environmental Release Test (CERT) Program

29. Technical Accomplishments in FY 1972:

A. General

Significant personnel changes occurred during FY 1972; three of the four staff members (2 biologists and 1 health physicist) who have worked on the project during the past several years are no longer employed by the Laboratory. A recent Ph.D. graduate of Colorado State University was hired and is a coinvestigator for the project. The health physicist will be replaced before the end of FY 1972, and will contribute to the FY 1973 effort.

B. Laboratory Experimental Program

The large environmental chamber and associated lighting and control equipment to be used for much of the laboratory experimental work have not functioned properly; a significant amount of effort was devoted to modifications of the chamber and related equipment to upgrade the operation of the entire system.

Installation and calibration of the carbon dioxide analyzer were accomplished. Equipment for measuring relative humidity profiles was purchased, has been received, and will be tested.

A laboratory experiment was conducted to evaluate the transfer of hypoiodous acid (HOI) from air to pasture grass. The generation of HOI-131 was performed by J. H. Keller, Idaho Chemical Programs - Operations Office, Allied Chemical Corporation. Bromegrass in 25- by 25-cm pots was exposed in a plexiglass exposure chamber; the mean linear velocity of the HOI-contaminated air above the grass was 1 m/sec. Because experimental conditions preclude comparison with normalized transfer velocities obtained in field experiments, an analogous quantity, the transfer parameter  $P_t$  ( $g^{-1}$ ) was used for comparison with molecular iodine gas. For Bromegrass with closed stomata, a value of  $P_t = 2.4 \times 10^{-5} g^{-1}$  was obtained for HOI. For five experiments in which  $I_2$  labeled with I-131 was released into the chamber containing grass with closed stomata a value of  $P_t = 2.4 \pm 0.9 \times 10^{-4} g^{-1}$  (sample standard deviation indicated) was obtained. If environmental conditions are favorable for stability of HOI, transfer of radioiodine released as HOI through the milk-food chain will be reduced in comparison with that for radioiodine released as  $I_2$ .

The sampling technique for tritiated water vapor was refined. Techniques for analysis of  $^3H$  contained in dry and green vegetation were developed for use in evaluating the transfer of  $^3H$  in water vapor from the atmosphere to vegetation. Preliminary laboratory tests to evaluate this transfer process will be completed during FY-1972; field evaluations are presently being planned.

Experimental evaluation to scope the transfer of Kr-85 and  $SO_2$ (S-35) from air to water surfaces will be completed following the testing and installation of the relative humidity profile instrumentation.

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1. Budget Activity No.: 06 02 06 00	2. Office: ID	3. Project Title: Controlled Environmental Release Test (CERT) Program
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29. Technical Accomplishments in FY 1972:

C. Metabolism Studies

Analysis of data from two earlier single-dose radioiodine metabolism experiments, performed in cooperation with B. R. Moss of Montana State University, was completed and the results were summarized for publication. Six cows were fed either Sudangrass or Bromegrass green chop ad libitum as the only forage following dosing with I-125 or I-131 at the beginning of the experimental period. Feeding Sudangrass decreased the average percentage secretion of the radioiodine dose per kilogram of milk from 0.090 to 0.048; the probability, P, that the difference is due to chance is less than 0.01. Feeding Sudangrass also reduced the average milk/plasma ratio from 2.1 to 1.0 (P <0.05). Fecal and urinary excretion percentages were higher on Sudangrass feed but were not significantly different (P >0.10) due to larger variability among the experimental animals.

Preparation of a paper summarizing the results of previous bovine radioiodine metabolism experiments and modeling efforts was begun.

30. Expected Results in FY 1973:

Laboratory studies of the transfer of gaseous and particulate materials to a variety of surfaces will be initiated in the environmental chamber. Retention characteristics of the various nuclide/surface combinations will be evaluated. Particulates labeled with radioisotopes of the following elements will be studied: Cs, Sr, Ru, Ba, Zn, Mn, Co, Ce. Initially, "soluble" particles with median aerodynamic diameters between 0.5 and 1.5 microns will be studied. Subsequent experiments will employ smaller particles and will include "insoluble" forms of the several elements. Deposition of these particles on and their retention by soil, concrete, asphalt, pasture grass, and edible vegetable greens will be evaluated. It is expected that a single consistent "meteorological" regime can be maintained for tests of deposition onto soil, concrete & asphalt. Tests employing pasture grass and vegetable greens canopies will be conducted under consistent conditions, but those may differ from those established for the tests with "smooth" surfaces. Limited data on resuspension of deposited material at low wind speeds can be obtained during retention studies.

Field releases under well documented conditions will be used to establish points of reference for the laboratory deposition experiments and to obtain data on transfer to plant species which, because of size or other limitations, cannot be readily studied in the laboratory. Field evaluation of radionuclide retention will also provide baseline data for the laboratory studies and permit measurements on plants peculiar to cool desert environments.

The paper summarizing the results of the bovine radioiodine metabolism experiments and mathematical model developments will be finished and submitted; this activity will finalize that phase of CERT program research.

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Field Office or Laboratory

1. Budget Activity No.: 06 02 06 00	2. Office: ID	3. Project Title: Controlled Environmental Release Test (CERT) Program
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31. Expected Results in FY 1974:

Work on the program outlined in item 30 (except for the last item) will be continued through FY-1974.

32. Description and Justification of Major Budget Items:

FY 1973

Materials and Supplies (Radioactive Sources)	\$ 3,000
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FY 1974

Materials and Supplies (Radioactive Sources)	\$ 5,000
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33. Description and Justification of Equipment Items:

FY 1973

Additional sampling equipment is needed to (1) characterize aerosol size distribution in the Laboratory and in the field and (2) quantify the extent and amount of deposition on field test plots.	\$ 5,000
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FY 1974

Specific purchases cannot be reliably predicted at this time. However, because unanticipated needs inevitably arise, for planning purposes \$5,000 has been included in the budget to cover these needs.	\$ 5,000
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Justification for Operating Costs & Equipment Obligations

RX BIOMEDICAL AND ENVIRONMENTAL RESEARCH

Ident. No.

