Safety Studies and Development of Operational Guidelines
Marshall Islands Radiological Safety Program RZ-1

3. Budget Activity No.:
RZ-03

4. Date Prepared:
May 1974

5. Method of Reporting:
Annual report to Division of Operational Safety

6. Working Location:
Brookhaven National Laboratory

7. Person in Charge:
C. B. Meinhold

Principal Investigator:
N. Greenhouse
F. Haughey
A. Hull

8. Project Term:
From: To:
Project will be initiated in FY 1975.

9. Man-Years:

	FY 1974	FY 1975	FY 1976
Sci., Res. Assoc. (Ph.D. or Equiv.)	---	1.0	1.0
Prof. (B.S. or Equiv.)	---	0.5	0.5
Sci. & Prof. - Total	---	1.5	1.5
Others	---	1.0	1.0
Guests & Research Collaborators	---	---	---
Total	---	2.5	2.5

10. Costs (In Thousands of Dollars):

	FY 1974	FY 1975	FY 1976
Labor (including benefits)	0	30	66
Mats., Trav., Dev. Subcont., Spec'l Proc.	0	75	37
Reactor, Accel., and/or Computer Usage	0	2	1
Allocated Technical Services	0	3	1
Gen. & Adm. Overhead	0	15	32
Total Research Cost	0	125	137
Equipment Obligations	0	20	0

11. Reactor Concept:

12. Materials:

13. Publications:

None

14. Scope:

Now that Micronesians are returning to the islands affected by weapons testing, a comprehensive, continuing radiation safety program is required. Such a program would be developed for the Division of Operational Safety using the facilities and personnel of the Brookhaven National Laboratory Health Physics and Safety Division. This project is intended to provide Operational Safety with a single focal point for their needs in this area. Areas needing scientific investigation will be suggested to the Division of Biomedical and Environmental Research, and other support activities to the Division of Operational Safety.

The specific goal of this project is to gather and evaluate previous and current data on the radiological situation as they relate to actual and projected land use. Significant exposure pathways will be identified as a basis for establishing a continuing environmental monitoring program. Using this information, annual surveys in the islands will be designed and performed in conjunction with the Brookhaven Medical Survey. Environmental samples will be returned to Brookhaven National Laboratory for analysis. In addition to those samples required to estimate the accuracy of the dose predictions, specific samples relating to the Medical Survey Group's interest will be collected and analyzed. Our close relationship with the Medical Survey Group will permit us to respond rapidly to their needs.

15. Relationship to Other Projects:

a) The facilities and personnel of the Brookhaven National Laboratory Health Physics and Safety Division Environmental Monitoring Group will be the basic element in the project.

b) Mutual assistance will exist with the Brookhaven Medical Survey Team. The annual radiological survey would be conducted during their visits to the islands when possible.

c) Extensive use will be made of the data and experience of previous studies in the islands. This will include consultation as needed with the personnel from the Lawrence Livermore Laboratory, Southwest Radiological Health Laboratory, AEC Health and Safety Laboratory, etc. Close cooperation with the University of Washington is anticipated for the radiological analysis of marine biota in the Marshallese diet.

16. Technical Progress in FY 1974:

Health Physics and Safety Division staff members will assist in the March 1974 medical survey in the islands in order to familiarize these

(See Continuation Sheet)

16. Technical Progress in FY 1974: (Cont'd)

personnel with the area and enable them to anticipate technical and administrative difficulties.

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17. Expected Results in FY 1975:

The project will be initiated in FY 1975 when the first detailed surveys in the islands will be designed and performed.

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18. Expected Results in FY 1976:

A radiation protection program for the islands will be fully implemented with the expectation that this project is to be continued for an indefinite period.

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19. Description and Explanation of Major Materials, Equipment and Subcontract Items:

In FY 1975, capital equipment funds of $20,000 is requested for a 800 channel analyzer and its associated hardware. The equipment is required to bring our environmental monitoring facilities to the "state of the art."

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20. Proposed Obligations for Related Construction Projects:

None

SCHEDULE 189

ADDITIONAL EXPLANATION FOR OPERATING COSTS

Brookhaven National Laboratory
Laboratory

RW-Operational Safety
Program

1. Contractor:
Associated Universities, Inc.

Contract No.:
E(30-1)-16

Task No.:

2. Project Title:
Safety Studies and Development of Operational Guidelines
Marshall Islands Radiological Safety Program

189 No.:

3. Budget Activity No.:
RW-03-(a)

4. Date Prepared:
May 1976

5. Method of Reporting:
Annual Report to Division of Operational Safety, monthly visits to DOS, Scientific Meetings and Journals

6. Working Location:
Brookhaven National Laboratory

7. Person in Charge:
C. B. Meinhold

Principal Investigator:
N. A. Greenhouse
J. R. Naidu
A. P. Hull

8. Project Term:
Continuing

From: To:

9. Man-Years:

Direct Man-Years	FY 1976	Transition Period	FY 1977	FY 1978
Scientific & Professional	2.5	0.5	2.0	2.0
Others	1.0	0.3	1.0	1.0
Guests & Research Collaborators	---	---	---	---
Total	3.5	0.8	3.0	3.0

10. Costs (In Thousands of Dollars):

	FY 1976	Transition Period	FY 1977	FY 1978
Research Costs	140	30	140	150
Equipment Obligations	30	10	15	10

11. Reactor Concept:

12. Materials:

Safety Studies and Development of Operational Guidelines

Project Title: Marshall Islands Radiological Safety Program RW-03-(a)

13. Publications:

Greenhouse, N. A. and McCraw, T. F. Marshall Islands Radiological Followup. Proc. Ninth Midyear Topical Symposium, Operational Health Physics, Denver, February 1976, P. L. Carson, Ed., pp. 742-7, Health Physics Society, Central Rocky Mountain Chapter, Boulder, Colorado, 1976.

14. Scope:

A comprehensive and continuing radiological safety program is required for the Bikini and Enewetak people who desire to reinhabit their home atolls. The program includes analyses of external radiation levels, soil and ground water contamination levels, and radioactivity in terrestrial and marine biota which comprise the human food chain. From these data, both external and internal doses and dose commitments will be made. In addition, projections of future radiological conditions will be postulated in order to provide appropriate guidance on projected land use and living patterns. Earlier dose assessments will be revised and updated, and dosimetry models will be refined to reflect actual trends as determined from the monitoring program.

Project personnel will provide a resource of expertise for establishment or independent review of radiation protection programs associated with cleanup and rehabilitation efforts in the northern Marshall Islands, and for related health physics interests of the Division of Operational Safety.

Field operations will be closely coupled with those of Brookhaven Medical Survey in the Marshall Islands, and Radiological Safety Program personnel will be of direct assistance to the Medical Survey whole body counting activities. Ancillary environmental radiological assessments will be made at Rongelap and Utirik atolls on an alternate year basis.

15. Relationship to Other Projects:

a) Surveys will be made in close conjunction with the BNL Medical Survey Team. Assistance will be given to their effort. The annual survey would be conducted during their visits to the Islands. b) Continued collaboration with the University of Washington, Laboratory for Radiation Ecology (LRE) is anticipated on Division of Operational Safety environmental programs in the Pacific basin. c) Extensive use will be made of prior survey data. Consultations will be held with other participating agencies in developing the bases for the survey requirements.

