

Mr. Schroebel discussed with Facer, no covering memo sent.  
(reply to memo from Facer to Liverman dated 3-23-73)

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~~WWSchroebel:mah~~  
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Rough Draft Material for Eniwetok Cleanup/Rehabilitation DEIS

Alternative A - no cleanup

If only radioactive scrap and debris are removed, the environmental impact of cleanup operations will be minimal; however, the DEIS should describe and evaluate the environmental consequences of the man-made radioactivity remaining in the environment. In addition, habitable land areas will be distinguished from any uninhabitable areas.

5-b-1 Proposed Actions - Cleanup Plan - Criteria - Radiological

Criteria for cleanup of radioactive scrap and debris developed for and employed during cleanup of Bikini should be applicable to Eniwetok, although these criteria should be reviewed by a group of experts for assurance of their adequacy in 1973-74. It should be noted that such cleanup has little effect on human population dose and is undertaken primarily to reduce the probability of high individual exposures. Specific statements should deal with radioactive waste crypts and any other locations where material has been concentrated during post-testing roll up. Holmes and Narver's records and Task Force Radsafe records may be reviewed for this purpose.

6 - Environmental Impacts

(4) Effects on Life Systems

Undoubtedly the most significant effects of the residual radioactivity on life systems will be the potential consequences to health of humans who will live on the atoll. (See 6.(6) - DOS)  
Although it is a <sup>scic</sup> radiological topic, some reference should be made to effects of constraints on land use, e.g., denial of habitation on specific islands.

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(5) Effects on Food Chains

The residual radioactivity which has existed in the environs of the atoll for approximately twenty years has undoubtedly penetrated all food webs of atoll ecosystems. In the absence of detailed radiological data it is not possible to state the amounts in any food chain but it is likely that concentrations of several radioactive species are sufficiently high to contribute amounts of radioactivity to man through his diet which are of potential significance to human health. Both bone seeking isotopes and radioactive species which distribute uniformly throughout tissue are present. Long-lived iodine will likely not be a problem of great concern. Meaningful assessment of the consequences of plutonium and other transuranics in the food chain as well as quantitative information on the contribution of radioactive fission and activation products in important food chains will have to await radiological survey results. It is highly unlikely, however, that concentrations are sufficiently high, even in the most highly contaminated areas of the atoll to cause disruption of food chains by radiation damage to components (References ). Data from the radiological survey on several components of major food chains to man will be evaluated and available towards the end of May.

The proper assessment of radionuclide transfer through the food web to the natives will have to wait on analyses of samples collected to date. However, even though consensus believes no

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overt genetic and somatic damage will occur to the ~~rehabilitated~~ natives due to either external or internal doses, no previous information is available relative to the special concentration processes of the transuranics in tropical marine ecosystems-- whether it be chemical, physical or biological. Therefore, one should be alerted to the unexpected. For example, the long lived radionuclides of Ni<sup>63</sup> and Ag<sup>108</sup> were not suspect for the first two decades of study at the Pacific Proving Ground. However, when it became obvious that these species would have to be formed in the blast it became routine to find these in all parts of the food chains. On this basis, I would not rule out the existence of I<sup>129</sup>, Tc<sup>99</sup> and a great variety of transuranics showing up in various parts of the food chain.

The meager human diet, naturally available, will consist of sea foods found in the reef, tidepools, lagoon and open sea; fruits and vegetables which can be harvested; and sea birds and their eggs. Cleanup and rehab operations should be designed to provide a minimum of impact on these foods. Continuation of the feeding habits developed by the natives after moving to Ujelang - using imported rice, flour and sugar - will reduce the daily ingestion of radionuclides.

#### 7 - Flora and Fauna

The effects of radioactivity existing in any part of the atoll on individuals and populations of plants and animals are likely to be very small. If they are detectable at all it will be only through

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long range studies employing sophisticated techniques in the more heavily contaminated areas of the atoll. Radiological survey data on the distribution of radioactivity in the environs and in life forms will permit quantification of the above statements and the identification of any problem areas that might exist as a result of special physical, chemical or biological concentration processes. However, it appears highly unlikely that these processes would occur to the extent of producing large effects on any significant portion of the flora and fauna of the atoll.

