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ATOMIC ENERGY COMMISSION
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Chairman Schlesinger
Commissioner Ramey
Commissioner Larson
Commissioner Doub
Commissioner Ray

THRU: General Manager

ENIWETOK RADIOLOGICAL SURVEY

This memorandum provides information regarding current activities on Eniwetok Atoll. These activities concern the surveys essential to the cleanup, rehabilitation, and resettlement of the atoll in connection with the announced return of Eniwetok to the Trust Territory of the Pacific Islands (TTPI).

In April 1947 the United Nations formally designated the former Japanese Pacific Mandates (Eniwetok included) as Trust Territories to be administered by the United States. Upon written notification to the U.N., Eniwetok was designated a nuclear testing site in December 1947, with the first test series there, SANDSTONE, being conducted in the spring of 1948. Prior to SANDSTONE, the Eniwetok people, about 136 in number, were moved by the United States to Ujelang Atoll where they still reside, although their number has now increased to about 432. Additional test series were conducted in the atoll during the years 1951 (GREENHOUSE), 1952 (IVY), 1954 (CASTLE), 1956 (REDWING), and 1958 (HARDTACK - PHASE I). The last of 43 tests was in July 1958. All tests have been listed publicly.

Geographic location of the atoll is shown in Figure 1. Its remoteness suggests inherent costly operations to accomplish the necessary surveys and subsequent cleanup. Figure 2 identifies the islands of the atoll and general location of the nuclear tests conducted.

On April 18, 1972, High Commissioner Johnston and Ambassador Williams jointly announced the intention of the United States to return Eniwetok Atoll to the TTPI subject to retention of some minor residual rights. Subsequently, the Department of Interior (DOI), Department of Defense (DOD), and AEC determined that a comprehensive and coordinated program to survey and clean up Eniwetok Atoll must be undertaken to make Eniwetok habitable. The program was divided into three phases: (1) Pre-cleanup Radiological and Engineering Survey, (2) Cleanup, and (3) Rehabilitation

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and Resettlement. As with Bikini Atoll, responsibility for cleanup and rehabilitation rests with the DOD and DOI respectively. AEC is responsible for conducting a radiological survey, assessing the results, and establishing criteria and constraints for cleanup and rehabilitation, involving other agencies, as appropriate.

Organization of the Eniwetok Radiological Survey, now under way, is shown in Figure 3. The Washington Interagency Group is charged with coordination of actions to effect overall Eniwetok Atoll objectives. The Manager, Nevada Operations Office, has been directed to plan, organize, and conduct the AEC radiological field survey to develop sufficient data on the total radiological environment of Eniwetok Atoll. Technical standards and requirements for the survey and cleanup operations will be provided by responsible divisions within AEC Headquarters. Specifically:

- (a) The Division of Biomedical and Environmental Research (DBER) has the responsibility for reviewing and guiding the preparation of a report on the radiological status of the atoll. This report will be prepared by the Data Evaluation Group at Lawrence Livermore Laboratory.
- (b) The Division of Operational Safety (DOS) shares responsibility with DBER and the Division of Military Application (DMA) for planning the survey. DOS will provide the coordination of these plans and their extension during the survey with the Assistant General Manager for Environment and Safety (AGMES). DOS will also provide information on the survey to EPA staff at the Washington level upon request. DOS will review and evaluate all data and assessments relevant to the feasibility of various cleanup methods and methods for disposal of hazardous materials. Cleanup criteria, requirements, guidelines, and environmental and health protection standards to be employed during cleanup operations will then be developed by DOS in consultation with appropriate AEC staff sections and other agencies.
- (c) The AGMMA has the overall authority and responsibility within the AEC for coordinating matters related to the rehabilitation of the Eniwetok Atoll.

The radiological survey, and the interpretive effort associated with it, is a large program superimposed on a number of technically qualified organizations. Survey activities and analytical efforts by responsible organizations are reflected in Figures 4 and 5.

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As an example of the complex radiological situation which exists on Eniwetok, one island, Runit, is shown in Figure 6 with a plot of gamma exposure rates on that island. Contamination from eight tests on Runit is measurable today. An early preliminary survey has confirmed the presence of a plutonium-bearing, sand layer outcropping on the ocean side of the island, and the existence of solid plutonium-bearing chunks, grains, and other particulates on the island surface and near surface. Earth and debris moving activities during and after test operations have resulted in a complex radiological situation in which adjacent areas may be quite different as to levels and vertical distribution of radioactivity in soil. Data available to date indicate that radiological contamination is less severe on other islands but is sufficient to pose a considerable problem.

