

|   |     |   |                                   |                          |  |  |  |
|---|-----|---|-----------------------------------|--------------------------|--|--|--|
| <b>Battelle</b>   |     | <b>INFORMATION FOR APPROVAL OF PROPOSAL</b><br>Prep Sheet <span style="float: right;">701740</span> |                                   |                          | PROPOSAL NO.   | AMENDMENT NO.  | REVISION NO.   |
|   |     |   |                                   |                          | - 9-78-RK-128  |  |  |
| PROPOSAL AUTHOR OR COORDINATOR  |     | PHONE   | PROJECT MANAG                     |                          | PHONE  | LEAD DEPARTMENT OR CENTER  |  |
| FT Cross  |     | 9425417   | LG Faust                          |                          | 9423613  | O&ES <span style="float: right; font-size: 1.5em;">PNL-9237</span> |  |
| SPONSOR'S NAME AND COMPLETE MAILING ADDRESS   |     |   |                                   |                          | PHONE  |  |  |
| Energy Research & Development Administration<br>Division of Biomedical & Environmental Research<br>Washington, D.C. 20545   |     |   |                                   |                          | NATIONALITY OF SPONSOR:  |  |  |
|   |     |   |                                   |                          | <input checked="" type="checkbox"/> U.S.<br><input type="checkbox"/> OTHER _____ |  |  |
| SPONSOR'S TECHNICAL CONTACT   |     |   | SPONSOR'S CONTRACT REPRESENTATIVE |                          |  | DATE PROPOSAL DUE SPONSOR  |  |
| W. H. Weyzen, M.D.  |     |   |                                   |                          |  | May 1977   |  |
| ESTIMATED COST  | FEE | PROPOSED CONTRACT AMOUNT  |                                   | PROPOSED CONTRACT PERIOD |  | PLANNED STARTING DATE  |  |
| \$200,000   |     | \$200,000   |                                   | 1 yr - FY 1978           |  | 10/1/77  |  |
| WORK IS TO BE CONDUCTED UNDER: <input type="checkbox"/> USE PERMIT CONTRACT 1831 <input type="checkbox"/> OPERATING CONTRACT 1830 (RELATED SERVICES) <input type="checkbox"/> OTHER |     |   |                                   |                          |  |  | (NO USE OF CONSOLIDATED LAB FACILITIES— EXPLAIN ON BACK) |
| SCOPE OF SCIENTIFIC RESEARCH  |     |   |                                   |                          |  |  |  |
| Development and improvement of methods and the evaluation of the radiological impact of the nuclear industry on workers and environmental residents.                                |     |   |                                   |                          |  |  |  |
| TITLE (X SHOULD BE USED <input type="checkbox"/> SHOULD NOT BE USED INSTEAD OF SCOPE ON PROPOSAL)   |     |   |                                   |                          |  |  |  |

**FOR AMENDMENTS. (CHANGES TO EXISTING AGREEMENTS) COMPLETE THE FOLLOWING IN ADDITION TO ABOVE, BELOW, AND BACK**

|  |                                       |                                       |
|--|---------------------------------------|---------------------------------------|
| SCOPE STATEMENT SHOULD:  | EXPIRATION DATE OF PRESENT AGREEMENT  | PERIOD OF EXTENSION OR REVISED PERIOD |
| <input type="checkbox"/> NOT BE CHANGED <input type="checkbox"/> BE CHANGED AS INDICATED ABOVE |                                       |                                       |
| NEW CONDITIONS, IF ANY   | ESTIMATED REVISED TOTAL CONTRACT COST |                                       |
|  | FEE                                   |                                       |
|  | REVISED TOTAL FOR CONTRACT            |                                       |

WHAT WILL BE THE EFFECT ON ERDA OR OTHER WORK CURRENTLY USING OR SHARING FACILITIES?  
 None.

SPECIFY ALL FACILITIES (BLDG. & ROOM NO.) AND MAJOR EQUIPMENT UNDER BNW CONTROL EXPECTED TO BE USED. SPECIFY ANY ERDA EQUIPMENT TO BE TAKEN OFFSITE.

3717 Bldg., Rm 1  
 329 Bldg - labs

REPOSITORY RK-Eng. Bldg. Area 3660  
 COLLECTION Human Issue

ANTICIPATED USAGE OF SERVICES, IE, TYPE AND ESTIMATED COST, AND FACILITIES CONTROLLED BY HEDL AND OTHER HANFORD SITE CONTRACTORS. INDICATE HEDL THIRD LEVEL MANAGEMENT COMPLETING ARRANGEMENTS. (ATTACH ANY DOCUMENTATION OF HEDL CONCURRENCE).

