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Report of the Advisory Group on Cleanup of Enewetak Atoll

The Advisory Group on Cleanup of Enewetak Atoll met at the Nevada Operations Office in Las Vegas on April 13 and 14, 1978. Members present were: W. L. Templeton, R. O. Gilbert, C. W. Francis, J. W. Healy, B. W. Wachholz, and W. J. Bair. Among the others present were T. McCraw, DOES, Roger Ray, Paul Mudra, John Stewart and Madeline Barnes, Nevada Operations Office, representing the Department of Energy; General Tate and Colonel Treat representing the Defense Nuclear Agency; and Drs. W. Robison and V. Noshkin from Lawrence Livermore.

The meeting was organized by Tommy McCraw and the agenda developed in consultation with W. J. Bair, chairman.

Purpose of the Meeting

The meeting centered around two questions pertaining to cleanup of the Enewetak Atoll. The committee was asked to:

1. review the most recent draft of "Assessment of Potential Doses to Populations from the Transuranic Radionuclides at Enewetak Atoll" by W. Robison, W. Phillips and V. Noshkin. The doses estimated in this report are considerably greater than those in the Environmental Impact Statement (EIS) upon which the cleanup criteria of 40 and 400 pCi/g soil were established.
2. advise on the application of proposed EPA transuranic standards to the Enewetak cleanup operation.

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In addition, the committee addressed the charter of the Advisory Group and the possibility of a visit by the Advisory Group to Enewetak.

Background Comments

At Dr. Liverman's request, five members of the Advisory Group participated in a review of the plans for cleanup of Enewetak Atoll on August 15-17, 1977. They concurred with the EIS's minimal and mandatory cleanup levels of 40 pCi/g soil and 400 pCi/g, respectively. This concurrence was based on the presentation of data indicating that the proposed EPA guidance levels of 1 mrad/year to lung and 3 mrad/year to bone would not be exceeded. Subsequent to the August 15-17 review no information was provided to the members of that review group or to the members of the newly formed Advisory Group until two days before the April 13-14, 1978 meeting when the Advisory Group received copies of the Lawrence Livermore draft report. This was the first indication to the Advisory Group that the data base in the EIS was being questioned. Thus, the Advisory Group was no better informed for this meeting than the review committee was last August. Also, one of the Advisory Group who was present and two of those unable to attend did not have the benefit of the information presented at the August meeting, although all members have knowledge of the Enewetak activity from other sources. On the first day of the meeting the Advisory Group was briefed on recent developments by DOE, LLL and DNA staff. On the second day the Advisory Group met with General Tate and Colonel Treat and then with Roger Ray to gain an understanding of DOE and DNA needs and problems. The briefing and discussion with DOE and DNA staff identified a number of other issues.

Issues, Facts and Questions Raised During the Meeting

1. Dose Assessment
 - a. It appears that Pu and Am in coconut are big contributors to bone dose estimates, but the dose estimates are based on inadequate data.
 - b. Inherent safety factors in calculations were not identified.
 - c. A "new" data base was not identified.
2. Plowing - is it an acceptable cleanup option?
3. Maximum quantity of soil that can be removed with allocated resources is 60,000 yd³!
4. Adequacy and timeliness of surface and subsurface soil sampling are questionable.
5. Calibration of IMP. Basis for correlation of IMP data with surface and subsurface levels of Pu and Am was questioned by the Advisory Group.
6. How does EPA expect new guidelines to be applied to Enewetak cleanup?
7. Is it appropriate to apply an averaging concept to the soil contamination cleanup levels? What method for averaging could be used?
8. Is air sampling and resuspension data adequate? Where are the data?
9. On what basis will DOE certify the cleanup?
10. Perceived vs. actual responsibilities of DOES, DBER, DNA, NVO, ERSP, LLL, BNL, University of Washington and the University of Hawaii--the Advisory Group senses that responsibility and authority lines are poorly established or identified.

Conclusions and Recommendations

1. Dose Assessment Report

The advisory Group does not believe the present draft of "Assessment of Potential Doses to Populations from the Transuranic Radionuclides at Enewetak" is an acceptable basis for decisions regarding cleanup criteria and eventual resettlement of the atoll for the following reasons:

- A. Data base: The data used in the dose assessment calculations appear to be inadequate and introduce into the dose calculations a large uncertainty which is not identified. Some of the data used are extrapolations from data collected at other sites and under different conditions from those at Enewetak, thus the data may not be applicable.
- B. Basic Assumptions: The assumptions used in deriving the dose estimates appear to have been selected more for the purpose of maximizing the range of doses that persons inhabiting the atoll could receive than for estimating most probable or reasonably expected doses. On the other hand, doses were estimated for what appears to be an average population, rather than for different population groups (e.g., infants, children, young adults, aged, etc.). In several cases the basic assumptions are not given and in others, unpublished and unsubstantiated conclusions served as a basis for assumptions used. An example is the gastrointestinal absorption factors.
- C. Approach: Dose estimates are not obtained for actual average soil concentrations as they presently exist on the islands. That is, the estimated average surface (0-3 cm) concentrations over 1/4 or 1/2 hectare areas obtained using the IMP and soil samples are not

used in the dose estimation scheme. The dose estimates obtained are based on hypothetical island average concentrations that may, in some cases, be quite unrealistic. It would seem desirable to compute doses based on the best soil data currently available. This exercise should then be repeated using anticipated soil levels after cleanup has been completed.

Specific comments on this report have been provided the authors.

Recommendations - The Advisory Group recommends that the authors of the dose assessment report consider these comments in preparing their next draft and that they redirect their efforts somewhat in order to estimate the most probable doses rather than maximum doses. This should not be interpreted to mean that consideration should not also be given to estimating doses to the maximum individuals.

