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July 9, 1974

SUMMARY OF TASK GROUP RECOMMENDATIONS

ENEWETAK ATOLL

INTRODUCTION

The Atomic Energy Commission agreed to provide radiological criteria for cleanup and rehabilitation of Enewetak Atoll to the Department of Defense (DOD) and to the Department of the Interior (DOI). A comprehensive survey of the radiological environment of Enewetak was made to serve as a basis for judgements and recommendations. The survey data show that the northern islands have the greater amount of radioactive contamination and there are plutonium problems.

The Director, Division of Operational Safety, appointed a Task Group and through it staff liaison representatives of DNA, DOI and EPA were kept informed of progress toward completion of recommendations. Current radiation protection guidance containing numerical standards and radiation protection philosophy of national and international standards bodies was used to develop recommended criteria:

- Population dose to the Enewetak people should be as low as practicable.

- The Federal Radiation Council (FRC) Radiation Protection Guides (RPG) for individual and gonadal exposures will be used to evaluate exposure options. The values should be reduced by 50 percent for individual exposure and 20 percent for gonadal exposure to allow for uncertainties in dose predictions. The guides for cleanup planning become:

	Exposure
Whole body and bone marrow	0.25 Rem/yr
Thyroid	0.75 Rem/yr
Bone	0.75 Rem/yr
Gonads	4 Rem in 30 yr

Cleanup of soil containing Pu can be handled on a case-by-case basis using the following:

a. < 40 pCi/gm of soil - corrective action not required.

b. 40 to 400 pCi/gm of soil - corrective action determined on a case-by-case basis considering all radiological conditions.

c. > 400 pCi/gm of soil - corrective action required.

DOSE ASSESSMENT AND CORRECTIVE ACTION ALTERNATIVES

For comparison with population dose guidelines, evaluations were made for the following conditions:

- Dose without cleanup.
- Dose reductions obtained by diet modification.
- Dose reductions achieved by removal of contaminated soil.

In addition, estimates were made for representative living patterns plus corrective actions:

- Plow the village island, and gravel the village area for radiation shielding.
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- Import pandanus, breadfruit, coconut and tacca from the southern islands.
- Import pandanus, breadfruit, coconut, tacca, and domestic meat from the southern islands.

DISPOSAL OF CONTAMINATED MATERIAL

Contaminated material is composed of soil, debris and scrap. At some places there is Pu including pieces of Pu metal. Contamination is distributed on and below the surface; some is in rad waste burial sites.

Fission products and induced radioactivity found on such scrap and debris, particularly scrap metal, should be made unavailable to the returning people. Possible approaches are:

1. Disposal in water-filled and underwater craters.

2. Land burial where the radiation level of the scrap is not significantly above that on land.

3. Disposal in deep water.

Pu excepted, the Task Group has not made recommendations for removal of contaminated soil. For any disposal there should be no pathway to people; periodic followup surveys are necessary. Disposal of Pu in any form is a greater problem, and disposal must protect against exposure for the future.

OBSERVATIONS AND CONCLUSIONS

The consensus of the Task Group reflects consideration of a range of options and the benefits of reviews and comments.

Choice of the method which will optimize reduction of exposures is a matter of judgement. Action such as use of imported foods could be effective but is not recommended. Although engineering actions, e.g., soil removal and replacements may appear to be preferable to restricting use of land for living and agriculture, these actions can otherwise adversely affect the environment and for some the effectiveness is uncertain. The extent of compliance by the people with restrictions has been considered, and an acceptable level of cooperation is expected so that they may use land where the radiation environment is or can be made acceptable.

Return of people to live on the southern islands, ALVIN through KEITH, is expected to result in radiation doses within the recommended criteria. JANET (Enjebi), which the people desire for a residence island is a special case of the category of islands having radiation and radioactivity levels which preclude living and agriculture. Steps to make this island completely or partially available in the near term are important from the social as well as scientific viewpoint. Predicted radiation doses associated with the Task Groups recommendation are given in the following table. The Bikini Atoll estimates and natural background ~~estimates of typical~~ levels in the U.S. are given for comparison.

southern
that people live only on the islands, ALVIN thru KEITH

PREDICTED RADIATION DOSE IN REM WITH ADOPTION OF TASK GROUP RECOMMENDATIONS

Maximum Annual Dose*

Whole Body		Bone Marrow	
Child	Adult	Child	Adult
0.125	0.128	0.148	0.149

Thirty Year Doses*

Whole Body	Bone**
2.2	11.5

Predicted Radiation Dose for Bikini Atoll

Thirty Year Doses***

Whole Body	Bone Marrow
5.3	9.4

Measured Terrestrial Gamma Dose - Rates in U.S.

0.04 to 0.13 Rem/yr

*See Option III, Table 11, of the Task Group report. Dose includes contribution from natural background, about 0.03 Rem/yr, and 0.90 Rem/30 yrs.