BOX NO. 2952  
 FOLDER DN5C 77-5

**MANAGEMENT APPROVALS**

| LEAD DEPARTMENT/PROGRAM MGR. | DATE    | AMOUNT    | PARTICIPATING DEPARTMENT/PROGRAM MGR. | DATE | AMOUNT |
|------------------------------|---------|-----------|---------------------------------------|------|--------|
| HV Larson <i>[Signature]</i> | 7-14-77 | \$200,000 |                                       |      |        |
| <i>[Signature]</i>           | 3-16-77 | 0         |                                       |      |        |
|                              |         |           |                                       |      |        |
|                              |         |           | OTHER APPROVALS                       |      |        |

**FOR CONTRACT SERVICES**

|   |   |                                       |         |               |         |                           |
|---|---|---------------------------------------|---------|---------------|---------|---------------------------|
| TYPE OF CONTRACT:   | TERMS OF PAYMENT  | SCOPE FILED                           | DATE    | SCOPE CLEARED | DATE    | ERDA NOTICE FILED         |
| <input type="checkbox"/> STANDARD RESEARCH<br><input type="checkbox"/> TECH. SERVICES<br><input type="checkbox"/> GOV'T. PRIME<br><input type="checkbox"/> GOV'T. SUBCONTRACT<br><input type="checkbox"/> GOV'T. GRANT<br><input type="checkbox"/> CPFF<br><input type="checkbox"/> FIXED PRICE<br><input type="checkbox"/> OTHER (EXPLAIN ON BACK) | <input type="checkbox"/> FIXED BILLING MONTHLY<br><input type="checkbox"/> ADVANCED PAYMENT<br><input type="checkbox"/> COST INCURRED MONTHLY<br><input type="checkbox"/> STANDARD GOV'T. | N 14798                               | 7/5/77  | C-518         | 7/13/77 |                           |
|   |   | CONTRACT SERVICES                     |         | DATE          |         | REVIEW PERIOD COMPLETE ON |
|   |   | FINANCE & ADMINISTRATION              |         | DATE          |         |                           |
| SPONSOR CODE WILL CAT.  |   | LEGAL                                 | DATE    |               |         |                           |
| A 16-2  |   | <i>[Signature]</i>                    | 4-21-77 |               |         |                           |
| D AND B   | RISK ASSESSMENT FORM REQUIRED IF NONE. EXPLAIN  | OCCUPATIONAL AND ENVIRONMENTAL SAFETY |         |               | DATE    |                           |
|   |   |                                       |         |               |         |                           |

443600

189-78-RK-128

RISK ASSESSMENT

PROPOSAL CONTRACT NO RK-02-01-0390 AMENDMENT NO \_\_\_\_\_ WORK AUTHORIZATION NO \_\_\_\_\_

SPONSOR WH Weyzen/EPDA-DBER

SCOPE OR BRIEF DESCRIPTION OF PROGRAM Evaluation of radiological impact of nuclear industry on workers and residents near the Hanford plant.