000527

Submission Date:  
May 1974

IDAHO

FIELD OFFICE OR LABORATORY

1. Budget Activity No. RX 02-03-00		2. Office 10		3. Project Title Controlled Environmental Release Test (CERT) Program			
4. Method of Reporting 1 Monthly		5. Person in Charge Adrian H. Dahl		Principal Investigator Paul G. Voillequé & O. Doyle Markha			
6. Contractor AEC-ID Health Services Lab		7. Working Location NRTS		8. State IDAHO	9. Type 2 AEC LAB.	10. Contr.	11. Task
12. Reactor Application		13. Coolant		14. Division B&ER		15. Lead Branch	
						16. PPB Identification	
						17. Materials Code	
18. Contract Term-Begin Month Day Year From		19. Contract Term-End Month Day Year To		20. Termination Date of Funding Month Day Year			
21. Man Years				FY 1974		FY 1975	
Scientific				1		0.5	
Other Direct				0.5			
Total Direct (No Fractions)				1.5		0.5	
22. Costs (In Thousands)				\$		\$	
a) Personnel Services				25		16	
1) Personnel Benefits				3		1	
b) Materials and Supplies				3		3	
c) Support Services						12	
d) Fuel Fabrication .2							
e) Reactor Fabrication .4							
f) Irradiations .6							
g) R&D Subcontracts							
h) Expendable Equipment							
i) Computer Services				1			
TOTAL - DIRECT COSTS				\$ 32		\$ 32	
j) Administrative Expense							
k) NRTS Expense				3		3	
TOTAL COSTS				\$ 35		\$ 35	
23. Goods & Services on Order (In Thousands)				-0-		-0-	
24. Equipment							
a) B&R Classification: 35 RX 90 01				xxx		xxx	
b) Equipment Obligations (In thousands)				\$ 5		\$ 5	
c) Equipment Costs (In thousands)				\$ 9		\$ 5	

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RX BIOMEDICAL AND ENVIRONMENTAL RESEARCH

IDAHO

FIELD OFFICE OR LABORATORY

1. Budget Activity No.	2. Office	3. Project Title
RX	10	Controlled Environmental Release Test (CERT) Program

26. Dates and Titles of Publications

Markee, E. H., Jr. and C. A. Hawley, Jr. 1963. Controlled environmental radioiodine tests (CERT) at the National Reactor Testing Station. p. 392-400. In Proc. of the Eighth AEC Air Cleaning Conference. TID-7677. U. S. Atomic Energy Commission.

Hawley, C. A., Jr., C. W. Sill, G. L. Voelz, and N. F. Isplitzer. 1964. Controlled Environmental Radioiodine Tests on the National Reactor Testing Station. IDO-12035. Idaho Operations Office. 65 p.

Hawley, C. A., Jr. and E. H. Markee, Jr. 1965. Controlled environmental radioiodine tests. p. 821-835. In Proc. of the Fifth AEC Symp. on Radioactive Fallout from Nuclear Weapons Tests. CONF-765. U. S. Atomic Energy Commission.

Hawley, C. A., Jr. (Ed.) 1965. Controlled environmental radioiodine tests at the National Reactor Testing Station. 1965 Progress Report. IDO-12047. Idaho Operations Office (AEC). 41 p.

Bunch, D. F. (Ed.) 1966. Controlled environmental radioiodine tests. Progress Report Number Two. IDO-12053. Idaho Operations Office (AEC). 33 p.

Bunch, D. F. 1967. The comparative environmental hazards from a release of methyl iodide or elemental iodine. p. 1169-1174. In Proc. of the Ninth AEC Air Cleaning Conference. CONF-66094. U. S. Atomic Energy Commission.

Bunch, D. F. (Ed.) 1968. Controlled environmental radioiodine tests. Progress Report Number Three. IDO-12063. Idaho Operations Office. 77 p.

Pelletier, C. A., and J. D. Zimbrick. 1968. Kinetics of environmental radioiodine transport through the milk-food chain. p. 257-267. In W. L. Reinig (Ed.) Proc. of the Health Physics Society Midyear Symposium on Environmental Surveillance in the Vicinity of Nuclear Facilities. Charles C. Thomas, Springfield, Illinois. 1970.

Zimbrick, J. D., and P. G. Voillequé (eds.). 1967. Controlled environmental radioiodine tests at the National Reactor Testing Station. Progress Report Number Four. IDO-12065. Idaho Operations Office. 78 p.

Voillequé, P. G., D. R. Adams, and J. B. Echo. 1970. Transfer of krypton-85 from air to grass. Health Physics 19:835.

Markee, E. H., Jr. 1971. Studies on the transfer of radioiodine gas to and from natural surfaces. NOAA Tech. Mem. ERL ARL-29. 28 p.

Adams, D. R., and P. G. Voillequé. 1971. Effects of stomatal opening on the transfer of  $^{131}\text{I}_2$  from air to grass. Health Physics 21:771-775.

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RX BIOMEDICAL AND ENVIRONMENTAL RESEARCH

10AND

FIELD OFFICE OR LABORATORY

1. Budget Activity No.	2. Office	3. Project Title
RX	10	Controlled Environmental Release Test (CERT) Program

Moss, B. R., P. G. Voillequé, E. L. Moody, D. R. Adams, C. A. Pelletier, and D. Moss. 1972. Effects of feeding sudangrass on iodine metabolism of lactating dairy cows. J. of Dairy Sc. 55:1487-1491.

Unpublished Oral Presentations

Markee, E. H., Jr., and D. R. Adams. Some processes affecting the transfer of radio-iodine gas. Presented at the Ninth Conference on Agricultural Meteorology, Sept. 1969.

Pelletier, C. A., P. G. Voillequé, and E. H. Markee, Jr. An environmental chamber for mass transfer studies. Presented at the 16th Annual Meeting of the Institute of Environmental Sciences. April, 1970.