**The dose to bone marrow is about one-third the dose to bone.

***Presented in "Additions to Radiological Report on Bikini Atoll, P. F. Gustafson, Division of Biology and Medicine," May 1968. Estimates do not include contribution from natural background.

RECOMMENDATIONS

The Task Group reached the following conclusions:

1. Observing precautions, the people may safely return after certain actions are taken. Exposures will be somewhat above current levels in the U. S., but the small risk seems permissible in relation to the desire of the people to return.

2. To assure exposures that will be as low as practicable:

   a. Villages and residences to be located on ELMER, FRED, DAVID, or other southern islands (ALVIN-KEITH).

   b. Travel and visits may be unrestricted to all islands except YVONNE. When Pu contamination on YVONNE is removed, the restriction of travel to that island may be lifted.

   c. Coconut excepted, growth of animal and vegetable subsistence crops to be limited to southern islands ALVIN-KEITH.

   d. Subsistence and commercial coconut may be grown without remedial measures except on ALICE, BELLE, CLARA, DAISY, IRENE, JANET, and YVONNE.

   e. Fishing permitted anywhere.

   f. Wild birds and eggs may be collected anywhere.

   g. Coconut crabs may be collected only on the southern islands (ALVIN-KEITH).

   h. Wells to provide lens water for human consumption or for agricultural use to be drilled only on the southern islands (ALVIN-KEITH). Water from any well to be assayed for bacterial, salinity, and radioactivity content before approved for use.

3. Enjebi (JANET) is a special case, and the people have a strong desire to live there. Three ground zeroes were on Enjebi and high yield events were fired nearby, with the result that this was the most heavily contaminated of the larger islands. The Task Group has been unable to determine a reliable, feasible way to bring exposures within the acceptable criteria and permit

resettlement of Enjebi on the same schedule as southern islands. The island can be resettled sometime in the future when radionuclide ingestion is no longer a problem. To develop the facts, test plantings with and without soil removal may be made. Construction and agriculture would be deferred until produce from test plantings showed acceptably low levels of radioactivity. Test plantings without soil removal would have least adverse impact on the island environment.

4. Concurrent with the Enjebi work, radioactivity levels should be measured in coconut and other food crops grown on PEARL, CLARA, ALICE, and BELLE. Produce from YVONNE should be included after removal of plutonium contamination.

5. All radioactive scrap metal and contaminated debris now or later identified should be removed. This includes three locations on SALLY and one on ELMER where buried contaminated debris should be exhumed and removed.

6. YVONNE, quarantined by the USAF in 1972, should remain quarantined until plutonium contamination on that island has been cleaned up. An authority responsible for enforcement of the quarantine should be identified and in residence in the Atoll if people return to the Atoll before cleanup is completed.

7. Only general recommendations for cleanup of Pu on YVONNE can be presented at this time. An accurate picture of this contamination should develop as the decontamination proceeds. The area observed to have small pieces of plutonium and the highest soil concentrations is about 30% of the island. A background for plans for the recovery of Pu will require:

   a. Assembly of a team of experts to interpret field radiation and radioactivity measurements, advise on cleanup actions and provide necessary health physics support. A Public Health Service group, now part of EPA, provided radiological assistance for cleanup of Bikini Atoll. Similar support should be sought from EPA for Enewetak.

   b. Decontamination of YVONNE is seen as an iterative process. This amounts to a search for and removal of the higher plutonium levels in soil.

c. The objectives of the cleanup are two:

(1) Recovery of the pieces of plutonium that have been observed on or near the island surface.

(2) Recovery of plutonium contaminated soil.

d. Recovery of plutonium in soil at concentrations greater than 400 pCi/g ^{239}, ^{240}Pu at any depth these levels are found. Also, recovery of contaminated soil sufficient to reduce surface levels to a value well below 40 pCi/g ^{239}, ^{240}Pu. After soil removal, all areas should be resurveyed to ensure no pieces or hot spots of plutonium remain.

8. Plutonium contaminated soil on IRENE should be handled as on YVONNE. Pieces of Pu metal are not expected to be found.

9. Test plantings of food crops may be conducted on each of the "no crops" islands as designated by the Enewetak people. As edible parts of these plants become available, concentrations of significant radionuclides should be measured and compared with the radiological survey predictions. These studies will indicate times at which planting of subsistence and commercial crops can be safely resumed.

10. Lens water sampling and analysis should be conducted, samples to be taken over a period of at least 12 calendar months. Bacterial content, salinity, and radionuclide content should be measured. Radioactivity information will contribute to an understanding of processes operating - or which can be made to operate - to reduce the ecological half-life of ^{90}Sr and ^{137}Cs below the radioactive half-life on the northern islands, especially JANET.