A PAPER STUDY ONLY

B. CHECK ANY ITEMS INVOLVED IN THE PROPOSED WORK: (PROVIDE DETAILS ON BACK OF FORM.)

- |  |                          |                          |  |                          |                          |  |                          |                          |
|--|--------------------------|--------------------------|--|--------------------------|--------------------------|--|--------------------------|--------------------------|
|  | YES                      | NO                       |  | YES                      | NO                       |  | YES                      | NO                       |
| 1. BIOHAZARDS CARCINOGENS, ALLERGENS         | <input type="checkbox"/> | <input type="checkbox"/> | 18. FLYING INVOLVED  | <input type="checkbox"/> | <input type="checkbox"/> | 35. HAZARDOUS LOCATION                                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. BIOHAZARDS VIRUS, BACTERIA, FUNGUS        | <input type="checkbox"/> | <input type="checkbox"/> | 19. WORK (OVER, UNDER, IN) WATER   | <input type="checkbox"/> | <input type="checkbox"/> | 36. FOOD   | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. DRUGS OR TOXIC MATERIAL VAPOR DUST        | <input type="checkbox"/> | <input type="checkbox"/> | 20. CLIMBING REQUIRED @ 10' ELEV.  | <input type="checkbox"/> | <input type="checkbox"/> | 37. RADIOACTIVE MATERIAL                                 | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. FLAMMABLE OR COMBUSTIBLE LIQUID GASES     | <input type="checkbox"/> | <input type="checkbox"/> | 21. NEW OUTSIDE UTILITIES REQUIRED   | <input type="checkbox"/> | <input type="checkbox"/> | 38. IONIZING RADIATION GENERATING MACHINE                | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. EXPLOSIVES (LIST QUANTITY & TYPE)         | <input type="checkbox"/> | <input type="checkbox"/> | 22. MAJOR UNUSUAL OR PROLONGED CONSTRUCTION ACTIVITY                           | <input type="checkbox"/> | <input type="checkbox"/> | 39. REACTOR OR CRITICAL FACILITY                         | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. RARE OR EXOTIC CHEMICALS                  | <input type="checkbox"/> | <input type="checkbox"/> | 23. SPACE CONFLICT WITH OTHER RESEARCH   | <input type="checkbox"/> | <input type="checkbox"/> | 40. DESIGN INTENDED FOR COMMERCIAL USE                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. ANY EFFLUENT RELEASE                      | <input type="checkbox"/> | <input type="checkbox"/> | 24. NEW FACILITY REQUIRED  | <input type="checkbox"/> | <input type="checkbox"/> | 41. PROTOTYPE MODEL OR OTHER ITEM TO BE DELIVERED        | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. WASTE DISPOSAL PROBLEMS                   | <input type="checkbox"/> | <input type="checkbox"/> | 25. FACILITY MODIFICATIONS REQUIRED  | <input type="checkbox"/> | <input type="checkbox"/> | 42. SPONSOR-FURNISHED MATERIALS OF HIGH INTRINSIC VALUE  | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. EQUIPMENT DISPOSAL PROBLEMS               | <input type="checkbox"/> | <input type="checkbox"/> | 26. SPECIAL VENTILATIONS REQUIRED  | <input type="checkbox"/> | <input type="checkbox"/> | 43. DOES SPONSOR HAVE RIGHTS TO SUPERVISE WORK           | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. HUMAN SUBJECTS INVOLVED                  | <input type="checkbox"/> | <input type="checkbox"/> | 27. HI PRESSURE FACILITY (LIST MAXIMUM PRESSURE)                               | <input type="checkbox"/> | <input type="checkbox"/> | 44. KNOWN CONFLICT WITH OTHER RESEARCH                   | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. THIRD PARTY HAZARDS INVOLVED             | <input type="checkbox"/> | <input type="checkbox"/> | 28. HI TEMPERATURE (LIST MAX. TEMP.)   | <input type="checkbox"/> | <input type="checkbox"/> | 45. WORK IS SAFETY ANALYSIS OR REC. OF SAFETY PROCEDURES | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. NOISE                                    | <input type="checkbox"/> | <input type="checkbox"/> | 29. EXCAVATION REQUIRED  | <input type="checkbox"/> | <input type="checkbox"/> | 46. WORK IN FOREIGN COUNTRY                              | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. HEAT STRESS LIKELY                       | <input type="checkbox"/> | <input type="checkbox"/> | 30. HIGH VACUUM EQUIPMENT  | <input type="checkbox"/> | <input type="checkbox"/> | 47. OTHER _____  | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. LASER OR OTHER HIGH INTENSITY LIGHT      | <input type="checkbox"/> | <input type="checkbox"/> | 31. SPECIAL LICENSE REQUIRED   | <input type="checkbox"/> | <input type="checkbox"/> |  |                          |                          |
| 15. NON-IONIZING RADIATION (MICROWAVE, ETC.) | <input type="checkbox"/> | <input type="checkbox"/> | 32. SPECIAL TRAINING REQUIRED  | <input type="checkbox"/> | <input type="checkbox"/> |  |                          |                          |
| 16. SPECIAL ELECTRICAL HAZARDS               | <input type="checkbox"/> | <input type="checkbox"/> | 33. OFF-SITE WORK  | <input type="checkbox"/> | <input type="checkbox"/> |  |                          |                          |
| 17. WORK UNDERGROUND                         | <input type="checkbox"/> | <input type="checkbox"/> | 34. LARGE QUANTITIES OF MATERIALS SUCH THAT THE QUANTITY ITSELF CREATES A RISK | <input type="checkbox"/> | <input type="checkbox"/> |  |                          |                          |

C. CHECK (1) OR (2)

- (1)  PROGRAM HAS BEEN DESIGNED TO MINIMIZE RISKS; INVOLVES ONLY NORMAL RISKS; WILL BE PERFORMED WITHIN PNWD FACILITIES; AND DOES NOT INVOLVE AN ITEM ON CHECK LIST TO ANY SIGNIFICANT EXTENT.
- (2)  PROGRAM INVOLVES OFF-SITE WORK (OTHER THAN ROUTINE BUSINESS TRAVEL) OR UNUSUAL RISKS CHECKED OR OTHERWISE NOTED ABOVE RISK MANAGEMENT CONFERENCE HAS BEEN HELD AND RISK MANAGEMENT PLAN IS ATTACHED.