Voillequé, P. G., and J. J. Fix. Transfer of airborne krypton-85 to vegetation. Presented at the Noble Gas Symposium in Las Vegas. Sept. 1973.

27. Scope

The CERT Program is a study of the processes whereby airborne contaminants are deposited on and removed from natural and man-made surfaces. Physical and biological processes and variables are studied in the laboratory and in the field. The program considers primarily the behavior of radioactive contaminants but the results of studies on certain radioactive particulate materials are directly applicable to non-radioactive contaminants.

28. Relationships with Other Projects

The CERT program is directly related to the reactor safety program, to the AEC Regulatory program, and to other programs which are necessarily concerned with the behavior of radionuclides in the environment. The findings of the CERT program can be used to estimate the consequences of potential accidents and to evaluate the actual hazards of planned or unplanned releases to the atmosphere from nuclear facilities.

The CERT effort is closely allied with the planned NRTS Radioecology program which will investigate the behavior and impact of airborne radionuclides in the NRTS environment. Since onsite antelope have higher levels of activity than offsite animals in edible portions of their bodies there have been several questions raised as to the levels of activity in livestock which graze 60% of the NRTS site. The CERT field release tests will provide much needed information on retention half-lives of various radionuclides as related to vegetative types and season of the year. These data are necessary in order to assess the environmental impact of NRTS atmospheric releases of radioactivity. Some results of the CERT program are applicable to conventional air pollution problems. Field tests have been carried out in cooperation with Dr. A. Clyde Hill and associates of the Air Pollution Laboratory at the University of Utah.

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Justification for Operating Costs & Equipment Obligations  
RX BIOMEDICAL AND ENVIRONMENTAL RESEARCH

10440

FIELD OFFICE OR LABORATORY

1. Budget Activity No.	2. Office	3. Project Title
RX	10	Controlled Environmental Release Test (CERT) Program

29. Technical Accomplishments in FY-1974

A. General

Early in FY-1974 the health physicist assigned to the CERT chamber studies was transferred to the Environmental Surveillance Section to work on the routine NRTS environmental monitoring program. Hiring of a replacement has not been permitted due to a reduction in the personnel ceiling for the Laboratory program.

B. Laboratory Experimental Program

Additional experiments were performed to evaluate the transfer of Kr-85 from air to various edible vegetable greens (lettuce, swiss chard, and turnip greens) and to Bromegrass. Vegetation grown in 25- by 25- cm pots were exposed to Kr-85 in a plexiglass exposure chamber. Small fans were used to mix the air in the chamber; wind simulation was not attempted. It was found that the concentration of Kr-85 in vegetation reaches an equilibrium value in a relatively short time, probably within one hour. Air-to-vegetation transfer velocities computed assuming a 1-hour equilibration time range from  $10^{-7}$  to  $10^{-6}$  cm/sec; the values were not lognormally distributed. The results of the experiments were summarized and presented at the Noble Gases Symposium in September, 1973 to eliminate some of the public's uncertainty regarding the impact of radioactive noble gas releases on radioactivity in man's food.

An acquisition and processing system for the environmental chamber sensor data (wind speed, temperature, and relative humidity profiles and carbon dioxide concentration) and for telemetered field release monitoring data was designed. Specifications for the system, which will be interfaced with existing telemetry and other equipment, were prepared for competitive procurement. The system, which will be installed in early FY-1975, is also capable of handling the high data rates required by hotwire anemometry systems which will be used in the environmental chamber to document turbulence characteristics for various experimental baffle settings.

C. Field Release Experiments

A sampling grid has been installed northeast of the NRF area at the NRTS. The grid is composed of 40 sampling stations located in approximately six acres of bottlebrush grass (Sitanion hystrix) and in big sagebrush (Artemesia tridentata) which surrounds the grass. Sitanion hystrix is the most abundant grass species on NRTS and is present on about 60% on NRTS. Artemesia tridentata is present on about 80% of the site. The sampling grid consists of 20 sampling stations in the bottlebrush grass and 20 in the big sagebrush. The sampling stations are located on transects which are 100 feet apart. Each transect has two to seven stations spaced at 60 foot intervals.

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RX BIOMEDICAL AND ENVIRONMENTAL RESEARCH

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FIELD OFFICE OR LABORATORY

1. Budget Activity No.	2. Office ID	3. Project Title
RX	ID	Controlled Environmental Release Test (CERT) Program

An electrical power grid was installed to provide power for high volume air samplers and particle sizing samplers located at the sampling stations. The central breaker boxes are separated from the electrical generators in order to minimize contamination of the generators during the release.

Wind speed (3 elevations) and direction, air temperature profile, and precipitation monitors have been installed on the grid. Sensor outputs are hardwired to a small trailer on the edge of the grid where the data are recorded.

Techniques were learned whereby the Cs-134 to be used in the field releases will be transferred to a large shielded cask by Allied Chemical Corporation at the NRTS. The cask will then be transported to the field release point where the isotope is to be pumped directly into the aerosol generator which will be used for the release. This will permit the release of Cs-134 without excessive exposure to personnel. The Ce-144 can be transferred directly to the aerosol generator in the field. Written procedures for the field release of the isotopes were prepared and have been reviewed and approved by ID Operational Safety. Estimates of some of the vegetation characteristics (density and unit masses) needed in the deposition calculations have also been made.

Concentrations of the naturally occurring Be-7 aerosol and of Be-7 on vegetation were measured during a two-month period at seven locations through a cooperative arrangement with another field project. Cs-137 was also detected in many of the samples and sufficient data may be available to describe its behavior during the period. These data are currently being summarized.

30. Expected Results in FY-1975

A. General

To partially remedy the staffing problem which has persisted for the past three years we plan to obtain manpower assistance by one or more of the following mechanisms: appointment of a postdoctoral fellow for work on the project, support of Ph.D. research dealing with deposition and/or retention in HSL facilities, or support of one-term research appointments for qualified graduate students. A two-year appointment of a postdoctoral researcher is the most desirable alternative and it is being actively pursued. Resumes of several qualified individuals have been reviewed and other qualified candidates are being sought. Discussions have been held with Associated Western Universities (AWU) regarding the necessary funding arrangements for such an appointment. Qualified students whose assistance may be obtained through either of the other mechanisms are also being sought. It is expected that support arrangements can be made for one or more individuals before the beginning of FY-1975.