11. A comprehensive air sampling program should be conducted over a period of 12 consecutive months under conditions closely approximating human habitation and expected soil disturbance to provide information on radioactivity levels in air. This program could be conducted coincident with and support cleanup.

12. Base-line surveys of body burdens and urine content of ^{137}Cs and ^{90}Sr should be made for the Enewetak people prior to return to Enewetak Atoll, and periodically thereafter. Re-surveys of the environmental radiation and radioactivity should be made in the first year of return and repeated, for example,

every other year.

13. Methods of disposal of plutonium contaminated soil and scrap will have to be decided. Pending a decision, it is recommended that cleanup should accomplish the recovery of plutonium contaminated soil and scrap with storage on YVONNE. If disposal is deferred for further study, such study should be initiated promptly.

14. The cleanup, with particular attention to removal and disposal of contaminated scrap, debris, and soil, should be documented in detail in a final report by those responsible in the field.

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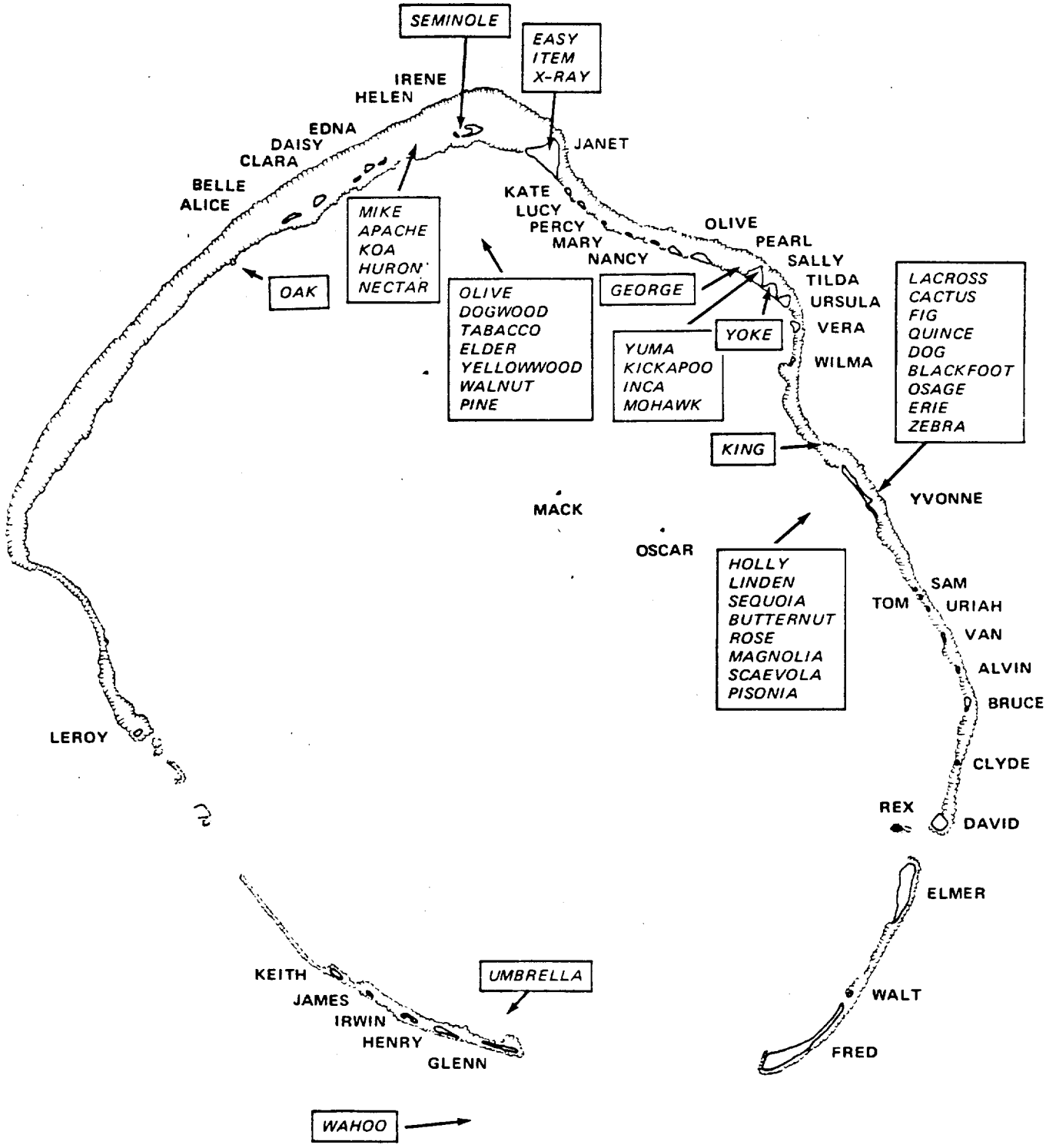

ENEWETAK ATOLL - TEST LOCATIONS

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