2. Application of Proposed EPA Guidance on Transuranics in Soils to Cleanup Criteria

This issue was discussed with EPA staff by Dr. Wachholz prior to the meeting. It is not expected that the EPA will insist on the use of their Guidance as an upper exposure level. However, the EPA has indicated that although reasons for not being able to achieve the Guidance levels are understandable in view of the uniqueness of the Enewetak situation, it is desirable to meet the proposed Guidance. The EPA states that the proposed Guidance is intended for use in deeds, development and use of public and private lands and was not intended for nuclear weapons test areas. The Advisory Group recommends that although the EPA Guidance is not intended to apply to such areas as Enewetak and does not appear to be a prerequisite for resettlement, every reasonable

effort should be made to comply with the EPA Guidance. The EPA Guidance on dose levels of 1 rem/year to lungs and 3 rem/year to bone for persons exposed to transuranic elements should be targets for the cleanup effort. However, decisions to reinhabit the atoll should be based on doses calculated from soil, air and vegetation measurements made after cleanup and consideration of the benefits of reinhabiting the islands.

3. Comments and Recommendations on other Issues and Questions Posed to the Advisory Group

A. Decisions on plowing should await the results of a plowing experiment to be conducted at Enewetak. It is recommended that a statistician, Madeline Barnes, Jo Jane Giacomini and/or Burt Friesen participate in the planning of the experiment and analysis of the results. Since DNA wants advice on plowing, this experiment should be completed as soon as possible.

B. Resuspension

Data on resuspension of Pu and Am contaminated soil particles at Enewetak are insufficient to evaluate the potential inhalation dose to children playing on the ground or adults working in agricultural areas. The Advisory Group urges that an effort be made to obtain resuspension data of this nature unless it already exists. If it does exist, the Advisory Group welcomes an opportunity to review the data.

C. Averaging the Soil Concentrations Over Entire Islands

The committee considered the possibility of using island average concentrations to determine how much soil should be removed, to assess cleanup performance and to calculate doses. The Advisory Group sees no compelling reason to alter the previously agreed upon plan to consider each 1/4 or 1/2 hectare separately for cleanup. The subject of averaging

arose from Dr. Robison's discussion of the dose assessment work where "average soil concentrations" were used. The Advisory Group believe the concept of averaging should be restricted to dose estimates and, even in this case, should be used with great care. There are a number of methods that could be used for basing dose assessments on actual soil data:

1. Compute the dose on the basis of highest estimated soil concentration for any unit (of 1/4 or 1/2 hectare size) on the island. This method could result in a very conservative dose estimate if most units on the island had much lower concentrations than the highest unit.
2. Average all the unit (1/4 or 1/2 hectare) average soil concentrations on an island and use this grand average to estimate potential dose. This method weights all units equally, even though some units would undoubtedly have greater utilization by inhabitants than other units.
3. A conservative approach would be to use the cleanup criteria designation for the island (40, 100, or 400 pCi/g, for village, agricultural, or picnic islands, respectively). Dose estimates for this option were obtained by Robison, et al. in their dose assessment paper presented to us at the meetings. Conservative dose estimates are likely since most units have average soil concentrations much below these cleanup criteria.
4. Perhaps the best method would be to estimate the dose separately for each 1/4 or 1/2 hectare unit on the island using the estimated average soil concentration for the unit.

These unit dose estimates could then be weighted depending on projected utilization by the inhabitants. This approach might be particularly well suited to estimating dose from the ingestion pathway.

D. IMP Calibration

The Advisory Group's questions on the calibration of IMP were not adequately answered at the meeting. Dr. Gilbert agreed to contact EG&G and Eberline and appropriate Nevada Operations staff for further information.

E. Onshore-Offshore Sampling

The presence of Pu/Am in marine areas has been suggested.

The Advisory Group would like an opportunity to review these data.

F. Apparent Sampling Inadequacies

The Advisory Group is concerned about certain apparent sampling or/and analytical inadequacies. These include subsurface soils, coconuts, seafood, air, and water that might be used for drinking

It is recognized that some of these data may be sufficient for dose assessment purposes and that it only appears to be inadequate because the Advisory Group is not aware of it.

4. Certification

The Advisory Group sensed that the issue of certification was causing problems to both DNA and DOE. It is recommended that questions regarding certification be identified and resolved soon to avoid misunderstanding and problems occurring at the completion of the cleanup. An area of potential problem is the lack of definition of terms in the certification. Such terms as "diligent effort," "all radioactive debris," "unlikely that

island surface concentrations exceed _____pCi/g," etc, are all subject to interpretation. Also the methods of sampling and analysis to be used should be defined (Attachment #2 to the Certification may include such information - but it was not given to the Advisory Group).

5. Charter of Advisory Group

The draft charter of the Advisory Group was discussed briefly and several recommendations suggested. However, based on conversations the Chairman has had with Hal Holister since the meeting, it seems better to postpone action on the charter until the present crisis regarding cleanup criteria decisions is past.

6. Visit to Enewetak

Preliminary plans were discussed for the Advisory Group's visit to Enewetak. The earliest date for the visit appeared to be August, 1978.

Comments on Cleanup Criteria

The Advisory Group recognizes that there are several options to the cleanup criteria to be used at Enewetak ranging from cleaning up all of the islands to cleaning up none of them. The number of islands which can be decontaminated depends upon the level of decontamination acceptable and the resources available. The latter appears to be fixed by the Congressional appropriation. The level of decontamination which is acceptable depends upon a determination by the Marshallese of the level of health risks they are willing to accept to live on the islands.

The Advisory Group can assist in developing estimates of the health risks associated with proposed cleanup levels and, after cleanup, with the actual levels remaining.