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Justification for Operation Costs & Equipment Obligations

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Field Office or Laboratory

1. Budget Activity No.:	2. Office: ID	3. Project Title: Controlled Environmental Release Test (CERT) Program
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B. Laboratory Experimental Program

The primary assignment of the postdoctoral fellow will be the environmental chamber deposition and retention studies although he will also assist in the field release tests. Laboratory studies of the transfer of gases and particulates to both vegetation and manmade surfaces will be continued using the environmental exposure chambers. Aerosol deposition and retention studies will be conducted using Ce and Cs or Sr tracers and simple vegetation canopies.

A series of experiments is planned to determine the effect of wind speed on retention of radioactivity by vegetation. The maximum wind velocity of the environmental chamber is only 12 mph; however, this can be extended to 24 mph or more by reducing the effective cross-sectional area of the chamber for these tests. Vegetation will be contaminated with a submicron aerosol in a flow-through exposure chamber and then placed in the environmental chamber for exposure to selected wind speeds. The contaminated vegetation will be sampled at intervals to determine the retention half-time. The environmental chamber air is recirculated through high efficiency particulate air filters so recontamination of the vegetation should not pose a problem.

C. Field Release Experiments

The overall objectives of the planned field releases are (1) to compare deposition and retention by vegetation of an isotope non biologically active (cerium) with a biologically important isotope (cesium), (2) to compare deposition and retention of each isotope as a function of season, and (3) to compare deposition and retention on two different vegetative forms - grass (Sitanion hystrix) and sagebrush (Artemesia tridentata). Submicron aerosols of the tracers will be released.

During the summer of 1973, we were unable to release the isotopes on the established grid. We required wind speeds from 12-25 mph from 235° but acceptable conditions did not occur during the experimental time schedule. Although the NRTS is equipped with an extensive weather (wind and temperature) telemetry system, the predictability of winds on the grid from the data furnished by this system is less than ideal because of the complex wind patterns on the NRTS and the advance notice required for source and grid preparation. Transmission of grid winds to the HSL is planned for use with the mesoscale data in predicting acceptable release periods for the grid.

A minimum of one field release is planned during FY-1975. Meteorological conditions may limit the fraction of the established grid which can be covered by the released plume. Since the air sampler locations are fixed, the deposition data may not be complete; however retention data can be

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Justification for Operation Costs & Equipment Obligations

IDAHO

Field Office or Laboratory

1. Budget Activity No.:	2. Office: ID	3. Project Title: Controlled Environmental Release Test (CERT) Program
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obtained from the entire area of contamination.

It is anticipated that additional data on transfer of airborne Be-7 and Cs-137 to vegetation will be obtained from samples collected as part of a separate field monitoring program. Weekly samples from ten locations for four months are planned during the growing season.

31. Expected Results in FY-1976

The laboratory experimental program outlined in item 30 will be continued and extended to cover other aerosols and sinks. The field release program will provide additional baseline data on deposition and retention under natural conditions.

32. Description and Justification of Major Budget Items

FY-1975

Radioactive sources, sampling materials, and disposable supplies	\$3,000
Financial support of graduate or postdoctoral research assistants	\$12,000

FY-1976

Radioactive source, sampling materials, and disposable supplies	\$4,000
Financial support of graduate or postdoctoral research assistants	\$14,000

33. Description and Justification of Equipment Items

FY-1975

Graphics display and hard copy capability for experimental data acquisition and analysis system.	\$5,000
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FY-1976

Specific purchases cannot be reliably predicted at this time. However because needs inevitably arise, \$5,000 has been included in the budget to cover these needs.	\$5,000
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1. TITLE: The Controlled Environmental Release Test (CERT) Program  
Field Releases

2. PROPOSED ACTION:

The Controlled Environmental Release Test (CERT) Program is being performed to study rates of deposition and retention of airborne particulate matter on manmade and natural surfaces. This particular phase of the CERT Program is designed to ascertain the deposition and retention of particulate radioactive tracers on vegetation common to the National Reactor Testing Station (NRTS). The effect of seasonal variables on these parameters will also be studied.

In these field releases, millicurie amounts of short-lived tracers will be released near the ground surface on a grid which has been established approximately four miles NE of the Naval Reactor Facility (NRF). The releases will occur on a seasonal basis with three releases planned for the next two years.

The tracers will be selected from the short-lived isotopes of cerium, ruthenium, cesium and zirconium. These tracers were chosen because they are relevant to releases from NRTS facilities (ICPP). Also, these isotopes are prominent ones associated with world-wide fallout from nuclear detonations. Little is known concerning their deposition and retention by plant surfaces.

The releases will be made at controlled rates under well documented and continuously monitored meteorological conditions. Personnel from the National Oceanic and Atmospheric Administration (NOAA) will provide appropriate meteorological data and pretest forecasting. In addition wind direction and speeds will be continuously monitored by instruments on the grid as well as other onsite telemetry stations.

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### 3. PROBABLE ADVERSE EFFECTS

The field experiments will result in the release of small amounts of short-lived radionuclides. A total of approximately 4.5 curies will be released in the three tests over the next two years. The relatively small size of the sampling grid (350 m x 150 m) will permit adequate contamination of the vegetation with only 500 millicuries of each of the three selected tracers. Most of the released materials will be deposited on and adjacent to the grid. However, small amounts of the tracer will be carried across the NRTS boundary by the NE winds. There are no NRTS facilities downwind (NE) of the grid and the nearest occupancies to the NE are 43 KM from the grid on the NRTS boundary in the Mud Lake-Terreton area. A 60 minute release is planned for each tracer. Estimated relative axial concentrations for this distance is  $3 \times 10^{-7} \text{ m}^{-2}$ . Based upon a wind speed of 4 m/sec the plume centerline air concentration in the Mud Lake-Terreton area for a one hour release is estimated to be  $1 \times 10^{-14} \text{ uC/cm}^3$ .