(Risk Management Conference including insurance, safety, contracts, legal, or other staff members as appropriate will be documented in a memorandum to be attached to this form. This conference may be initiated by telephone request to Contract Services.)

- PROJECT MANAGER APPROVAL: Signature \_\_\_\_\_ Date \_\_\_\_\_
- DEPARTMENT MANAGER APPROVAL: (or Center Director Approval) Signature \_\_\_\_\_ Date \_\_\_\_\_
- O&ES SIGNATURES

|                   |      |                      |      |               |      |
|-------------------|------|----------------------|------|---------------|------|
| INDUSTRIAL SAFETY | DATE | RADIATION PROTECTION | DATE | ENVIRONMENTAL | DATE |
|-------------------|------|----------------------|------|---------------|------|

CONTRACT SERVICES:

A. THE PROPOSED WORK IS CLASSIFIED AS:

- |  |   |
|--|---|
| <input type="checkbox"/> 1. IN-LAB/NORMAL RISK     | <input type="checkbox"/> 3. IN-LAB/UNUSUAL RISK     |
| <input type="checkbox"/> 2. OUT OF LAB/NORMAL RISK | <input type="checkbox"/> 4. OUT OF LAB/UNUSUAL RISK |

B. CONTRACT PROVISIONS RECOMMENDED:

- |  |  |
|--|--|
| <input type="checkbox"/> 1. STANDARD INDUSTRIAL RESEARCH AGREEMENT PROVISIONS                | <input type="checkbox"/> 4. SPECIAL DISCLAIMER           |
| <input type="checkbox"/> 2. STANDARD INDUSTRIAL TECHNICAL INVESTIGATION AGREEMENT PROVISIONS | <input type="checkbox"/> 5. SPECIAL INSURANCE PROVISIONS |
| <input type="checkbox"/> 3. SPECIAL INDEMNITY  | <input type="checkbox"/> 6. OTHER                        |

CONTRACT SERVICES Signature \_\_\_\_\_ Date \_\_\_\_\_

LEGAL: COMMENT Requires HSC Review

LEGAL Signature R. E. Jones Date 4-21-77

0009345

Postmortem analysis of human subjects for radionuclide content of body  
and organ systems.

0009346



U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION  
 ADDITIONAL JUSTIFICATION FOR OPERATING COSTS

**SCHEDULE 189**

RICHLAND OPERATIONS OFFICE  
 PREPARED BY BATTELLE-NORTHWEST

|  |
|--|
| REF. NO.   |
| 189 NO.  |
| PROGRAM RK - Environmental<br>Research and Development |

|  |   |
|--|---|
| 1. CONTRACTOR:<br>BATTELLE MEMORIAL INSTITUTE - PACIFIC NORTHWEST LAB. CONTRACT NO. EY-76C-06-1830 |   |
| 2. PROJECT TITLE<br>Evaluation of Radionuclides in Man   |   |
| 3. BUDGET ACTIVITY NO.<br>RK-02-01-01  | 4. DATE<br>March 1977                     |
| 5. METHOD OF REPORTING<br>Annual Reports and Open Literature                                       | 6. WORKING LOCATION<br>Richland, WA       |
| 7. PERSON IN CHARGE:<br>W. R. Wiley  | PRINCIPAL INVESTIGATOR(S):<br>F. T. Cross |

8. PROJECT TERM:  
 FROM: 1967 TO: Continuing

|  | FY 1977 | FY 1978 | FY 1979 |
|--|---------|---------|---------|
| <b>9. MAN YEARS DIRECTLY ASSIGNED</b>                |         |         |         |
| (a) SCIENTIFIC                                       | 2.0     | 2.0     | 2.0     |
| (b) OTHER TECHNICAL                                  | 1.1     | 1.1     | 1.1     |
| SUBTOTAL   | 3.1     | 3.1     | 3.1     |
| SUPPORTING   | 2.5     | 2.5     | 2.5     |
| TOTAL (NO FRACTIONS)                                 | 6.0     | 6.0     | 6.0     |
| <b>10. FUNDING (DOLLARS IN THOUSANDS)</b>            |         |         |         |
| <u>OPERATING COSTS</u>                               |         |         |         |
|  | \$      | \$      | \$      |
| (a) STAFF LABOR - DIRECT                             | 79      | 90      | 94      |
| (b) MATERIALS, SERVICES                              | 43      | 51      | 55      |
| SUB CONTRACTS  |         |         |         |
| (c) INDIRECT EXPENSES                                | 58      | 59      | 61      |
| (d) _____  |         |         |         |
| TOTAL BUDGET OUTLAY                                  | 180     | 200     | 210     |
| TOTAL BUDGET AUTHORITY                               |         |         |         |
| <u>CAPITAL EQUIPMENT NOT RELATED TO CONSTRUCTION</u> |         |         |         |
| OBLIGATION AUTHORITY                                 | \$ 12   | \$ 6    | \$ 6    |
| COSTS  | \$      | \$      | \$      |