16. Technical Progress in FY 1976 and Transition Period:

A major survey was conducted at Bikini and Eneu Islands in February 1975 in response to Department of the Interior's request for guidance on the siting of the second increment of housing construction at Bikini. This survey revealed unacceptable radiation levels at most of the proposed sites, suggested alternate sites, and laid the groundwork for a larger multiagency survey in

(See Continuation Sheet)

[redacted]

19. Description and Explanation of Major Materials, Equipment and Subcontract Items:

Capital Equipment Fiscal Year 1977:

Additional memory and an x-y plotter ($9,000) for the Ge(Li) spectrometer system is needed to improve sample analyses and data processing capabilities on large numbers of environmental samples collected during field surveys.

Peripheral electronics ($6,000) for a thin intrinsic germanium detector array is needed to process soil samples for heavy elements.

Capital Equipment Fiscal Year 1978:

In FY 1978 a standard compatible magnetic tape unit ($7,000) will be needed for data storage, which will enable the scientific staff to transfer

(See Continuation Sheet)

19. Description and Explanation of Major Materials, Equipment and Subcontract Items: (Cont'd.)

Capital Equipment Fiscal Year 1978: (Cont'd.)

spectra data from present analyzer equipment to the Central Scientific Computing Facility.

20. Proposed Obligations for Related Construction Projects:

None

SCHEDULE 189

ADDITIONAL EXPLANATION FOR OPERATING COSTS

Brookhaven National Laboratory — RK-Environmental Research and Development Program
Laboratory

1. Contractor: Associated Universities, Inc. — Contract No.: EY-76-C-02-0016 — Task No.:

2. Project Title: Surveillance of Facilities and Sites Marshall Islands Radiological Safety Program — 189 No.:

3. Budget Activity No.: RK-01-05-02-3 (600003)

4. Date Prepared: May 1977

5. Method of Reporting: Annual Report to Division of Operational Safety, Standards and Compliance (SSC), Monthly Visits to SSC, Scientific Meetings and Journals

6. Working Location: Brookhaven National Laboratory

7. Person in Charge: C. B. Meinhold

Principal Investigator: N. A. Greenhouse (664-4250)

8. Project Term: Continuing

From: To:

9. Man-Years:

	FY 1977	Pres. Bud. FY 1978	Rev. Req. FY 1978	FY 1979
Sci.,Res.Assoc.(Ph.D or Equiv.)	1.0	2.0	2.0	1.0
Prof. (B.S. or Equiv.)	0.5	1.0	1.0	1.0
Sci. & Prof. - Total	1.5	3.0	3.0	2.0
Others	1.0	1.5	1.5	1.5
Guests & Research Collaborators	---	---	---	---
Total	2.5	4.5	4.5	3.5

10. Costs (In Thousands of Dollars):

	FY 1977	Pres. Bud. FY 1978	Rev. Req. FY 1978	FY 1979
Labor (including benefits)	63	79	87	83
Mats.,Trav.,Dev. Subcont.,Spec'l. Proc.	44	32	62	67
Reactor, Accel., and/or Computer Usage	0	0	0	0
Allocated Technical Services	2	1	1	1
Gen. & Adm. Overhead	31	38	42	60
Total Research Cost	140	150	192	211
Equipment Obligations	10	10	10	5

11. Reactor Concept:

12. Materials:

AK-113

[redacted]

From these data, assessments of both external and internal doses and dose commitments will be made. In addition, projections of future radiological conditions will be postulated in order to provide appropriate guidance on projected land use and living patterns. Earlier dose assessments will be revised and updated, and dosimetry models will be refined to reflect actual trends as determined from the monitoring program.

Project personnel will provide a resource of expertise for establishment of independent review of radiation protection programs associated with cleanup and rehabilitation efforts in the northern Marshall Islands, and for related health physics interests of the Division of Safety, Standards and Compliance.

15. Relationship to Other Projects:

a. Field surveys will be made in close conjunction with those of the BNL Medical Survey Team, and assistance will be given to their efforts.

b. Continued collaboration with the University of Washington, Laboratory for Radiation Ecology is anticipated in SSC-sponsored environmental programs in the Pacific Basin.

[redacted]

16. Technical Progress in FY 1977:

During a field trip in September-October 1976, visits to Wotje, Ailuk, Utirik, Rongelap, and Bikini provided opportunities to collect urine samples

(See Continuation Sheet)

because of the lengthy set up and processing times for amounts of radioactivity which are below conventional limits of detection. Anticipated cost is $10,000.

Capital Equipment, FY 1979:

[redacted]

dle peak loads of environmental samples which must otherwise be subcontracted to a commercial laboratory.

(See Continuation Sheet)

Surveillance of Facilities and Sites
Project Title: Marshall Islands Radiological Safety Program RK-01-05-02

20. Proposed Obligations for Related Construction Projects:

None

DEPARTMENT OF ENERGY

ENERGY - OPERATING EXPENSES AND CAPITAL ACQUISITION

SCHEDULE 189

ADDITIONAL EXPLANATION FOR OPERATING OBLIGATIONS

Brookhaven National Laboratory — GK-Multi-Resource
Laboratory — Mission Resource

1. Contractor: — Contract No.: — Task No.:

Associated Universities, Inc. — EY-76-C-02-0016

2. Project Title: — 189 No.:

Surveillance of Facilities and Sites
Marshall Islands Radiological Safety Program

3. Budget Activity No.:

GK-01-01-52-3-(a)
(600003)

4. Date Prepared:

March 1978

5. Method of Reporting:

Annual Report to Division of Safety Standards and Compliance (SSC)
Monthly Visits to SSC
Scientific Journals and Meetings

6. Working Location:

Brookhaven National Laboratory

7. Person in Charge:

C. B. Meinhold

Principal Investigator:

N. A. Greenhouse (664-4250)

8. Project Term:

Continuing

From: To:

9. Person-Years:

	FY 1978	Pres.Bud. FY 1979	Rev.Req. FY 1979	FY 1980
Direct Person-Years				
Scientific & Professional	2.0	3.0	3.0	3.0
Others	2.5	2.0	4.0	4.0
Guests & Research Collaborators	---	---	---	---
Total	4.5	5.0	7.0	7.0

10. Costs (In Thousands of Dollars):

	FY 1978	Pres.Bud. FY 1979	Rev.Req. FY 1979	FY 1980
Research Costs	150	211	400	420
Total Research Obligations	198	218	369	427
Equipment Obligations	11	20	20	50

11. Reactor Concept:

12. Materials:

GK-115

Project Title: Surveillance of Facilities and Sites
Marshall Islands Radiological Safety Program GK-01-01-52-

13. Publications:

Greenhouse, N. A. and Miltenberger, R. P. Radiological analyses of Marshall Islands environmental samples from 1974 through 1976. BNL Report (in press).

Greenhouse, N. A. and Miltenberger, R. P. External radiation survey and dose predictions for Rongelap, Utirik, Rongerik, Ailuk, and Wotje Atolls. BNL Report (in press).

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14. Scope:

(a) 200 Word Summary: A comprehensive radiological safety program will be maintained for the inhabitants of atolls in the northern Marshall Islands contaminated as a result of the U.S. Pacific Testing programs. The following items and services will be provided:

1. Environmental and personnel monitoring to provide data for BNL dose assessments and determination of radiological trends.

2. Individual and population dosimetry based on actual measurements. These data will be used to modify dose commitment predictive models so that they accurately reflect future trends.

3. Suggestions based on field experience to mitigate doses via the more critical pathways.

4. A flexible resource of radiological expertise to independently review radiation protection programs associated with rehabilitation efforts in the northern Marshalls, and for related health physics interests of OES in the Pacific Basin.