Although vegetation on the grid will be contaminated, the concentration of the nuclides will be low, and there will be no adverse effect on the vegetation. Vegetative sampling procedures (removal of certain plants and plant parts for analysis) will be more detrimental, at least to certain plants. The detriment to grass sampled on the grid will be temporary but sampling of the sagebrush will most likely result in killing some of the plants. However, the total number of plants to be sampled is small and will be insignificant as far as the ecosystem is concerned.

By far the most adverse effect to the environment in the grid area was caused by the road into the grid area. Some of the vegetation in the road's path has been and more will be destroyed, and the effect of the road will be visible for many years. However, this road is only .25 to .5 miles long and the area involved is small, therefore, the effect on the ecosystem will be minor. The road already exists due to preliminary sampling and installation

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In the immediate area north of the test grid, small rodents, jackrabbits and antelope may ingest the contaminated vegetation and thus receive higher body burdens of the tracers than offsite animals. However, since the amounts of the tracers released are only a fraction of that annually released by ICPP and since the half-lives of the isotopes used in these tests are relatively short, the effect on the animal population will be insignificant. A long term study to determine nuclide levels in biological samples on and near NRTS is now in progress and samples will be collected during the test.

#### 4. ALTERNATIVES

The CERT field releases are designed to obtain much needed information regarding the deposition and retention times of radionuclides currently being released from NRTS facilities and deposited on NRTS vegetation. The alternative of not obtaining this data is not considered acceptable.

#### 5. ASSESSMENT OF SHORT-VERSUS LONG-TERM BENEFITS

Some probable short-term benefits are (1) data on retention and deposition of particles on vegetation common to NRTS. (2) Provide comparisons of the effects of season or deposition and retention (3) Provide data for comparison between field and laboratory. Some of the probable long-term benefits (1) Provide adequate data to assess the environmental consequences of accidental or planned releases from NRTS facilities as well as nuclear detonations. (2) Provide the basic data necessary for interpretations of data on nuclide levels in biological materials.

#### 6. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS

No irreversible or irretrievable commitments are involved.

#### 7. COST BENEFIT ANALYSIS

The costs to the environment are temporary and minor, and are more than balanced by the technical benefits outlined in Section 5.

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8. SUMMARY ANALYSIS

No significant short- or long-term environment impacts will result from the CERT field releases. Data obtained from the tests will assist in the analysis of environmental effects of airborne releases of radioactive particles as well as other pollutants.

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Justification for Operating Costs & Equipment Obligations

RX BIOMEDICAL AND ENVIRONMENTAL RESEARCH

IDAHO

FIELD OFFICE OR LABORATORY

1. Budget Activity No. RX 02-03-00		2. Office 10		3. Project Title Controlled Environmental Release Test (CERT) Program				
4. Method of Reporting 1 Monthly			5. Person in Charge Adrian H. Dahl		Principal Investigator Paul G. Voillequé & O. Doyle Markham			
6. Contractor		7. Working Location NRTS		8. State IDAHO	9. Type 2 AEC LAB.	10. Contr.	11. Task	
2. Reactor Application		13. Coolant	14. Division B&ER	15. Lead Branch		16. PPB Identification		
						17. Materials Code		
8. Contract Term-Begin Month Day Year From			19. Contract Term-End Month Day Year To			20. Termination Date of Funding Month Day Year		
1. Man Years				FY 1973	FY 1974	FY 1975		
				Scientific	1.0	1.0	1.0	
				Other Direct	0.5	0.5	0.5	
				Total Direct (No Fractions)	1.5	1.5	1.5	
2. Costs (In Thousands)				\$	\$	\$		
a) Personal Services				25	25	25		
1) Personnel Benefits				3	3	3		
b) Materials and Supplies				3	4	4		
c) Support Services								
d) Fuel Fabrication .2								
e) Reactor Fabrication .4								
f) Irradiations .6								
g) R&D Subcontracts								
h) Expendable Equipment								
i) Computer Services				1				
TOTAL - DIRECT COSTS				\$ 32	\$ 32	\$ 32		
j) Administrative Expense				3	3	3		
k) NRTS Expense				35	35	35		
TOTAL COSTS				\$ 35	\$ 35	\$ 35		
3. Goods & Services on Order (In Thousands)				-0-	-0-	-0-		
4. Equipment								
a) B&R Classification:				xxx	xxx	xxx		
b) Equipment Obligations (In thousands)				\$ 3	\$ 5	\$ 5		
c) Equipment Costs (In thousands)				\$ 3	\$ 5	\$ 5		

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Justification for Operating Costs & Equipment Obligations

WHO  
Field Office or Laboratory

Budget Activity No.: RX 02-03-00	2. Office: ID	3. Project Title: Controlled Environmental Release Test (CERT) Program
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5. Dates and Titles of Publications:

- a. E. H. Markee, Jr., and C. A. Hawley, Jr., "Controlled Environmental Radioiodine Tests (CERT) at the National Reactor Testing Station", in Proceedings of the Eighth AEC Air Cleaning Conference, TID-7677, pp 392-400 (1963).
- b. C. A. Hawley, Jr., et al. Controlled Environmental Radioiodine Tests at the National Reactor Testing Station, IDO-12035 (June, 1964).
- c. C. A. Hawley, Jr. and E. H. Markee, Jr., "Controlled Environmental Radioiodine Tests," in Proceedings of the Fifth AEC Symposium on Radioactive Fallout from Nuclear Weapons Tests, CONF-765, pp 821-835 (November, 1965).
- d. C. A. Hawley, Jr. (ed.), Controlled Environmental Radioiodine Tests at the National Reactor Testing Station, 1965 Progress Report, IDO-12047 (February, 1966)
- e. D. F. Bunch, (ed.), Controlled Environmental Radioiodine Tests, Progress Report Number Two, IDO-12053 (August, 1966).
- f. D. F. Bunch, "The Comparative Environmental Hazards from a Release of Methyl Iodide or Elemental Iodine," in Proceedings of the Ninth AEC Air Cleaning Conference, CONF-66094, pp 1169-1174 (January, 1967).
- g. D. F. Bunch, (ed.), Controlled Environmental Radioiodine Tests Progress Report Number Three, IDO-12063 (January, 1968).
- h. C. A. Pelletier and J. D. Zimbrick, "Kinetics of Environmental Radioiodine Transport through the Milk-Food Chain", Proceedings of the Health Physics Society Midyear Topical Symposium, January 26, 1968 on Environmental Surveillance in the Vicinity of Nuclear Facilities, W. C. Reinig, editor.
- i. J. D. Zimbrick and P. G. Voillequé, (eds.) Controlled Environmental Radioiodine Tests at the National Reactor Testing Station, Progress Report Number Four, IDO-12065 (December, 1968).
- j. E. H. Markee, Jr. and D. R. Adams, "Some Processes Affecting the Transfer of Radioiodine Gas", paper presented at the Ninth Conference on Agricultural Meteorology, September, 1969. To be published in Atmospheric Environment.
- k. C. A. Pelletier, P. G. Voillequé and E. H. Markee, Jr. "An Environmental Chamber for Mass Transfer Studies", paper presented at the 16th Annual Meeting of the Institute of Environmental Sciences (April, 1970).
- l. P. G. Voillequé, D. R. Adams, and John B. Echo, "Transfer of Krypton-85 from Air to Grass", Health Physics, 19, 835(1970).

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 RX BIOMEDICAL AND ENVIRONMENTAL RESEARCH

IDAHO

FIELD OFFICE OR LABORATORY

1. Budget Activity No.	2. Office	3. Project Title
RX 02-03-00	10	Controlled Environmental Release Test (CERT) Program

26. Dates and Titles of Publications: Continued

- m. E. H. Markee, Jr., "Studies of the Transfer of Radioiodine Gas to and from Natural Surfaces", NOAA Technical Memorandum ERL-29 (April, 1971).
- n. D. R. Adams and P. G. Voillequé, "Effects of Stomatal Opening on the Transfer of <sup>131</sup>I<sub>2</sub> from Air to Grass", Health Physics, 21, 771(1971).
- o. B. R. Moss, P. G. Voillequé, E. L. Moody, D. R. Adams, C. A. Pelletier, and D. Hoss, "Effects of Feeding Sudangrass on Iodine Metabolism of Lactating Dairy Cows", Journal of Dairy Science, 55, 1487(1972).

27. Scope:

The CERT program is a study of the processes whereby airborne contaminants are deposited on and removed from natural and man-made surfaces. Physical and biological processes and variables are studied in the laboratory and in the field. The program considers primarily the behavior of radioactive contaminants but other contaminants such as SO<sub>2</sub> have been and will be studied; the results of studies on certain radioactive particulate materials are directly applicable to non-radioactive contaminants.

28. Relationships with Other Projects:

The CERT program is directly related to the reactor safety program, to the AEC Regulatory program, and to other programs which are necessarily concerned with the behavior of radionuclides in the environment. The findings of the CERT program can be used in estimating the consequences of potential accidents and to evaluate the actual hazards of planned or unplanned releases to the atmosphere from nuclear facilities. The CERT effort is closely allied with the planned NRTS Radioecology program which will investigate the behavior and impact of airborne radionuclides in the NRTS environment.

Data on the collection efficiencies of air filters for various radioactive substances which have been determined as part of the CERT research have been utilized by the environmental monitoring program on and around the National Reactor Testing Station. Similar information has been utilized in the Independent Measurements Program conducted by the Health Services Laboratory (HSL) for the Directorate of Regulatory Operations.

Some results of the CERT program are applicable to conventional air pollution problems. Field tests have been carried out in cooperation with Dr. A. Clyde Hill who heads a program on air pollution at the University of Utah.

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RX BIOMEDICAL AND ENVIRONMENTAL RESEARCH

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FIELD OFFICE OR LABORATORY

1. Budget Activity No.	2. Office	3. Project Title
RX 02-03-00	ID	Controlled Environmental Release Test (CERT) Program

9. Technical Accomplishments in FY-1973:

A. General

The only significant personnel change in Fy-1973 was the addition of a new health physicist (M.S. degree) to the staff in September to fill a position vacated in March. He will be a principal contributor to the laboratory experimental program and will also participate in the field release experiments. The status of personnel involved in the CERT program is expected to be stable through FY-1975.

B. Laboratory Experimental Program

The relative humidity monitoring equipment was tested and placed in operational condition. Wind speed, temperature, and relative humidity profiles and carbon dioxide concentration are the environmental variables which we can document for tests in the large environmental chamber. Average values of these variables are measured during experiments in the smaller flow-through chambers. In the static (no wind simulation) chamber experiments average temperature, relative humidity, and carbon dioxide concentration are documented.

By manipulating several air flow regulating devices in the large chamber, we obtained velocity profiles which approximate those observed in the environment for flow over natural surfaces. These profiles will be maintained to provide consistent conditions throughout a series of experiments.

Six experiments have been performed to evaluate the transfer of Kr-85 from air to various edible vegetable greens (leaf lettuce, swiss chard, and turnip greens) and to Bromegrass. Vegetation grown in 25- by 25-cm pots was exposed to Kr-85 in a plexiglass exposure chamber. Small fans were used to mix the air in the chamber; wind simulation was not attempted. The calculated transfer velocities obtained are all quite small (as was expected); none exceeds  $9 \times 10^{-7}$  cm/sec (turnip greens, 2-hour exposure). Additional experiments in which the exposure to similar concentration levels is extended for up to ~200 hours will be completed to ascertain the activity transferred under "equilibrium conditions". The results of these experiments will be summarized and presented as an invited paper at the Noble Gases Symposium in Las Vegas in September, 1973.