At a September 7, 1972, Interagency Meeting, the following agreements with respect to funding were reached:

- (a) The AEC will fund the radiological aspects of the precleanup survey, the conduct of any other radiological survey activity that might be required to understand conditions in the environment as they relate to exposures of people and developments of standards, and the conduct of periodic follow-up radiological surveys that take place after cleanup. If later field and/or laboratory work is done by the AEC in support of cleanup, AEC should be reimbursed by DOD.
- (b) DOD would be responsible for funding the engineering portions of the precleanup survey and those monitoring and survey activities that are required to support cleanup operations and to insure safety of personnel involved in cleanup activities. DOD also would fund the later cleanup of both radiological and non-radiological activities. DOI would be responsible for funding rehabilitation costs once cleanup is completed.

Present best estimate of the cost of the AEC precleanup radiological survey is \$1.3M. Costs of subsequent studies and radiological monitoring activities are estimated to be approximately \$1M per year for FY 1974 and beyond. DOD costs for cleanup and related activities are estimated at between \$20-40M and may go higher. The actual final costs are highly dependent on the amount of soil and debris needed to be removed and subsequent disposal methods employed. To date the DOD has committed approximately \$500K in the precleanup engineering survey.

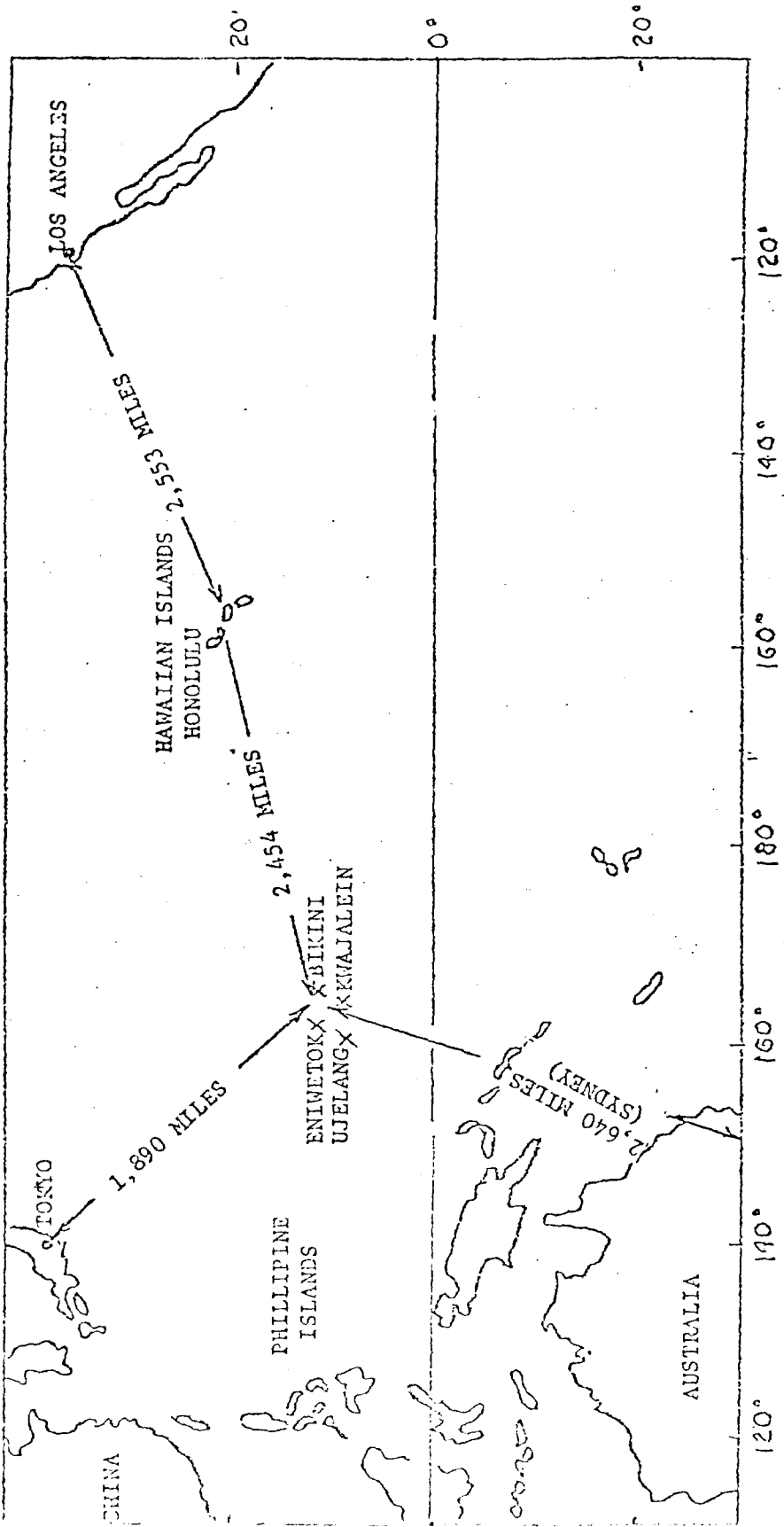
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The initial field survey was contemplated for the period October 12-December 6, 1972. The first week of this schedule was started, but not completed, when Typhoon Olga caused a suspension of activities. Subsequently, it was necessary to revise and reschedule the survey to account for weather factors and logistic limitations. An aerial radiological and photographic survey of the atoll was accomplished November 8-25 during the period of minimal logistic support. Survey activities were resumed during the week of November 27 on a revised schedule and will now extend to mid-February 1973. The AEC radiological survey now appears to be progressing smoothly and collected samples are being returned to the CONUS for analysis. Data to date, based mainly on the results of the aerial survey, appear to be generally consistent with earlier knowledge and expectations.