Program activities for the coming fiscal year will emphasize the following:

1. *In vivo* counting of Bikini and Enewetak residents. These efforts will define baseline body burdens of gamma-emitting nuclides for new residents at both atolls, and will periodically assess changes in body burdens over time which might result from various exposure pathways.

2. Urine bioassay to define radionuclide excretion patterns from individuals, and to estimate ^{90}Sr and transuranic nuclide burdens.

GK-116

(See Continuation Sheet)

Surveillance of Facilities and Sites

Project Title: Marshall Islands Radiological Safety Program GK-01-01-52-3-(a)

14. Scope: (continued)

3. Definition of the annual contributions to dose via the inhalation pathway at Bikini, Rongelap, and Utirik. Special emphasis will be placed on continuous air sampling for wind-mediated resuspension of radionuclides in local soils; and on special measurements to define aerosol contributions resulting from human activity.

4. Development of radiological dose predictive models which involve both human and environmental monitoring data.

(b) Supplement to 200 Word Summary: The FY 1979 budget request contains a significant increase over the FY 1978 allocation. This increase reflects a realistic assessment of operating costs imposed by the in vivo counting, bioassay, and air monitoring activities begun in FY 1978. Additionally, field trip activities and analytical laboratory services have substantially exceeded original estimates for the basic radiological safety program, and these costs are expected to continue. Finally, there are a number of peripheral programs of mutual interest to BNL and OES which will be cost-effective if included with the basic efforts, manpower and budget permitting. These include in order of importance:

1. Definition of local diet patterns at all atolls of interest, and continuous monitoring of diets for seasonal changes and long-term trends which might impact on realistic dose predictions.

2. Incorporation of public information and education programs into the total BNL effort to minimize the adverse psychological and sociological impacts of local radiological conditions and of our efforts to understand them.

3. Retrospective assessment of the radiological picture in the northern Marshalls prior to the establishment of the BNL program in FY 1975.

4. Continued collaboration with UW/LRE on OES radiological programs.

15. Relationship to Other Projects:

This program will be logistically coupled wherever possible to the BNL Medical Program in the Marshall Islands. Technical collaboration will continue on matters of mutual interest. The radiological safety program will also bear directly on a retrospective reassessment of thyroid and whole body doses to the BRAVO fallout victims at Rongelap and Utirik, a new program for which funding is expected in FY 1978. The program will also interact cooperatively with related efforts at the University of Washington (LRE) and at Lawrence Livermore Laboratory.

GK-117

(See Continuation Sheet)

[redacted]

and pathway analyses with actual human uptake experience.

18. Expected Results in FY 1980:

Continuation of programs described in FY 1979.

(See Continuation Sheet)

19. Description and Explanation of Major Materials, Equipment and Subcontract Items:

Capital Equipment - FY 1980:

Two phantoms ($10,000) are required to provide adequate calibrations for the Marshall Islands In Vivo Counting program. A computer-based pulse height analyzer ($40,000) is needed to maintain the division counting laboratory at state-of-the-art, and to provide independent analytical facilities for ultra-low-level sample counting.

20. Proposed Obligations for Related Construction Projects:

None.

DEPARTMENT OF ENERGY

ENERGY - OPERATING EXPENSES AND CAPITAL ACQUISITION

SCHEDULE 189
ADDITIONAL EXPLANATION FOR OPERATING OBLIGATIONS

Brookhaven National Laboratory — GK-Multi-Resource
Laboratory — Mission Resource

1. Contractor: Associated Universities, Inc.
Contract No.: EY-76-C-02-0016
Task No.:

2. Project Title:
Surveillance of Facilities and Sites
Dose Reassessment for Populations on Rongelap and Utirik
Following Exposure to Fallout
189 No.:

3. Budget Activity No.:
GK-01-01-52-3-(b)
(600160)

4. Date Prepared:
March 1978

5. Method of Reporting:
Annual Report to Division of
Biomedical & Environmental Research
Scientific Meetings and Journals

6. Working Location:
Brookhaven National Laboratory

7. Person in Charge:
C. B. Meinhold

Principal Investigator:
J. R. Naidu (664-4210)
N. A. Greenhouse (664-4250)

8. Project Term:
From: To:
Project to be initiated and terminated in FY 1979

9. Person-Years:

	FY 1978	Pres.Bud. FY 1979	Rev.Req. FY 1979	FY 1980
Direct Person-Years				
Scientific & Professional	---	---	0.5	---
Others	---	---	---	---
Guests & Research Collaborators	---	---	---	---
Total	---	---	0.5	---

10. Costs (In Thousands of Dollars):

	FY 1978	Pres.Bud. FY 1979	Rev.Req. FY 1979	FY 1980
Research Costs	0	0	25	0
Total Research Obligations	0	0	25	0
Equipment Obligations	0	0	0	0

11. Reactor Concept:

12. Materials:

GK-120

[redacted]

larger, whereas the incidence of thyroid nodules in the two populations were not signficantly different.

A preliminary study has indicated that the critical area of investigation that could shed light is the period during fallout and evacuation for both the islands. In addition, the fact that the Utirik population returned within 120 days following evacuation, whereas the Rongelap population returned only after three years, requires that we look closely at the Utirik population in terms of a longer exposure period, both internal and external. Further studies would, therefore, have to concentrate on the re-examination of all available data in reports issued by various agencies during that period, consultations with scientific personnel involved at that time, identifying the areas of uncertainty, and using appropriate computer programs to analyze the data. The end result will enable us to look for correlations between the incidence of thyroid nodules and the reassessed dose estimates.

15. Relationship to Other Projects:

(a) This study will help establish dose estimates from the time of the incident to the present, and will complement the aerial survey, for external radiation measurements, over these islands, which is scheduled soon. Together they should present a reliable picture of doses received by the populations and also enable dose estimates to be projected into the future.

(b) This study will be in close conjunction with the BNL Radiological Safety Program in the Marshall Islands and with related programs of the BNL Medical Department. Continued collaboration with the University of Washington, Laboratory of Radiation Ecology, in the area of environmental radioactivity will be maintained.

16. Technical Progress in FY 1978:

Preliminary literature search and consultations with Dr. C. A. Sondhaus, University of California, have been completed. This has resulted in defining areas of uncertainty in information and establishing the procedural steps that should be carried out towards elucidating this problem. Progress is being made

(See Continuation Sheet)

Project Title: Surveillance of Facilities and Sites
Dose Reassessment for Populations on Rongelap and Utirik
Following Exposure to Fallout GK-01-01-52-3

16. Technical Progress in FY 1978: (continued)

in the analysis of historical samples (dated March 1, 1954 from Rongelap and Utirik Islands). However, delay in funding for FY 1978 has caused the project to be set aside until such time that the funding is appropriated. Consequently, it is expected that studies will have to be continued into FY 1979.

17. Expected Results in FY 1979:

The literature search, consultations and the analysis of data will be completed, and will lead to comprehensive discussions and final dose assessments for both the islands. These results will be used to test the hypothesis that radiation effects can be translated into meaningful dose estimates. The prognosis of the FY 1978 study should also permit validation of the models used in arriving at the dose estimates in terms of present day exposures.

18. Expected Results in FY 1980:

Program completed.

19. Description and Explanation of Major Materials, Equipment and Subcontract Items:

None.

20. Proposed Obligations for Related Construction Projects:

None.