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SCHEDULE 189

PAGE 2 of 7

RICHLAND OPERATIONS OFFICE

PROJECT TITLE

Evaluation of Radionuclides in Man

11. Reactor Concept: Not applicable.
12. Strategic, Precious and S.F. Materials: None
13. Publications Since January 1976 (Other Than Topical or Progress Reports):  
I. C. Nelson and V. W. Thomas, Jr., "Plutonium in Human Lung in the Hanford Environs." BNWL-SA-5855 (abstract), to be presented at the Fourth International Congress of IRPA, Paris, France, April 1977.
14. Purpose, Need and Scope: This program is concerned with the evaluation of the radiological impact of the nuclear industry on workers and on residents in the neighborhood of the Hanford plant and with the development or improvement of methods to serve that end.
- a) Post-Mortem Radioanalytical Studies: These studies are directly supportive to the United States Transuranium Registry (USTR) relative to its responsibility to measure the deposition of transuranium elements in occupationally exposed individuals and to compare the body and organ burdens estimated on the basis of tissue analysis with in-vivo estimates based upon urinary and/or fecal assay and external counting, particularly of the chest or wound sites. The objectives of this effort are to:
- Quantify significant radionuclides as distributed within the body and as related to age, occupation, geographical residence and point of time.
  - Advance procedures for measurement sensitivity and statistical significance in the radioanalysis of human tissues and engage in interlaboratory comparison of analytical methods to assure quality of the program nationwide:
- b) Biological-Dosimetry Studies: These studies seek to determine how animal and human data can be best employed in answering questions pertaining to human health risks. An interdisciplinary group of chemists, dosimetry specialists and radiobiologists will participate in these studies, taking advantage of the availability of a unique source of human material in the USTR and also of animal tissues and data from the long-standing PNL research program.

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RICHLAND OPERATIONS OFFICE

PROJECT TITLE

Evaluation of Radionuclides in Man

The objectives of this effort are to:

- Compare distributions of radionuclides and localization within human tissues with animal data to explore extent to which animal models are applicable to man.
- Identify and determine dose to relevant tissues and targets within tissues that are at risk.
- Promote the development of dose-effect relationships for human exposures and contribute to the bases for setting radiation protection standards.

15. Relationship to Other Projects: The post-mortem radioanalytical studies relate to and supplement similar work at LASL and Rocky Flats. The LASL and PNL programs provide leadership in cross-calibration and methods development. The biological-dosimetry studies are related to the PNL animal research and to the PNL projects Dosimetry of Internal Emitters and Dosimetry of Particulate Sources in the Lung, which relate internally deposited radioactivity to biologically relevant dose. F. T. Cross is serving on NCRP Committee 33 on Radiation Dose Calculations. G. E. Dagle is a member of the American College of Veterinarian Pathologists.

16. Technical Progress in FY-1977:

- a) Post-Mortem Radioanalytical Studies: Collection and radiochemical analyses of post-mortem tissue samples (lung, liver, bone and tracheobronchial lymph nodes) from individuals formerly residing in the vicinity of the Hanford project continued during the past year. During the year, commencing November 1, 1975, 107 analyses for  $^{238}\text{Pu}$  and  $^{239,240}\text{Pu}$  and 117 analyses for gamma emitters were performed on these tissues.

Post-mortem tissue samples and blood samples were also analyzed for the USTR. During the year 37 analyses for  $^{238}\text{Pu}$  and  $^{239,240}\text{Pu}$ , 49 analyses for gamma emitters and 88 analyses for uranium were performed. Twenty-two samples are in process. New bone procedures were developed to accommodate the Registry's request for separate analysis of plutonium in mineral bone and marrow.

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RICHLAND OPERATIONS OFFICE

PROJECT TITLE

Evaluation of Radionuclides in Man

Samples analyzed for Quality Assurance, procedure development, evaluation or improvement and/or technician training purposes totaled 268.