fr *F. A. Camm*
Frank A. Camm
Major General, USA
Assistant General Manager
for Military Application

Enclosures:
Figures 1, 2, 3,
4, 5, and 6

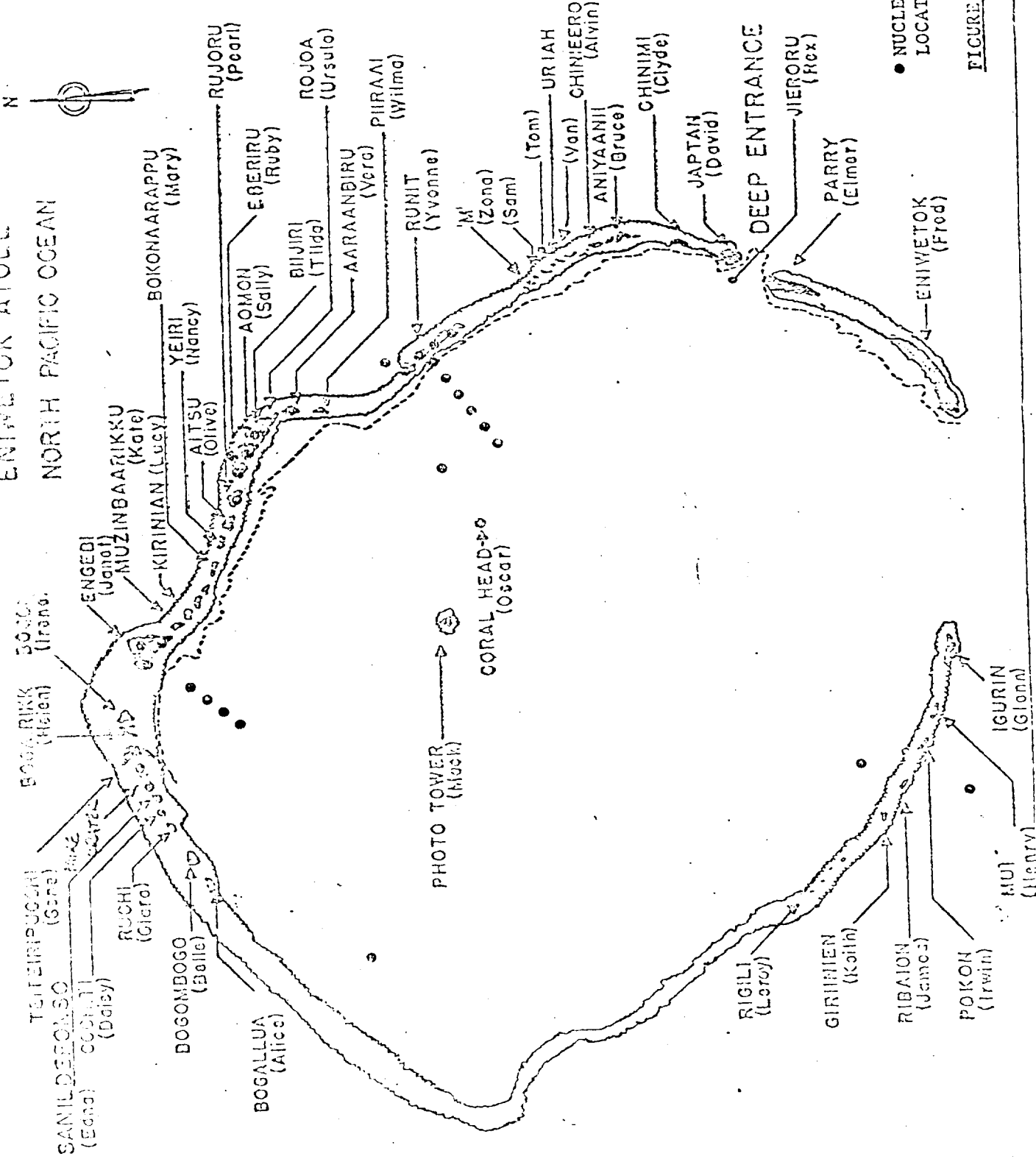
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FIGURE 1