Associated Universities, Inc. EY-76-C-02-0016

2. Project Title: 189 No.:

Surveillance of Facilities and Sites--SUMMARY

3. Budget Activity No.:

GK-01-01-52-3

4. Date Prepared:

March 1978

5. Method of Reporting:

See sub-activities

6. Working Location:

Brookhaven National Laboratory

7. Person in Charge:

See sub-activities

Principal Investigator:

See sub-activities

8. Project Term:

Continuing

From: To:

9. Person-Years:

	FY 1978	Pres.Bud. FY 1979	Rev.Req. FY 1979	FY 1980
Sci.,Res.Assoc.(Ph.D. or Equiv.)	1.0	1.0	1.5	1.0
Prof. (B.S. or Equiv.)	1.0	2.0	2.0	2.0
Sci. & Prof. - Total	2.0	3.0	3.5	3.0
Others	2.5	2.0	4.0	4.0
Guests & Research Collaborators	---	---	---	---
Total	4.5	5.0	7.5	7.0

10. Costs (In Thousands of Dollars):

	FY 1978	Pres.Bud. FY 1979	Rev.Req. FY 1979	FY 1980
Labor (including benefits)	96	116	164	171
Mats., Trav., Dev. Subcont., Spec'l Proc.	6	32	135	126
Reactor, Accel., and/or Computer Usage	0	0	4	0
Allocated Technical Services	1	5	5	5
Gen. & Adm. Overhead	47	58	117	118
Total Research Cost	150	211	425	420
[redacted]				
Total Research Obligations	198	218	394	427
Equipment Obligations	11	20	20	50

11. Reactor Concept:

12. Materials:

Project Title: Surveillance of Facilities and Sites GK-01-01-52-

SUMMARY

Sub-activity	Title
GK-01-01-52-3-(a)	Marshall Islands Radiological Safety Program
GK-01-01-52-3-(b)	Dose Reassessment for Populations on Rongelap and Utirik Following Exposure to Fallout

(See Continuation Sheet)

DEPARTMENT OF ENERGY

ENERGY - OPERATING EXPENSES AND CAPITAL ACQUISITION

SCHEDULE 189

ADDITIONAL EXPLANATION FOR OPERATING OBLIGATIONS

Brookhaven National Laboratory — GK-Multi-Resource

Laboratory — Program

1. Contractor: — Contract No.: — Task No.:

Associated Universities, Inc. — EY-76-C-02-0016

2. Project Title: — 189 No.:

External Radiation Measurements and "Ground Truth" for Northern Marshall Islands Regional Radiological Survey

3. Budget Activity No.:

GK-01-01-52-3

4. Date Prepared:

May 1978

5. Method of Reporting:

Written Report to D.O.E.S.

6. Working Location:

Brookhaven National Laboratory

7. Person in Charge:

C. B. Meinhold

Principal Investigator:

N. A. Greenhouse (664-4250)

8. Project Term:

From: 8/78

To: 12/31/78

9. Person-Years:

	FY 1978	Pres.Bud. FY 1979	Rev. Req. FY 1979	FY 1980
Sci.,Res.Assoc.(Ph.D. or Equiv.)	---	---	---	---
Prof. (B.S. or Equiv.)	0.5	---	0.5	---
Sci. & Prof. - Total	0.5	---	0.5	---
Others	---	---	---	---
Guests & Research Collaborators	---	---	---	---
Total	0.5	---	0.5	---

10. Costs (In Thousands of Dollars):

	FY 1978	Pres.Bud. FY 1979	Rev. Req. FY 1979	FY 1980
Labor (including benefits)	12	0	17	0
Mats., Trav., Dev. Subcont., Spec'l Proc.	7	0	12	0
Reactor, Accel., and/or Computer Usage	0	0	0	0
Allocated Technical Services	0	0	0	0
Gen. & Adm. Overhead	6	0	11	0
Total Research Cost	25	0	40	0
Total Research Obligations	33	0	45	0
Equipment Obligations	0	0	0	0

11. Reactor Concept:

12. Materials:

Project Title: External Radiation Measurements and "Ground Truth" for Northern Marshall Islands Regional Radiological Survey

13. Publications:

Greenhouse, N.A. and Miltenberger, R.P. Radiological analyses of Marshall Islands environmental samples from 1974 through 1976. BNL Report 50796 in press.

Greenhouse, N.A. and Miltenberger, R.P. External radiation survey and dose predictions for Rongelap, Utirik, Rongerik, Ailuk, and Wotje Atolls. BNL Report 50797 in press.

14. Scope:

(a) 200 Word Summary: A comprehensive external radiation survey program will be conducted on each of the approximately 13 atolls or islands in the Northern Marshall Islands which could have received tropospheric fallout from U.S. nuclear weapons tests in the Pacific. The surveys will provide "ground truth" data on ambient external gamma radiation levels on-island. This data will be used as the basis for calibration and normalization of aerial radiological monitoring by E.G.&G. Corporation. The program will include detailed external radiation measurements with pressurization chamber and scintillation survey instruments, and in situ gamma spectrometry on all islands of interest. Surface soil samples will be collected and analyzed for significant gamma emitters in order to make decay corrections for long-term dose predictions via the external radiation exposure pathway.

BNL field trip staff and analytical lab facilities will be available for other environmental sample collections and analyses as needed by the overall scientific program.

15. Relationship to Other Projects:

This program is directly related to our continuing environmental and personnel monitoring efforts under the BNL Marshall Islands Radiological Safety Program. It will also interact cooperatively with related efforts at the University of Washington (LRE) and Lawrence Livermore Laboratory.

16. Technical Progress in FY 1978:

Personnel and analytical laboratory resources will be mobilized in support of this program. If the regional survey begins on schedule, the first of the three survey legs should be completed by the end of FY 1978.

17. Expected Results in FY 1979:

The remaining two survey legs will be completed, data analyzed, and a

(See Continuation Sheet)

17. Expected Results in FY 1979: (Continued)

report of BNL activities in support of this effort will be written for inclusion in the overall project report.

18. Expected Results in FY 1980:

Project will be completed in FY 1979.

19. Description and Explanation of Major Materials, Equipment and Subcontract Items:

Capital Equipment, FY 1979:

None required.

Capital Equipment, FY 1980:

None required.

20. Proposed Obligations for Related Construction Projects:

None.

DEPARTMENT OF ENERGY

ENERGY - OPERATING EXPENSES AND CAPITAL ACQUISITION
SCHEDULE 189
ADDITIONAL EXPLANATION FOR OPERATING OBLIGATIONS

Brookhaven National Laboratory — GK-Multi Resource
Laboratory — Mission Resource

1. Contractor: Associated Universities, Inc. — Contract No.: EY-76-C-02-0016 — Task No.:

2. Project Title: — 189 No.:

Special In-vivo Counting and Bioassay Program for the Bikini People. Supplement to the BNL Marshall Islands Radiological Safety Program.