Analytical techniques for both free and bound tritium in vegetation samples have been developed and tested. The capability for sampling for tritiated water vapor in the atmosphere has been checked in laboratory studies and evaluated under field conditions. Both capabilities are employed in a series of experiments underway to measure air-to-vegetation transfer of tritiated water vapor. A variety of vegetable greens and Bromegrass are being used for this evaluation. Environmental variables documented (and controlled to the extent possible) are

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FIELD OFFICE OR LABORATORY

1. Budget Activity No.	2. Office ID	3. Project Title
RX 02-03-00	ID	Controlled Environmental Release Test (CERT) Program

29. Technical Accomplishments in FY-1973: Continued

wind speed profile, relative humidity profile,  $^3\text{H}_2\text{O}$  concentration profile, and  $\text{CO}_2$  concentration.

High volume air samplers for particle size analysis were assembled for use in the exposure chambers and in the field. The samplers were used for sampling ruthenium aerosols released into the chamber for one-hour exposures of vegetation. Ninety-two percent of the Ru-103 activity in the aerosol generated was associated with particle diameters of less than 1.1 microns. Evaluation of the distribution of activity in the (0-1)-micron size range and estimation of the median diameter which characterizes the distribution are planned.

Three aerosol release experiments were conducted in the flow-through exposure chamber. Cabbage plants were exposed to submicron Ru-103 aerosols for 1-hour periods to evaluate the uniformity of deposition on exposed vegetation and to estimate the transfer parameter,  $P_t$ , which is analagous to the normalized transfer velocity which one would obtain from field experiments. Transfer parameters of  $\sim 4 \times 10^{-7} \text{ (g}^{-1}\text{)}$  were measured for exposed cabbage surfaces. Additional experiments to measure transfer parameters for grasses and vegetable greens will be completed in FY-1973 using Ru-103.

C. Field Release Experiments

A sampling grid has been installed northeast of the NRF area at the NRTS. The grid is composed of 40 sampling stations located in approximately six acres of bottlebrush grass (Sitanion hystrix) and in big sagebrush (Artemesia tridentata) which surrounds the grass. Sitanion hystrix is the most abundant grass species on NRTS and is present on about 60% on NRTS. Artemesia tridentata is present on about 80% of the site. The sampling grid consists of 20 sampling stations in the bottlebrush grass and 20 in the big sagebrush. The sampling stations are located on transects which are 100 feet apart. Each transect has two to seven stations spaced at 60 foot intervals.

Wind, temperature and precipitation monitors have also been installed on and near the grid. A tower installed in the center of the grid will give temperatures and wind speeds at three elevations during releases.

Estimates of Sitanion hystrix and Artemesia tridentata densities in the grid area have been established and estimates of the mass per sagebrush plant were determined by clipping the green fleshy parts of a large number of sagebrush plants chosen at random. The unit weight of the grass will be obtained during the experiments. These data (mass per unit area) are necessary in order to determine normalized deposition velocities of released aerosols.

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RX BIOMEDICAL AND ENVIRONMENTAL RESEARCH

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FIELD OFFICE OR LABORATORY

1. Budget Activity No.	2. Office	3. Project Title
RX 02-03-00	10	Controlled Environmental Release Test (CERT) Program

29. Technical Accomplishments in FY-1973: Continued

A field release to measure deposition velocities and retention half-life for the fission product aerosols Cs-134 and Ce-141 will be conducted over this grid during May 1973. These results will provide a reference point for environmental chamber deposition and retention studies using native grasses and will be useful in evaluating results of contamination surveillance activities at the NRTS.

Evaluation of tritium concentrations in the atmosphere and transfer to vegetation downwind from the Idaho Chemical Processing Plant has begun. Data from this evaluation should provide points of comparison for the chamber studies of air to vegetation transfer of tritiated water.

A paper on our earlier work on bovine iodine metabolism modeling is nearing completion. Because of the extreme interest in environmental radioiodine expressed by Regulatory agencies, other relevant CERT data will be summarized and published as a research note.

30. Expected Results in FY-1974:

Laboratory studies of the transfer of gases and particulates to both vegetation and man-made surfaces will be continued using the environmental exposure chambers. The studies of  $^3\text{H}_2\text{O}$  vapor transfer will be extended to cover several types of vegetation. Aerosol deposition and retention studies will be extended to Cs, Ce, and Sr aerosols and to include a small variety of vegetation canopies.

One or two field releases of submicron aerosols will be conducted over native or pasture vegetation to obtain field baseline data on particle deposition and retention characteristics under documented conditions.

An experiment to determine the effect of wind speed on retention of radioactivity by vegetation will be conducted using plants contaminated in the small chambers. The full wind speed range (0-12 mph) of the large environmental chamber will be employed in the first-cut evaluation of the problem.

The Idaho Chemical Processing Plant stack release of  $^3\text{H}_2\text{O}$  will be employed to obtain data on air to vegetation transfer under field conditions for comparison with laboratory results.

As indicated above, the Kr-85 results will be presented and published to eliminate some of the public uncertainty regarding the potential effects of gaseous waste disposal from nuclear generating stations and reprocessing facilities. Results of the laboratory tritium release studies will be reported, as will initial particulate deposition and retention results.

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FIELD OFFICE OR LABORATORY

1. Budget Activity No.	2. Office	3. Project Title
RX 02-03-00	10	Controlled Environmental Release Test (CERT) Program

1. Expected Results in FY-1975:

The program outlined above in item 30 will be continued and extended to cover other aerosols and sinks.

2. Description and Justification of Major Budget Items:

FY-1974

Radioactive Sources Sampling Materials, and Disposable Supplies \$4000

FY-1975

Radioactive Sources, Sampling Materials, and Disposable Supplies \$4000

3. Description and Justification of Equipment Items:

FY-1974

A data acquisition and analysis system is needed to \$5000  
 (1) simplify monitoring of environmental variables during  
 environmental chamber and field release experiments and  
 (2) reduce the human effort required to extract and analyze  
 the data obtained from the sensors.