ENIWEITOK ATOLL
NORTH PACIFIC OCEAN



● NUCLEAR TEST
LOCATIONS (APPRO.)

FIGURE 2

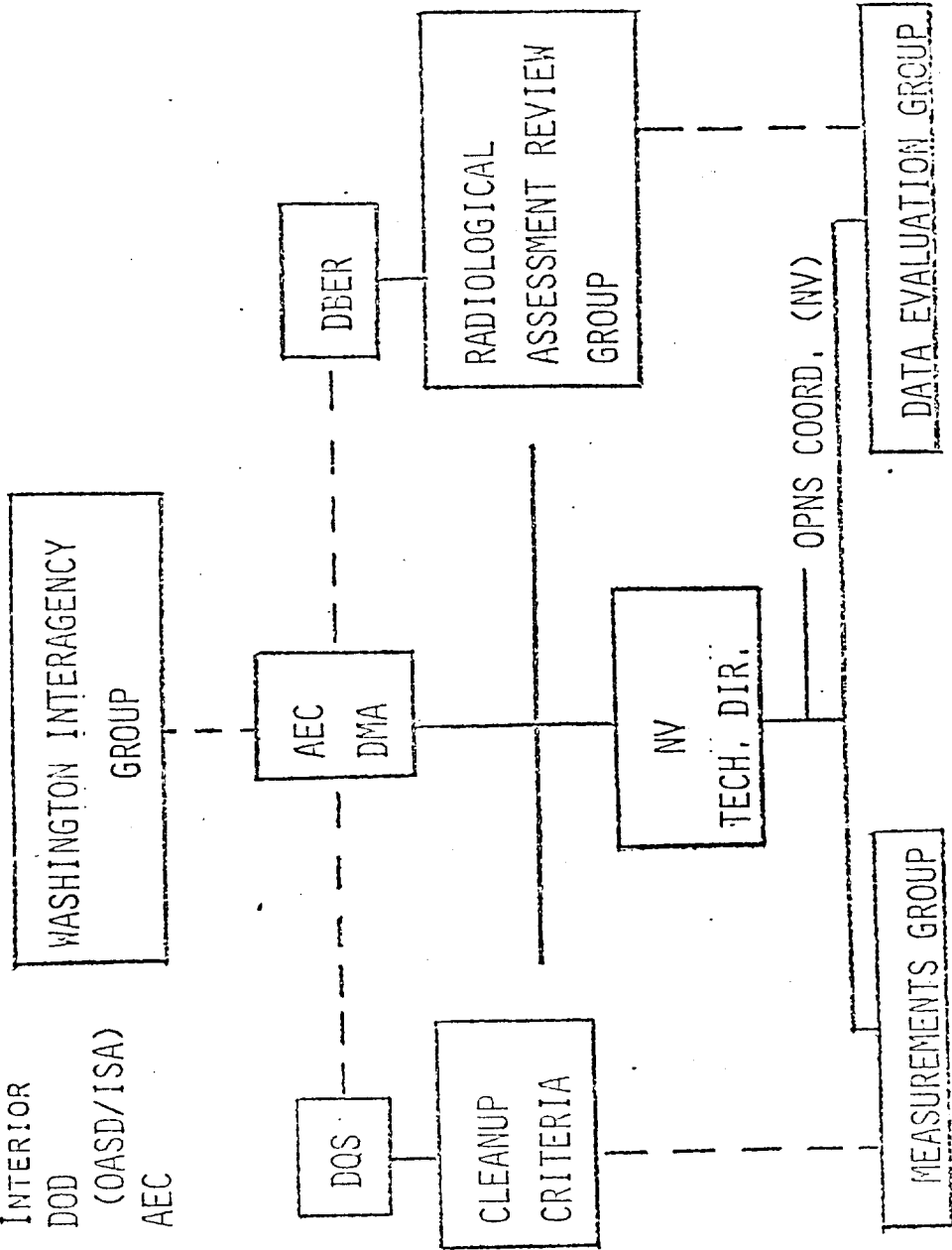
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Labels on the map include:

- TATEIRIPUCORI (Gene)
- SANILDESONSO (Eada)
- COBANI (Daisy)
- BOGOMBOGO (Belle)
- BOGALLUA (Alice)
- RUCHI (Glera)
- BOGOMBIKK (Helen)
- BOGOMBIKK (Irene)
- ENGEDI (John)
- MUZINBAARIKKU (Kate)
- KIRINIAN (Lucy)
- YEIRI (Nancy)
- AITSU (Olive)
- AOMOH (Sally)
- BIIJIRI (Tilda)
- AAARAANBIRU (Vera)
- PIIRAANI (Wilma)
- RUJORU (Pearl)
- ROJOA (Ursula)
- EBERIRU (Ruby)
- RUNIT (Yvonne)
- M' (Zona)
- (Sam)
- (Tom)
- URIAH (Van)
- CHINIEERO (Alvin)
- ANIYAANI (Bruce)
- CHINIMI (Clyde)
- JAPTAN (David)
- JIERORU (Hex)
- PARRY (Elmer)
- ENIWEITOK (Fred)
- IGURIN (Glenn)
- MIU (Henry)
- POKON (Irwin)
- RIBAION (James)
- GIRIHINIEN (Kaita)
- RIGILI (Leroy)
- CORAL HEAD (Oscar)
- PHOTO TOWER (Mack)
- DEEP ENTRANCE

ORGANIZATION OF THE ENIWETOK SURVEY PROGRAM

MR. JOHN DEYOUNG ----- INTERIOR
 CAPT GORDON SCHULLER- DOD
 (OASD/ISA)
 CAPT WILLIAM W. GAY - AEC
 EPA "COLLABORATION"



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FIGURE 3

SURVEY DETAIL

EXTERNAL DOSE AND SOIL SURVEY (3000 SAMPLES)

EXTERNAL GAMMA DOSE AND DOSE RATE
SOIL SAMPLING -- CORES, SIDE WALL, AND SURFACE
AERIAL MEASUREMENTS (QUICK LOOK AND PHOTO)

AIR, BIOTA, AND POTABLE WATER SURVEY (1000)

AIR PARTICULATES
COLLECTION OF FOOD PLANTS AND ANIMALS
RAD CHEM ANALYSIS OF WATER

AQUATIC SURVEY (900 SAMPLES)

BIOCHEMICAL BEHAVIOR OF TRANSURANIUM ELEMENTS
SHALLOW WATER CORING, WATER SAMPLING, DREDGING,
IN SITU DETECTION MEASUREMENTS
MARINE SAMPLING -- DEEPER REGIONS OF LAGOON
COLLECTION OF EDIBLE MARINE VERTEBRATES AND
INVERTEBRATES

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LABORATORY ANALYTICAL CAPABILITY

LABORATORY KIND OF ANALYTICAL WORK

LLL SAMPLE PREPARATION - SOIL AND BIOTA
 COMPLETE ANALYTICAL TREATMENT, SEA WATER
 GAMMA ANALYSIS, ALL TYPES OF SAMPLES, MARINE SURVEY