3. Budget Activity No.: GK-01-01-52-3

4. Date Prepared: July 1978

5. Method of Reporting: Written report to D.O.E.S.

6. Working Location: Brookhaven National Laboratory and Marshall Islands

7. Person in Charge: C.B. Meinhold

Principal Investigator: N.A. Greenhouse

8. Project Term: Continuing

From: 8/01/78 To: 9/30/78

9. Person-Years:

	FY 1978	Pres.Bud. FY 1979	Rev.Bud. FY 1979	FY 1980
Sci.,Res.Assoc.(Ph.D. or Equiv.)	---	---	---	---
Prof. (B.S. or Equiv.)	---	---	---	---
Sci. & Prof. - Total	---	---	---	---
Others	---	---	---	---
Guests & Research Collaborators	---	---	---	---
Total	---	---	---	---

10. Costs (In Thousands of Dollars):

	FY 1978	Pres.Bud. FY 1979	Rev.Bud. FY 1979	FY 1980
Labor (including benefits)	0	0	0	0
Mats., Trav., Dev. Subcont., Spec'l Proc.	20	0	0	0
Reactor, Accel., and/or Computer Usage	0	0	0	0
Allocated Technical Services	0	0	0	0
Gen. & Adm. Overhead	0	0	0	0
Total Research Cost	20	0	0	0
Total Research Obligations	20	0	0	0
Equipment Obligations	0	0	0	0

11. Reactor Concept:

12. Materials:

Project Title: Special In-vivo Counting and Bioassay Program for the Bikini People. Supplement to the BNL Marshall Islands Radiological Safety Program GK-01-01-52-3

13. Publications:

Greenhouse, N.A. and Miltenberger, R.P. Radiological analyses of Marshall Islands environmental samples from 1974 through 1976. BNL Report 50796.

Greenhouse, N.A. and Miltenberger, R.P. External radiation survey and dose predictions for Rongelap, Utirik, Rongerik, Ailuk, and Wotje Atolls. BNL Report 50797.

14. Scope:

(a) 200 Word Summary: A special field trip will be made in August 1978 to do in-vivo counting and urine bioassay at Kwajalein Atoll on 20 to 30 Bikini residents before their anticipated exodus from Bikini in late August. In addition, a separate field trip party will proceed to Bikini to collect 24 hr urine samples from those Bikini residents who cannot be accomodated on the charter flight which will bring the in-vivo counting subjects to Kwajalein.

The rationale for this effort is as follows:

(1) Accurate internal dosimetry for ^{137}Cs body burdens in the Bikinians requires an assessment of extant body burdens just prior to the departure of the people from Bikini.

(2) There is evidence that both the short-term and long-term compartment ^{137}Cs clearance rates from the Bikinians may differ significantly from those for the ICRP standard man. Determination of these parameters is essential to the accurate assessment of total dose commitments.

(3) During the past several years the Bikinians have become apprehensive about potential health effects which they feel might result from their having lived in the contaminated Bikini environment. The personal attention that they will receive in these personnel monitoring activities should help to alleviate some of their fears.

15. Relationship to other Projects:

This program is directly related to our on-going environmental and personnel monitoring efforts under the BNL Marshall Islands Radiological Safety Program.

16. Technical Progress in 1978:

Assessments of body burdens and clearance parameters and the determination

(See Continuation Sheet)

16. Technical Progress in 1978: (Cont'd)

of dose commitments for individuals living on Bikini Atoll will be completed by the end of the FY 1978.

17. Expected Results in FY 1979:

Project will be completed in FY 1978.

18. Expected Results in FY 1980:

N/A

19. Description and Explanation of Major Materials, Equipment and Subcontract Items:

The funding request includes $8,000 for two round trip charter flights between Bikini and Kwajalein to transport the Bikini people for in-vivo counting.

Capital Equipment, FY 1978:

N/A

20. Proposed Obligations for Related Construction Projects:

None.

[redacted] dose commitments from environmentally derived radionuclides at these atolls, and to better understand excretion kinetics among the Marshallese. The means and ranges of radionuclide loss rate constants will be determined to improve the accuracy of dose commitment estimates.

18. CONTRACTOR TASK MANAGER

Charles B Mitchell

02/05/79

[redacted]

☒ a. Facility Requirements	☒ d. Background	☒ g. Future accomplishments	☐ j. Explanation of milestones
☒ b. Publications	☒ e. Approach	☒ h. Relationships to other projects	☐ k. Other (specify):
☒ c. Purpose	☒ f. Technical progress	☒ i. Environmental assessment	

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DOE Form 5120.2 (Page 2) (12-78)

TASK REQUIREMENTS FOR OPERATING/EQUIPMENT COSTS AND OBLIGATIONS

CONTRACTOR NAME: Associated Universities, Inc.

BIN NUMBER	TASK NO.	REV. NO.	DATE PREPARED	CONTRACTOR NUMBER
		0	04/02/79	

	FY 1979 BY-2	FY 1980 - BY-1 PRESIDENT'S	FY 1980 - BY-1 REVISED	AUTHORIZED	BY-FY 1981
20. STAFFING (*in staff years*)					
a. SCIENTIFIC	2.7	3.0	3.0		3.0
b. OTHER DIRECT	1.7	4.4	4.4		4.4
c. TOTAL DIRECT	4.4	7.4	7.4		7.4
21 OBLIGATIONS AND COSTS (*in Thousands*)					
a. TOTAL COSTS	211	420	420		465
b. TOTAL OBLIGATIONS	211	459	446		480
22. EQUIPMENT (*in Thousands*)					
a. EQUIPMENT COSTS	18	38	38		26
b. EQUIPMENT OBLIGATIONS	25	50	50		10
23. OTHER COSTS (*specify*)					
a.					
b.					
c.					
d.					

24 OPTIONAL FIVE-YEAR PLAN (*in Thousands*) Constant BY dollars	FY 82-BY+1	FY 83-BY+2	FY 84-BY+3	FY 85-BY+4
a. TOTAL OPERATING COSTS				
b. TOTAL OPERATING OBLIGATIONS				
c. TOTAL EQUIPMENT COSTS				
d. TOTAL EQUIPMENT OBLIGATIONS				

25 MILESTONE SCHEDULE	PROPOSED SCHEDULE	AUTHORIZED SCHEDULE

GK-87

TASK TITLE Marshall Islands Radiological Safety Program	BUDGET AND REPORTING CODE GK-01-01-08-4 (600003)			DATE PREPARED 04/02/79
CONTRACTOR NAME Associated Universities, Inc.	CODE BNL	BIN NUMBER	TASK NO.	REV. NO. 0

17. Task Description (Cont.)

3. Replicate determinations of ultra-low level Pu and Am urinary excretion rates among Northern Marshalls inhabitants and among Marshallese control groups who reside outside the fallout areas.

4. Establishment of ^{137}Cs and ^{90}Sr excretion rates among Marshallese control groups.

19a. Facility Requirements.

It is anticipated that work for this proposal will use existing Laboratory facilities and site utility services.

19b. Publications.

Fiscal Year 1978

Greenhouse, N. A., Miltenberger, R. P., and Cua, F. T. External Radiation Survey and Dose Predictions for Rongelap, Utirik, Rongerik, Ailuk and Wotje Atolls. BNL 50797, December 1977.

Greenhouse, N. A., Miltenberger, R. P., and Cua, R. T. Radiological Analyses of Marshall Islands Environmental Samples 1974-1976. BNL 50796, December 1977.

Fiscal Year 1979 - 1st Quarter

Miltenberger, R. P., Greenhouse, N. S., and Cua, F. T. Whole Body Counting Results for Inhabitants of the Northern Marshall Islands: 1974-1978. Health Physics Journal (submitted).

Miltenberger, R. P., Greenhouse, N. A., Cua, F. T., and Lessard, E. T. Dietary Radioactivity Intake from Bioassay Data: A Model Applied to ^{137}Cs Intake by Bikini Island Residents. Health Physics Journal (submitted).

Greenhouse, N. A. Follow-up Radiological Surveillance, Marshall Islands. Presented at the 1978 Annual Meeting of the Health Physics Society, Minneapolis, Minnesota, June 1978.