Development of capabilities for measuring amounts of  $^{241}\text{Am}$  in USTR tissue samples continued. The laboratory now has access to a 500 mm<sup>2</sup> intrinsic germanium diode which may be used to analyze tissue by direct counting of low energy radiation. Calibration of the detector is in progress. In the absence of significant absorption of the low energy radiation in tissue samples (an effect which will have to be studied) a detection level of a few disintegrations per minute of  $^{241}\text{Am}$  per sample for a 10-minute count is expected. Longer counting times would lower this limit and reasonable counting times in terms of needed sensitivity will be explored.

- b) Biological-Dosimetry Studies: These studies are newly proposed. No significant progress can be reported.
- c) Diagnostic Techniques and In-Vivo Studies (formerly a part of this 189): The development of a technique for assessing the internal deposition of promethium oxide was terminated at the end of this year. Although previous experiments involving exposure of dogs to a samarium-promethium oxide aerosol revealed that the two elements were metabolized similarly, the amounts deposited in the lung were insufficient to permit adequate measurements of the radioactive tracer in urine. Another experiment to fix the level of lung deposition needed to produce measureable quantities in urine was determined to be necessary. Such an experiment would have formed the basis for determining the smallest amounts of tracer required to be deposited in lungs of human test subjects to produce measureable quantities in urine for periods up to 14 days.

The program of whole-body counting measurements on local residents and control groups to be used in assessing the feasibility of such measurements to quantify the environmental impact of waste management programs was terminated at the end of this year. During the year, 63 children from the Hanford Elementary School were counted on the Hanford Mobile Whole Body Counter. In addition, 84 children were counted at Benton City,

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RICHLAND OPERATIONS OFFICE

PROJECT TITLE

Evaluation of Radionuclides in Man.

Washington, and 57 at Othello, Washington. Neither Benton City nor Othello are on the Columbia River downstream from the Hanford project. Benton City is south of the project and Othello northeast of the project, essentially on opposite sides of the project in terms of prevailing winds. The data have not been analyzed.

Based on the findings of a peer review of these studies, it was concluded that they should not be supported by the Division of Biological and Environmental Research under this program and therefore were eliminated.

17. Expected Results in FY-1978:

a) Post-Mortem Radioanalytical Studies: Sample collection and analysis of post-mortem tissues will continue for both environmental and USTR cases. Analysis of USTR blood samples from plutonium workers will continue. High purity intrinsic germanium diodes to measure  $^{241}\text{Am}$  in USTR samples will be available for use on a routine basis. Analysis and summary reports on the interlaboratory calibration program will be prepared in FY 1978. Liaison with the LASL group and others will continue regarding calibrations and standardization of procedures for processing tissues.

At the request of the US separate analysis of plutonium in mineral bone and marrow will continue.

b) Biological-Dosimetry Studies: All post-mortem tissue will be routinely identified and prepared for subsequent radiometric analysis. This will include development of improved methods for separating marrow from mineral bone and the removal of lymph nodes from lung tissue. Histologic examination will be provided for tissues such as lymph nodes that are sometimes difficult to distinguish from blood clots. For tissues suspected of containing sufficient activity, autoradiographs will be prepared for the purpose of locating the radioactivity within the tissue. The distribution of the radioisotopes and localization within the tissues will be compared with animal data in order to explore the extent to which animal models are applicable to man. Neutron-induced autoradiography will be developed to locate those depositions too low in activity for conventional

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RICHLAND OPERATIONS OFFICE

PROJECT TITLE

Evaluation of Radionuclides in Man

photographic autoradiography if specific funds become available. Dosimetry will be emphasized both from the macroscopic point of view and in detail relative to the microstructure of the tissues as the relevant data base develops.

18. Expected Results in FY-1979: The post-mortem tissue and interlaboratory calibration programs will continue. When radionuclides other than plutonium, americium and uranium are identified as potential occupational hazards, they will be added to the effort of the radiochemical laboratory. Request for analysis of curium may likely be next because of its association with plutonium and americium in nuclear power generation. The biological-dosimetry studies will be expanded and become more sophisticated as experience develops and the human data base grows. Relevant dosimetry and the development or improvement of human risk models will proceed.

19. Description and Justification of Major Materials, Equipment and Other Unusually Significant Items:

|               | <u>FY-1978</u> | <u>FY-1979</u> |
|---------------|----------------|----------------|
| Miscellaneous | \$6000         | \$5000         |

Miscellaneous equipment requested includes general laboratory equipment for increasing efficiency of laboratory and for replacement. These items include drying ovens, shakers, etc. Also included is hardware for interfacing alpha energy analyzers to computer, obviating inefficient analysis of data.