MCL GAMMA ANALYSIS
 SOIL DISSOLUTION AND ANALYSIS FOR PU AND ⁹⁰SR
 ANALYSIS OF AIR FILTERS

UW MARINE SURVEY
 ⁵⁵FE ANALYSIS
 ⁹⁰SR ANALYSIS

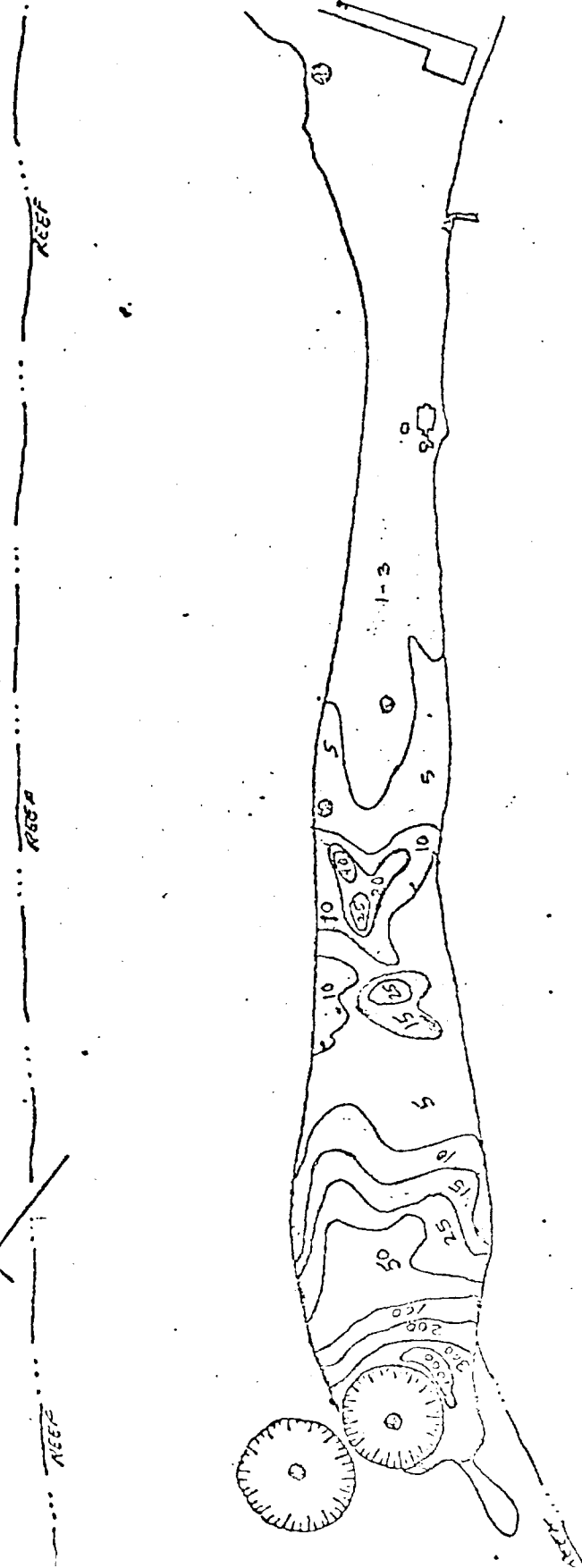
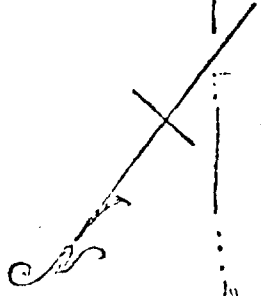
CONTRACT ANALYSES
 GAMMA ANALYSIS
 SOIL DISSOLUTION AND ANALYSIS FOR PU AND ⁹⁰SR
 ANALYSIS FOR PU
 PU HEALTH STUDIES

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NERC (EPA) LAS VEGAS

ASL

PACIFIC OCEAN



GAMMA EXPOSURE RATES
μR/hr MICRO ROENTGENS PER HOUR
LAGOON

BRUNIT (CYVOINNE) 40 SGZ
ENIWETOK ATOLL, MARSHALL ISLANDS
MAY 1972

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FIGURE 6