TASK TITLE	BUDGET AND REPORTING CODE			DATE PREPARED
Marshall Islands Radiological Safety Program	GK-01-01-08-4 (600003)			04/02/79
CONTRACTOR NAME Associated Universities, Inc.	CODE BNL	BIN NUMBER	TASK NO.	REV. NO. 0

19c. Purpose.

This program is operated to provide continuously updated data on ionizing radiation doses and dose commitments received by the residents of islands in the Northern Marshalls which have been contaiminated by U.S. atmospheric nuclear tests. These data will be used to develop predictive dose modelling, and to provide a basis for remedial actions when necessary.

19d. Background.

This work was begun in 1974 to provide radiation safety related information to the A.E.C. concerning the residents of Bikini, Rongelap, and Utirik Atolls, and the impending return of the Enewetak people.

19e. Approach.

Field trips to the Marshall Islands will be conducted two to three times per year to do *in vivo* counting and urine collections for radioassay and for environmental sampling. Samples and *in vivo* counting data will be analyzed primarily at BNL. Results will be incorporated into a computerized data base for manipulation, modelling studies, and incorporation into reports for publication.

19f. Technical Progress.

Three field trips were conducted during FY1978 for environmental sampling and personnel monitoring.

The Spring 1977 whole body counting trip to Bikini demonstrated dramatic and unexpected increases in ^{137}Cs body burdens among the residents. These findings led to a Department of the Interior decision to move the Bikini people off their home atoll. The decline in ^{137}Cs and ^{90}Sr body burdens among the Bikinians will be monitored during FY1979. A detailed diet and living pattern study of residents of the Northern Marshalls is expected to improve understanding of internal and external radiation exposure pathways. This study and estimates of radionuclide excretion rates derived from follow-up personnel monitoring on the Bikinians are expected to improve predictive modelling and reduce the probability of unexpected occurrences such as that at Bikini last year.

Emphasis on personnel monitoring is expected to continue through FY1980 and FY1981. Development at ultra-low level analytical capabilities for transuranic radionuclides and the establishment of corroborative bioassay programs in cooperation with other laboratories are expected to clarify and quantitate low level plutonium and americium body burdens among the Bikinians and Rongelapese. Similar determinations among a Marshallese control population are expected to demonstrate differences, if any, between the residents of contaminated atolls and regional background.

TASK TITLE	BUDGET AND REPORTING CODE			DATE PREPARED
Marshall Islands Radiological Safety Program	GK-01-01-08-4 (600003)			04/02/79
CONTRACTOR NAME Associated Universities, Inc.	CODE BNL	BIN NUMBER	TASK NO.	REV. NO. 0

19f. Technical Progress (cont.)

Systematic personnel and environmental monitoring programs are expected to be initiated at Enewetak in FY 1980 and to be well established by FY 1981.

19g. Future Accomplishments.

These studies are expected to provide a better understanding of the radiological impact on man resulting from habitation in an environment contaminated with man-made radioactive materials. They are further expected to provide a basis for corrective actions where needed and to minimize through better understanding the fears of the people living in these areas.

19h. Relationship to Other Projects.

This program will function in cooperation with the BNL Medical Research Program in the Marshall Islands and will occasionally share the same logistical support resources for field trips. It will also function cooperatively with various Pacific research programs at the Lawrence Livermore Laboratory; and especially with programs to develop predictive dose estimates for present and future residents on contaminated islands. The BNL program will provide retrospective dose information to aid in the development of prospective dose models by LLL.

19i. Environmental Assessment.

Work done under this task proposal has either no environmental impact or has impacts similar to those described in and covered by BNL's Environmental Impact Statement (ERDA 1540).

19j. Explanation of Milestones.

None

19k. Other.

None

and computer techniques, a comprehensive fallout model will be developed. Using this model in conjunction with dietary and life style patterns prevalent at time of exposure, a reassessed dose estimate--internal and external--will be made for the populations of Rongelap and Utirik. The dose estimates will be evaluated in terms of the thyroid nodule incidences in these populations to test the hypothesis that radiation effects can be translated into meaningful dose estimates.

J. R. Naidu for J. R. Naidu *(Signature)* and N. A. Greenhouse *(Date)*

19. DETAIL ATTACHMENTS: *(See instructions)*

- [x] a. Facility Requirements
- [x] b. Publications
- [x] c. Purpose
- [x] d. Background
- [x] e. Approach
- [x] f. Technical progress
- [x] g. Future accomplishments
- [x] h. Relationships to other projects
- [x] i. Environmental assessment
- [ ] j. Explanation of milestones
- [ ] k. Other (specify):

GK-101

DOE Form 5130.2 (Page 3)
(12-78)

TASK REQUIREMENTS FOR OPERATING/EQUIPMENT COSTS AND OBLIGATIONS

CONTRACTOR NAME: Associated Universities, Inc.

BIN NUMBER	TASK NO.	REV. NO.	DATE PREPARED	CONTRACTOR NUMBER
		0	04/02/79	

20. STAFFING (in staff years)	FY 1979 BY-2	FY 1980 - BY-1 PRESIDENT'S	FY 1980 - BY-1 REVISED	AUTHORIZED	BY-FY 1981
a. SCIENTIFIC	0.3	0.3	0.3		0.3
b. OTHER DIRECT	---	0.3	0.3		0.3
c. TOTAL DIRECT	0.3	0.6	0.6		0.6
21. OBLIGATIONS AND COSTS (in Thousands)					
a. TOTAL COSTS	50	50	50		53
b. TOTAL OBLIGATIONS	50	51	51		54
22. EQUIPMENT (in Thousands)					
a. EQUIPMENT COSTS	0	0	0		0
b. EQUIPMENT OBLIGATIONS	0	0	0		0
23. OTHER COSTS (specify)					
a.					
b.					
c.					
d.					

24 OPTIONAL FIVE-YEAR PLAN (in Thousands) Constant BY dollars	FY 82-BY+1	FY 83-BY+2	FY 84-BY+3	FY 85-BY+4
a. TOTAL OPERATING COSTS				
b. TOTAL OPERATING OBLIGATIONS				
c. TOTAL EQUIPMENT COSTS				
d. TOTAL EQUIPMENT OBLIGATIONS				

25. MILESTONE SCHEDULE	PROPOSED SCHEDULE	AUTHORIZED SCHEDULE

GK-102

CONTRACTOR NAME	CODE	BIN NUMBER	TASK NO.	REV. NO.
Associated Universities, Inc.	BNL			0

19a. Facility Requirements.

It is anticipated that work for this proposal will use existing Laboratory facilities and site utility services.

19b. Publications.

None

19c. Purpose.

To look for correlations between the incidence of thyroid nodules in the inhabitants of Rongelap and Utirik Islands (Marshall Islands) and the reassessed dose estimates.

This study will fuse together all available information on fallout from the BRAVO test and using advanced analytical techniques (now available) derive realistic dose estimates to the inhabitants of Rongelap and Utirik. The results should provide information towards elucidating the whole question of low-level effects of radiation.

19d. Background.

Incidence of thyroid nodules, benign and malignant, in the exposed populations of Utirik and Rongelap has indicated critical differences in correspondence between nodule incidence and thyroid dose for the populations. The estimated external dose received from the time fallout began to the time of evacuation shows that the Rongelap population received an external dose (175 rads) which was about 13 times that for the Utirik population (14 rads), and the thyroid dose was about 10 times larger, whereas the incidence of thyroid nodules in the two populations were not significantly different.