FY-1975

Specific purchases cannot be reliably predicted at this \$5000  
 time. However, because unanticipated needs inevitably  
 arise, for planning purposes \$5,000 has been included in  
 the budget to cover these needs.

BRIEF ENVIRONMENTAL ANALYSIS  
IDAHO OPERATIONS OFFICE

Budget Activity No.

RX-02-03-00

Date Submitted:

April 1973

TO: Lyman Bryan, Director  
Finance Division

*Donald I. Walker*  
FROM: Donald I. Walker, Director  
Health Services Laboratory

1. TITLE: Controlled Environmental Release Test (CERT) Program
2. PROPOSED ACTION:

The Controlled Environmental Release Test (CERT) Program is being performed to study the processes whereby airborne contaminants are deposited on and removed from natural and man-made surfaces. Physical and biological variables believed to be significant in these processes are documented in field and laboratory experiments in which gaseous or particulate radioactive tracers are released. Transfer of the tracer to vegetation or other surfaces and retention of the transferred material are evaluated. The predictive models developed can be used in estimating the consequences of potential accidents and to evaluate the actual hazards resulting from planned or unplanned releases to the atmosphere. Many results are directly applicable to the behavior of common nonradioactive pollutants in the atmosphere.

Laboratory experiments are performed in plexiglass exposure chambers. In the flow-through type chambers prefiltered air is contaminated with tracer material, drawn over the vegetation or other surface, and then filtered to remove the contaminant prior to being exhausted to the ambient atmosphere. In the wind tunnel type chamber, in-line filter systems cleanse the air during each cycle through the system.

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TITLE: Controlled Environmental Release Test (CERT) Program

Activity: RX-02-03-00

In the field tests, millicurie amounts of short-lived tracers will be released directly to the atmosphere. The tracer will be transported by the airflow across the test surfaces and subsequently offsite. The concentration of the tracer in offsite air will be well below the corresponding guide value and the resulting yearly radiation doses to the critical group will be less than 1% of those due to natural background.

Vegetation in the test area will be contaminated. However, since only trace amounts of activity will be used, there will be no adverse effects on the vegetation. Vegetative sampling procedures (removal of certain plants and plant parts for analysis) will be more detrimental, at least to certain plants, but will affect such a small percentage of the plants that the effects on the local vegetation community will be insignificant.

In the test area some small rodents, jackrabbits, and perhaps an occasional antelope will be exposed to higher air concentrations than those to which the offsite population are exposed and to contaminated forage. Predators of these animals will also be exposed to small quantities of tracer radioactivity. Although it is conceivable that tumors might be induced in some individual animals, the impact on the animal populations will not be significant.

4. ALTERNATIVES:

The CERT Program is designed to obtain valuable data on deposition and retention of radioactive materials. The alternative of not obtaining the data is not considered acceptable. The use of environmental chambers for the majority of the experiments minimizes the potential impact of the program. Elimination of all field releases is not viable alternative since such tests are required to provide reference points and for studies related to native vegetation which is too large for use in laboratory experiments.

5. ASSESSMENT OF SHORT-VERSUS LONG-TERM BENEFITS:

Conduct of the CERT Program does not pose a significant threat to the continued existence of vegetation or animal communities on or

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TITLE: Controlled Environmental Release Test (CERT) Program

Activity: RX-02-03-00

In field experiments millicurie quantities of short-lived tracers are released at controlled rates under well documented and continuously monitored meteorological conditions. Pre-test forecasting, situation analysis during the release, and documentation are provided by personnel of the National Oceanic and Atmospheric Administration (NOAA). These experiments will be conducted at the Experimental Field Station, Test Grid Three, and occasionally in adjacent undisturbed areas. Field releases under well documented conditions will provide points of reference for the laboratory experimental work as well as providing information on deposition, retention and transfer mechanisms in the cool high desert ecosystem of the National Reactor Testing Station (NRTS).

A wide variety of radioactive tracers will be used. Elements will be chosen on the basis of their relevance to actual or potential environmental contamination problems. Radioactive cesium, ruthenium, cerium, manganese, cobalt, barium, and zinc have been identified as labels for particulate tracers; the selection of particular isotopes will be made with the aim of minimizing potential adverse effects for a given experiment.

3. PROBABLE ADVERSE EFFECTS:

The conduct of the CERT Program will result in the release of small amounts of predominantly short-lived radionuclides; a total activity of 5 Ci may be released to the atmosphere in a single year. The strict control and limited size of the releases, isolation of the testing areas, and dispersion of the activity released all help to preclude the possibility of adverse effects on man or his environment. Additional discussion of expected consequences of the testing follows.

The majority of tracer releases will be conducted in the Laboratory in exposure chambers. Filtration systems for the chambers will remove radioactive particulates and radioiodine gas; however, small quantities of radioisotopes which are not readily filtered (e.g., Kr-85 and tritiated water vapor) will be discharged to the atmosphere. Yearly radiation doses to on- or offsite personnel from such releases will in no case be as great as 1 mrem (approximately 1% of those due to natural background).

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TITLE: Controlled Environmental Release Test (CERT) Program

Activity: RX-02-03-00

near the NRTS. Certain areas have been established for such testing; however the conduct of the tests will not preclude future alternative uses of these or adjoining areas. In brief, the long term productivity of these lands is not compromised by the proposed short-term use.

6. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS:

There are no significant irreversible resource commitments associated with the CERT Program. As indicated above, the long-term assests of the testing locations will not be diminished. Small amounts of disposable supplies will be used and small numbers of samples of NRTS vegetation will be removed from the ecosystem.

7. COST BENEFIT ANALYSIS:

The technical benefits of the program were outlined in the description of the program (item 2 above). The environmental costs, although not readily quantifiable, are known to be very small.

8. SUMMARY:

No significant short- or long-term environmental impacts will result from the conduct of the CERT Program. Data obtained from the experiments will assist in the analysis of potential environmental effects of airborne releases of radioactivity and other pollutants.