20. Relationship to Construction Projects: Not applicable.
21. Comments: The objectives and activities of this program have been redirected to solely provide support, directly or indirectly, to the USTR. The ERDA human program relative to plutonium exposure should increase with this new orientation. The leadership of the program has been changed and additional personnel (a prosector and a biologist/pathologist) are included. The human material in the USTR and the PNL animal tissues and data will be used to promote the development of dose-effect relationships for human exposures and contribute to the base for setting radiation protection standards. The

SCHEDULE 189

RICHLAND OPERATIONS OFFICE

PROJECT TITLE

Evaluation of Radionuclides in Mar.

new biological-dosimetry studies are regarded as an important adjunct to the post-mortem radiometric studies.

0009353

Budget Activity No: RK-02-01-01  
 Control No: 0390  
 Title: Evaluation of Radionuclides in Man

Capital Equipment Justification  
Input for Schedule 46

| Item | Description of Equipment                    | Justification   | Obligation (\$K) |       |
|------|---|---|------------------|-------|
|      |   |   | FY-77            | FY-78 |
| 1    | Miscellaneous - drying ovens, shakers, etc. | General laboratory equipment for replacement and increasing efficiency of laboratory. Also included is hardware interfacing alpha energy analyzers to computer for efficient data analysis. | 12               | 6     |

189 SYNOPSIS

Budget Activity No: RK-02-01-01  
Control No: 0390  
Title: Evaluation of Radionuclides in Man  
Principal Investigator: F. T. Cross

| <u>Funding</u> (All dollars in thousands) | <u>FY-1977</u> | <u>FY-1978</u> | <u>FY-1979</u> |
|---|----------------|----------------|----------------|
| Operating (BO) - Cost                     | \$180          | \$200          | \$210          |
| Equipment (BA) - Obligations              | \$ 12          | \$ 6           | \$ 6           |

Brief Description of Scope of Work:

This program is concerned with the evaluation of the radiological impact of the nuclear industry on workers and on residents in the neighborhood of the Hanford plant and with the development or improvement of methods to serve that end.

Post-Mortem Radioanalytical Studies: These studies are directly supportive to the United States Transuranium Registry (USTR) relative to its responsibility to measure the deposition of transuranium elements in occupationally exposed individuals and to compare the body and organ burdens estimated on the basis of tissue analysis with in-vivo estimates based upon urinary and/or fecal assay and external counting, particularly of the chest or wound sites.

Biological-Dosimetry Studies: These studies seek to determine how animal and human data can be best employed in answering questions pertaining to human health risks. An interdisciplinary group of chemists, dosimetry specialists and radiobiologists will participate in these studies, taking advantage of the availability of a unique source of human material in the USTR and also of animal tissues and data from the long-standing PNL research program.

0009355

**ENVIRONMENT AND SAFETY  
 FORMAT FOR COMPUTERIZED DATA BASE INPUT  
 189 SUBMISSION**

|   |   |                  |                |
|---|---|------------------|----------------|
| <b>FIELD LABORATORY:</b> PACIFIC NORTHWEST LABORATORY                       | <b>PROGRAM/SUBPROGRAM</b> RK-Environmental Research & Development |                  |                |
| <b>1. Contractor:</b> <i>Battelle Memorial Institute</i>                    | <b>Contract No.:</b> EY-76-C-06-1830                              | <b>Task No.:</b> |                |
| <b>2. Project title (35 characters):</b> Evaluation of Radionuclides in Man |   |                  |                |
| <b>3. Budget Activity No.:</b> RK-02-01-01                                  | <b>4. Date Prepared:</b> March 1977                               |                  |                |
| <b>5. Method of Reporting:</b> Annual Reports and Open Literature           | <b>6. Work Location:</b> Richland, WA                             |                  |                |
| <b>7. Person in Charge:</b> W. R. Wiley                                     | <b>8. Project Term:</b> 1967-Continuing                           |                  |                |
| <b>Principal Investigator:</b> F. T. Cross                                  | <b>From:</b> 1967   |                  |                |
| <b>9. Man Years</b>   | FY <u>1977</u>  | FY <u>1978</u>   | FY <u>1979</u> |
| a) Scientific   | <u>2.0</u>  | <u>2.0</u>       | <u>2.0</u>     |
| b) Other Technical  | <u>1.1</u>  | <u>1.1</u>       | <u>1.1</u>     |
| Subtotal  | <u>3.1</u>  | <u>3.1</u>       | <u>3.1</u>     |
| c) Supporting   | <u>2.5</u>  | <u>2.5</u>       | <u>2.5</u>     |
| Total   | <u>6.0</u>  | <u>6.0</u>       | <u>6.0</u>     |
| <b>10. Funding</b>  | FY <u>1977</u>  | FY <u>1978</u>   | FY <u>1979</u> |
| <b>Operating Costs</b>  |   |                  |                |
| a) Direct Salaries  | <u>79</u>   | <u>90</u>        | <u>94</u>      |
| b) Materials, Services, Subcontracts  | <u>43</u>   | <u>51</u>        | <u>55</u>      |
| c) Indirect Expenses  | <u>58</u>   | <u>59</u>        | <u>61</u>      |
| Total   | <u>180</u>  | <u>200</u>       | <u>210</u>     |
| <b>Obligations for Capital Equipment Not Related to Construction</b>        | <u>12</u>   | <u>6</u>         | <u>6</u>       |