A preliminary study has indicated that the critical area of investigation that could shed light is the period during the fallout and evacuation for both the islands. In addition, the fact that the Utirik population returned within 120 days following evacuation, whereas the Rongelap population returned only after three years, requires that we look closely at the Utirik population in terms of a longer exposure period, both internal and external. Further studies would, therefore, have to concentrate on the re-examination of all available data in reports issued by various agencies during that period, consultations with scientific personnel involved at that time, identifying the areas of uncertainty, and using appropriate computer programs to analyze the data. The end result will enable us to look for correlations between the incidence of thyroid nodules and the reassessed dose estimates.

portation and deposition of fallout will also be completed. Final analysis of a recent diet and life style study will on completion provide an internal and external exposure estimate. All the data so gathered will be used to generate a model(s) for arriving at the dose estimate in terms of exposure at time of fallout. Discussions with scientists and technical people who were involved

a. This study will help establish dose estimates from the time of the incident to the present, and will complement the aerial survey for external radiaton measurements, over these islands, which has been completed. Together they should present a reliable picture of doses received by the populations and also enable dose estimates to be projected into the future.

b. This study will be in close conjunction with the BNL Radiological Safety Program in the Marshall Islands and with related programs of the BNL Medical Department. Continued collaboration with the University of Washington, Laboratory of Radiation Ecology, and the Battelle Pacific Northwest Laboratory will be maintained in the area of sample analysis and data interpretation.

19i. Environmental Assessment.

[redacted]

has impacts similar to those described in and covered by BNL's Environmental Impact Statement (ERDA 1540).

19j. Explanation of Milestones.

None

19k. Other.

None

[redacted]

☒ b. Publications ☒ e. Approach ☒ h. Relationships to other projects ☐ k. 288 Detail

☒ c. Purpose ☒ f. Technical progress ☒ i. Environmental assessment ☐ l. Other (Specify):

TITLE	BUDGET AND REPORTING CODE			DATE PREPARED
Marshall Islands Radiological Safety Program	HA-02-01-02-0			03/31/80
CONTRACTOR NAME Associated Universities, Inc.	CODE BNL	WP NUMBER	TASK NO.	REV. NO. 0

20a. Facility Requirements.

It is anticipated that work for this proposal will use existing Laboratory facilities and site utility services.

20b. Publications.

Greenhouse, N.A., Miltenberger, R.P., Lessard, E.T. External Exposure Measurements at Bikini Atoll, BNL 51003, January 1979.

Greenhouse, N.A. Dosimetry Methods and Results for the Former Residents of Bikini Atoll, BNL 26797, November 1979.

Miltenberger, R.P., Greenhouse, N.A., Lessard, E.T. Whole Body Counting Results for Inhabitants of the Northern Marshall Islands: 1974-1978, Health Physics, in press.

Miltenberger, R.P., Lessard, E.T., Greenhouse, N.A. Dietary Radioactivity Intake from Bioassay Data: A Model Applied to ^{137}Cs Intake by Bikini Island Residents, Health Physics, in press.

20c. Purpose.

The primary purpose of this program is to measure and evaluate the internal and external doses to people living on those islands in the Marshalls group which were impacted by tropospheric fallout from United States atmospheric nuclear tests in the Pacific. Its objectives are:

a. Direct or indirect measurement of radionuclide body burdens and resultant doses and dose commitments.

b. Measurement of external radiation environments and their contributions to the total doses to individuals and island populations.

c. Evaluation of dietary habits and living patterns insofar as they relate to the elucidation of exposure pathways and the determination of doses.

20d. Background.

This program was initiated in 1974 at the request of the AEC (DOS) in anticipation of potential radiation exposures to the returning Bikini population.

20e. Approach.

Internal and external doses will be measured and evaluted using accepted and up-to-date health physics practices.

dividual body burden histories. Daily activity ingestion rates were calculated from the body burden data. Uptake regimes which best fit the activity ingestion rate data were; constant continuous uptake for ^{90}Sr and stepwise increasing uptake for ^{137}Cs. Dosimetric models which described the uptake scenario were derived and individual dosimetric results for persons residing on Bikini Island sometime during the years 1969 and 1978 were determined. In addition, doses due to residual radioactivity in persons after departure from Bikini were calculated. Individual body burdens, urine activity concentrations and dose equivalents have been recorded or stored in a computer data base. Publications and reports describing dosimetric methods and results, whole body counting results and biological removal rate constants for Bikinians have been written.

Routine personnel monitoring was provided for Rongelap and Utirik residents. A statistical analysis was performed to determine the minimum sample size needed to establish the mean ^{137}Cs body burden at the 90% confidence level. Male and female adult, adolescent and child categories were counted at each atoll and many persons who participated in prior whole body counting visits were recounted. In addition, urine bioassay samples were collected from adult and adolescent population groups. Body burden histories and dosimetric results have been completed for half the resident populations for years following rehabitation of the atolls.

20f. Technical Progress cont.

Data collection on types and amounts of food consumed by the Marshallese was done by actually living with them. Simultaneous observations on their living patterns were also made. These studies were part of the Northern Marshallese Islands Radiological Survey (13-Atoll Survey)

Expected Progress in BY-2 (FY 1980).

Baseline radionuclide body burdens will be evaluated for the returning Enewetak population. Evaluation of the post residence decline of body burdens among former Bikini residents will continue. The data base on dietary habits and living patterns will be updated for all relevant atolls and/or islands.

Expected Progress in BY-1 (FY 1981).

Personnel monitoring and related demographic assessment activities will continue at Rongelap, Utirik, Enewetak and other areas of interest to DOE. Monitoring of former Bikini residents will be phased out unless circumstances dictate otherwise.

Expected Progress in BY (FY 1982).

Personnel monitoring and related demographic assessment activities will continue in all areas of interest in the Marshall Islands.

20g. Future Accomplishments.

A running account will be maintained of individual and population dosimetric information for the residents of islands affected by the Pacific Testing Programs. These data will provide an empirical basis for improving the accuracy and value of long-range predictive dose assessments from man-made radionuclides in the environment.

20h. Relationship to Other Projects.

This program operates and interacts directly with the Brookhaven Medical Program in the Marshall Islands, and provides contempory data to be factored into the Retrospective Dose Reassessments for Rongelap and Utirik (and other islands affected by weapons test fallout). It also provides empirical bases for upgrading long range predictive dose modelling activites such as those of the Lawrence Livermore Laboratory. Coordination of this program with related programs within DOE and its contractors will be accomplished through timely exchange of program findings and related information.

20i. Environmental Assessment.

[redacted]

Work done under this task proposal has either no environmental impact or has impacts similar to those described in and covered by BNL's Environmental Impact Statement (ERDA 1540).

DOE F 5120.2
(10-79)

U.S. DEPARTMENT OF ENERGY

FIELD TASK PROPOSAL/AGREEMENT

1. WORK PACKAGE NUMBER	2. TASK NO.	3. REV. NO.	4. PROJECT NO.	5. DATE PREPARED (mm dd yy)	6. CONTRACTOR NUMBER
		0		03/31/80	HP 0510 (003010)

7. TASK TITLE	8. WORK PACKAGE TITLE
Dose Reassessment for Rongelap and Utirik	

9. BUDGET AND REPORTING CODE	10. TASK TERM Begin: (mm dd yy)	End: (mm dd yy)	11. CONTRACTOR NAME	12. CODE (see instructions)
HA-02-01-01-0	Continuing	Open	Associated Universities, Inc.	BNL

13. CONTRACTOR TASK MANAGER (Name: Last, First, MI) (FTS No.)	14. PRINCIPAL INVESTIGATORS (Name: Last, First, MI)
C.B. Meinhold 666-4209	Naidu, J.R. (666-4263) Greenhouse, N.A. (666-4250)

15. WORK LOCATION (See instructions): Name of facility, City, State, Zip Code	16. Is this task included in the Institutional Plan?	17. Does this task include any management services efforts?
	☒ YES ☐ NO	☐ YES ☒ NO

18. TASK DESCRIPTION (Approach, relation to work package, in 200 words or less)

An in-depth study of all information pertaining to BRAVO test fallout on Rongelap and Utirik will be made. In addition, using advanced analytical and computer techniques, a comprehensive fallout model will be developed. Using this model in conjunction with dietary and life style patterns prevalent at time of exposure, a reassessed dose estimate--internal and external--will be made for the populations of Rongelap and Utirik. These dose estimates will be evaluated in terms of the thyroid nodule incidences in these populations, and the results obtained will provide information towards correlating doses and radiation effects.