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Alternative B - Cleanup for complete rehabilitation

5.b.1. Proposed Actions - Cleanup Plans - Criteria - Radiological

Criteria for cleanup actions beyond debris and scrap removal and leading to significant reductions in population exposures and, hence, to reduction of potential health consequences should have two objectives:

(1) To assure that individual exposures are below levels at which there is an unacceptable health risk. It is likely that doses exceeding those recommended as upper limits by FRC, NCRP and ICRP (170 mrem per year) for exposure to population groups will be acceptable for this purpose.

(2) To reduce population exposures to as low as practicable.

Specific measures to effect such reduction should be based on cost-benefit considerations. Since soil manipulation is likely to be the major method of dose reduction, particular attention will have to be paid to evaluating the environmental consequences of these procedures.

Criteria will necessarily depend on detailed radiological survey data for it will be necessary to establish what can be accomplished toward reducing exposures by cleanup actions in reference to costs and to methods for reducing exposures by methods other than cleanup.

Since DOS-AEC has the responsibility for establishing cleanup criteria, they should have the last word regarding input to DOD-DOI in this area.

6. Environmental Impacts

(4) Effects on life systems

Soil manipulation (mixing, removal, addition) for the purpose of cleanup or exposure reduction is likely to have minimal direct effect on human inhabitants of the atoll. However

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such procedures if extensively employed are likely to have significant immediate, long term and perhaps irreversible effects on life forms present on and near the atoll. By affecting life systems on which man depends this will also affect <sup>human</sup> inhabitants of the atoll. For areas in which radioactivity is uniformly distributed population exposure will be reduced in proportion to the area manipulated. For this reason such procedures are likely to be most effectively pursued on a selective basis in areas where local high concentrations of radioactivity exist or where inhabitants will spend large fractions of their time. It will be exceedingly difficult even when detailed soil profile data from the radiological survey become available to balance the benefits of population exposure reduction against the consequence to life systems of extensive soil manipulation. Soil removed will have to be deposited somewhere. If deposited in the ocean adjacent to the atoll, the physical effects on marine forms could be <sup>severe</sup> ~~serve~~ and will have to be evaluated as will the consequences of adding additional radioactivity to the marine environment. Reduction of dose by covering contaminated areas with uncontaminated soil from sources outside the atoll could introduce plant disease and parasites.

(5) Effects on Food Chains

Soil manipulation procedures are likely to have direct impact on most terrestrial food chains. Direct destruction of vegetation by these procedures is likely to be less important than the disturbance of surface soil relationships necessary for sustaining

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both animal and vegetative growth. In the case of at least some soil manipulation procedures (i.e., deep plowing) it appears possible that the long-term environmental costs of these procedures would significantly exceed the direct costs to conduct the procedure.

Alternative C - Cleanup of some areas

This alternative is perhaps the most likely of the three. Specific criteria for cleanup actions and the environmental consequences of these actions can be derived by application of the relevant considerations of Cases A & B to individual areas, islands or groups of islands of the atoll. The desires of the Eniwetok people will have an important influence on the selection of this alternative.

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Additional material to be considered for working in to DEIS:

3g. In order to describe the present condition of the islands it should be reiterated that (a) NVOO (Nervick) will assist DNA with the results of the survey plus (b) we (DBER) should add the integrated results of the biogeochemical study of the atoll which will help evaluate the ecological health of the whole atoll.

5.b.1. Do we have a responsibility for the cleanup-health survey for nonradioactive debris such as the Be on Engebi (Irene)? If so that should be included in the criteria.

6 Environmental Impacts on --

(2) Water Quality - It is possible that nuclear detonations on or near islands have permanently altered the island surface and subsurface

structures which provide the boundary between lagoon and ocean salt water and the fresh water in the lens. If so, the habitability of the islands may have to be evaluated with respect to water supply.

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