**11. Abbreviated Abstract (200 word limit imposed for computer storage):**

This program is concerned with the evaluation of the radiological impact of the nuclear industry on workers and on residents in the neighborhood of the Hanford plant and with the development or improvement of methods to serve that end.

Post-Mortem Radioanalytical Studies - These studies are directly supportive to the United States Transuranium Registry (USTR) relative to its responsibility to measure the deposition of transuranium elements in occupationally exposed individuals and to compare the body and organ burdens estimated on the basis of tissue analysis with in-vivo estimates based upon urinary and/or fecal assay and external counting, particularly of the chest or wound sites.

Biological-Dosimetry Studies - These studies seek to determine how animal and human data can be best employed in answering questions pertaining to human health risks. An interdisciplinary group of chemists, dosimetry specialists and radiobiologists will participate in these studies, taking advantage of the availability of a unique source of human material in the USTR and also of animal tissues and data from the long-standing PNL research

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12. Technology Supported (circle one or more):

|              |                  |                             |                |
|--------------|------------------|-----------------------------|----------------|
| Coal         | Oil & Gas        | Oil Shale                   | <u>Fission</u> |
| Fusion       | Solar            | Geothermal                  | Hydroelectric  |
| Conservation | Multi-Technology | Not Directly Energy Related |                |

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13. Requirements Supported (select one or more from Section 2.0 of "AES Field Guidance for Schedule 189 Call" and indicate appropriate code numbers from tables 2.1 through 2.8)

VII.A.1.1  
VII.A.1.5

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14. Does effort include a significant amount of information or data processing activity? <5 % If not zero, provide a few words to characterize the activity, e.g., data handling or analysis, mathematical model development or use, bibliographic searches, use of computer graphics, etc.

Data handling or analysis.

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15. Key words (select from attached key work list to maximum extent possible):

|              |              |           |
|--------------|--------------|-----------|
| 1. dosimetry | 2. plutonium | 3. fate   |
| 4. human     | 5. tissues   | 6. safety |

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## KEY WORD LIST

In the Key Word List below, please circle up to six key words that best characterize your project. If the Key Word List is inadequate, provide up to three additional words which describe your project (maximum total six words). List and define additional words in space provided at bottom of this page.

|                         |                    |                  |
|-------------------------|--------------------|------------------|
| Aerosols                | Forests            | Oil Spills       |
| Aging                   | Gamma ray          | Oxidation        |
| Air                     | Genetics           | Pathogenesis     |
| Animal                  | Glands             | Photosynthesis   |
| Bacteria                | Heart              | Plants           |
| Biochemistry            | Hormones           | Plumes           |
| Biomass                 | Human              | Plutonium        |
| Biopsy                  | Hydrocarbon        | Radionuclide     |
| Blood                   | Immunology         | Reproduction     |
| Bone                    | Ingestion          | Respiration      |
| Cancer                  | Inhalation         | RNA              |
| Carcinogens             | Instrumentation    | Safety           |
| Cells                   | Invertebrates      | Sewage           |
| Climates                | Infrared           | Scrubber         |
| Computer Codes          | In vitro           | Sociology        |
| Construction            | In vivo            | Soils            |
| Diseases                | Kidneys            | Somatic          |
| DNA                     | Land               | Subsidence       |
| Economics               | Lungs              | Sulfur Compounds |
| Ecosystem               | Magnetic Fields    | Synthetic Fuels  |
| Effluents               | Medicine           | Teratogenesis    |
| Electromagnetic         | Metabolism         | Thyroid          |
| Element (Specify) _____ | Meteorology        | Tissues          |
| Emissions               | Microwave          | Toxicology       |
| Enzymes                 | Mining             | Toxins           |
| Epidemiology            | Molecular          | Ultraviolet      |
| Fate                    | Mutagenesis        | Virus            |
| Fauna                   | Mutation           | Waste            |
| Fishes                  | Neoplasms          | Water            |
| Financial               | Neurology          | Weather          |
| Flora                   | Nitrogen Compounds | X-ray            |
| Food                    | Noise              |                  |

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