19. CONTRACTOR TASK MANAGER

Charles B. Meinhold (Signature) J.R. Naidu N.A. Greenhouse 03/31/80 (Date)

20. DETAIL ATTACHMENTS: (See instructions)

☒ a. Facility Requirements	☒ d. Background	☒ g. Future accomplishments	☐ j. Explanation of milestones
☒ b. Publications	☒ e. Approach	☒ h. Relationships to other projects	☐ k. ZBB Detail
☒ c. Purpose	☒ f. Technical progress	☒ i. Environmental assessment	☐ l. Other (Specify):

[redacted]

BRAVO test and using advanced analytical techniques (now available) derive realistic dose estimates to the inhabitants of Rongelap and Utirik. The results should provide information towards assessment of the risk coefficients for radiation-induced thyroid disease.

20d. Background.

Incidence of thyroid nodules, benign and malignant, in the exposed populations of Utirik and Rongelap has indicated critical differences in correspondence between nodule incidence and thyroid dose for the populations. The estimated external dose received from the time fallout began to the time of evacuation shows that the Rongelap population received an external dose (175 rads) which was about 13 times that for the Utirik population (14 rads), and the thyroid dose was about 10 times larger, whereas the incidences of thyroid nodules in the two populations were not significantly different.

A preliminary study has indicated that the critical area of investigation is the period starting from the beginning of fallout to the completion of evacuation for both the islands. In addition, the fact that the Utirik population returned within 120 days following evacuation, whereas the Rongelap population returned only after three years, requires that we look closely at the Utirik population in terms of a longer exposure period, both internal and external. Further studies would, therefore, have to concentrate on the re-examination of all available data in reports issued by various agencies during that period, consultations with scientific personnel involved at that time, identifying the areas of uncertainty, and using appropriate computer programs to analyze the data. The end result will enable us to look for correlations between the incidence of thyroid nodules and the reassessed dose estimates.

TITLE	BUDGET AND REPORTING CODE			DATE PREPARED
Dose Reassessment for Rongelap and Utirik	HA-02-01-01-0			03/31/80
CONTRACTOR NAME Associated Universities, Inc.	CODE BNL	WP NUMBER	TASK NO.	REV. NO. 0

20e. Approach.

The study will comprise:

a. Literature search for all available data concerning the BRAVO test, such as, meteorological conditions and radiation measurements. Discussions with scientific and technical personnel involved in the BRAVO test.

b. Use of historic samples and teeth samples to determine ^{129}I, ^{90}Sr, and $^{239, 240}Pu$ concentrations to derive concentrations of other radionucldies. In addition, excised thyroid glands from exposed Marshallese will be analyzed for ^{129}I and ^{99}Tc and data so generated will be used to estimate the concentrations of short lived iodine isotopes.

c. Diet and life style studies to provide information for dose assessment.

d. Computer simulation of the BRAVO test fallout to determine the transport and deposition of radionuclides.

Management Controls

Fiscal control will be exercised in the form of monthly comparisons, over the task term, of actual costs incurred against corresponding line items of the budget. Technical results shall be monitored through a periodic review, by the Contractor Task Manager, of accomplishments by measuring actual performance as compared to expected progress. All work shall be conducted in conformance with generally accepted standards for R&D and other investigative or analytic procedures, as observed by universities and large independent research facilities including Brookhaven National Laboratory (BNL).

20f. Technical Progress.

Technical Progress in BY-3 (FY 1979).

A preliminary literature search and consultations with Dr. C.A. Sondhaus, University of California, have been completed. This has resulted in defining areas of uncertainty in information available and establishing the procedural steps that should be carried out to reassess the dose estimates. All available data on external radiation measurements, radionuclide concentrations in soil, water, vegetation, animal and food items have been collated. Historic samples collected from Rongelap and Utirik have been submitted for ^{129}I analysis. Pertinent meteorological data pertaining to the BRAVO test has been researched and the information supplied to Lawrence Livermore Laboratory so that they can go ahead with the computer simulation of fallout transportation and deposition.

The ^{129}I determinations of the soil samples have been completed for those historic samples that were available. Some of these samples will also be analyzed for ^{99}Tc. In addition, we are exploring the possibility of analyzing "Bikini-

20f. Technical Progress cont.

ash" the fallout material that settled on the Japanese fishing vessel. These samples should provide the most accurate characterization of the fallout. Preliminary computer simulations of fallout transportation and deposition have been completed. Data analysis of the recent diet and life style study has been completed. Discussion with scientists and technical people who were involved with the BRAVO test is being continued. Analysis of the Marshallese teeth samples for Pu isotopes is in progress.

Expected Progress in BY-2 (FY 1980).

A final report on the diet and life style for the Marshallese will be completed. The computer simulation of fallout will also be completed. Thyroid glands from the exposed Marshallese will be analyzed for ^{99}Tc and ^{129}I. Analysis of the "Bikini-ash" will be done as soon as we get an aliquot of the sample. It is also expected that data on the exposed Japanese fishermen will be made available at that time. Preliminary analysis of the data generated so far will be made using existing models. The results will be extrapolated to present times so as to test the validity of the models used.

Expected Progress in BY-1 (1981).

Final dose estimates to the exposed inhabitants of Utirik and Rongelap should be completed. The methodology developed will be extended to Likiap and other islands which were on the "fringe" of the fallout pattern.

20g. Future Accomplishments.

The techniques and expertise developed in the course of this study could be used to reassess doses to population in other areas subjected to exposure from fallout or even those resulting from occupational situations in the past.

20h. Relationship to Other Projects.

a. This study will help establish dose estimates from the time of the incident to the present, and will complement the aerial survey for external radiation measurements, over these islands, which has been completed. Together they should present a reliable picture of doses received by the populations and also enable dose estimates to be projected into the future.

b. This study will be in close conjunction with the BNL Radiological Safety Program in the Marshall Islands (HA-02-01-02-0) and with related programs of the BNL Medical Department (HA-02-01-01-0). Continued collaboration with the University of Washington, Laboratory of Radiation Ecology, and the Battelle Pacific Northwest Laboratory will be maintained in the area of sample analysis and data interpretation.

20i. Environmental Assessment.

Work done under this task proposal has either no environmental impact or has impacts similar to those described in and covered by BNL's Environmental Impact Statement (ERDA 1540).

20j. Explanation of Milestones.

None

201. Other.

None

REPOSITORY PNNL

COLLECTION Marshall Islands

BOX No. 5688

FOLDER Marshall Islands Radiological Safety Program Review May 21 and 22, 1981

DOCUMENT **DOES NOT** CONTAIN ECI

Reviewed by DJ Kreshka Date 4/30/97