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T. L. Shipman, M.D., H-DO

16 June 1953

T. N. White, H-6

OUTLINE OF RAD-SAFE OPERATIONS AT ENIWETOK BETWEEN THE SANDSTONE AND GREENHOUSE TESTS, WITH SPECIAL REFERENCE TO CONDITIONS ON ENGEBI.

H-6

The Sandstone operation comprised three shots as follows:

<u>Name of Shot</u>	<u>1948 Date</u>	<u>Island</u>
X-ray	15 Apr.	Engebi
Yoke	1 May	Aomon
Zebra	15 May	Runit

Starting 5 October, 1948, a preliminary survey of the radiological condition of the Shot Islands was conducted by Dr. Simon Shlaer, Health Division, LASL. He found that the general pattern of relative intensities on Engebi was not much different from what had been observed during the weeks following the shot on that Island. Within 300 yards of ground zero, the most radioactive region, there was no trend of intensity with distance, the readings varying in an irregular way between approximate limits of 30 to 100 mr/hr. From 300 to 750 yards there was a rapid decrease in intensity. Beyond 750 yards the intensity was less than 1 mr/hr. At ground zero the readings ranged from 40 to 150 mr/hr, depending on the amount of steel left in the tower stubs. By excavating successive layers of soil in an exceptionally radioactive location about 1000 feet from ground zero, he found that the activity of the soil decreased rapidly with depth. The activity in the 6 to 7 inch layer was less than 1% of the activity in the top inch. (Report LAB-H-1-1, Secret)

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During January, 1949, a survey was made by Brig. Gen. James P. Cooney, USAMC, DMA of AEC; Dr. Harry O. Whipple and Mr. Gordon Pettengill, H-Div. LASL; Dr. K. Z. Morgan, ORNL; and Dr. Carl C. Gamertsfelder, Hanford Works.

This survey was preliminary to a conference at Holmes & Narver offices in Los Angeles on ways and means for decontaminating the Shot Islands. Following this conference, it was decided that decontamination should be done by

- (1) First, removing and dumping into the sea all of the radioactive scrap, (e.g. radioactive steel debris) that could be located.
- (2) Second, wetting the soil to allay dust, and bulldozing the top layer to bury the generally dispersed radioactive contamination.

Note Since it might appear that burying the contamination would not entirely solve the problem in an area where subsequent excavation work would be necessary, a digression is made here to set forth the reasoning upon which this method of disposal was based.

On account of the great penetrating power of gamma rays in air, much of the radiation exposure of a man standing in a contaminated area is due to distant radioactive material. For the kind of gamma radiation existing on the Shot Islands, 80 or 90% of the exposure is due to radiation coming from distances greater than 10 feet. Suppose then that all of the radioactive material is adequately covered, and that subsequently a 20 foot diameter hole is dug. Suppose that the hole is dug in such a way as to expose the previously covered radioactivity without removing any of it (which is a practical impossibility). Then the man could at most receive 10 to 20% of the radiation exposure which he would have received if the decontamination by burial had not been done.

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end of note This theoretical calculation is conservative. Under practical conditions experience has shown that this method of decontamination is even more effective than the calculation indicates. Mr. Charles Blackwell, Health Division, LASL, was on duty as Rad-Safe Officer during the period approximately 13 February to 15 March 1949 to supervise the removal of the radioactive scrap from Engebi Island. He left when it was decided that no further work would be done in contaminated areas until some months later, when systematic decontamination would be undertaken.

During the period 6 May through 15 August 1949, Dr. Wm. H. Ray, Health Physicist, ORNL, served as Rad-Safety Officer at Eniwetok. He conducted a scientific investigation of the situation with special emphasis on the radioactive content of dust on the Shot Islands. He was unable to detect any significant quantity of radioactivity in dust kicked up by any ordinary activities on the islands. By stirring up dust into the air by artificial means, he was able to obtain some radioactivity. He concluded that there was not enough radioactivity in the dust to be a health problem, and that the proposal to wet the soil during decontamination by earth-moving was unnecessary. (It was later decided to wet the earth anyway, to be absolutely safe). In addition, Dr. Ray supervised the removal of radioactive scrap from the Shot Islands <sup>D</sup>Ammon and Runit, and prepared three recorded lectures for the instruction of contractor personnel in radiological safety precautions. Dr. Ray's work is covered in the following "Radiological Safety Reports" (Confidential) SD-225 (20 May 1949), SD-226 (3 June 1949), SD-358 (17 June 1949), SD-359 (8 July 1949), SD-947 (31 July 1949), SD-948 (19 Aug. 1949). Systematic

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decontamination by earth-moving was started, on Engebi, about 1 November 1949, with Mr. Wm. Rhodes, H-Division, IASL, on duty. During February 1950, with the decontamination work on Engebi completed, and the work on other islands nearing completion, Mr. Rhodes was relieved as Rad-Safety Officer by Mr. Jack Aeby, H-Division, IASL, and another survey was made by Dr. Simon Shlaer, starting 25 February. The following is excerpted from his report (Confidential) to W. A. Curtis, AEC Resident Engineer, dated 1 March 1950.

The islands were surveyed with MX-6 monitoring instruments sensitive only to gammas. The permissible weekly dose at the present time in the laboratory at Los Alamos is 300 milli-roentgens (MR.) per week. With the present work week at Eniwetok of 54 hours, the maximum dose rate for continuous exposure is about 5.5 MR. per hour.

Engebi - 25 February 1950

The entire graded area within the 1,000 foot radius from zero was found to have an activity below 1 MR. per hour for the most part. At the outermost edges of this area occasional spots with 1.5 MR. per hour can be found.

No indication of the position of the old tower base could be detected with the instruments. Metal scrap with activities as high as 3.5 MR. per hour can be found just outside the graded area, both seaward and along the zero line.

Top soil samples from the vicinity of the location for the new tower were collected and beta activity of this has been measured to evaluate the necessity of moistening the soil during operations there.

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The measurements showed that when an unshielded G. M. tube is placed about 1" above the soil spread to about 1/4" thickness, the Victoreen model 263 shows about 1 MR. per hour activity. Though this cannot be evaluated in a precise way it would seem that moistening the soil would be desirable.

This excerpt includes all of the information relative to conditions on the island of Engebi that is contained in his report. <sup>P</sup> Shortly thereafter, another survey was made by Gen. Cooney and Mr. Aeby. The following excerpt from their (Confidential) report to Mr. Curtis, dated 22 March 1950, contains all of the information contained in their report relative to working conditions on the island of Engebi.

The islands were surveyed with MX-6 monitoring instruments sensitive only to gammas. The permissible weekly dose at the present time in the laboratory at Los Alamos is 300 milliroentgens (MR.) per week. With the present work week at Eniwetok of 54 hours, the maximum dose rate for continuous exposure is about 5.5 MR. per hour.

ENGEBI 3/17/50

The entire graded area within the 1,000 foot radius from zero was found to have an activity below 1 MR. per hour for the most part.

No indication of the position of the old tower base could be detected with the instruments. The metal scrap mentioned in Shlaer's report of 1 March 1950 has been removed to the lagoon side, well out of the working area.

The grading operations on this island have been completed.

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NOTES AND RECOMMENDATIONS

As of this date, 3/22/50, all islands of Eniwetok atoll are declared free of radiation hazard, with the exception of the tower area on Runit. This area will be eliminated, as a radiation hazard, by the grading which should be completed within one month.

At present, film badges are being worn by all Holmes & Narver personnel on Eniwetok atoll and some Army personnel on Eniwetok Island, as well as the Navy personnel on Parry Island. A total of about 900 film badges are issued each month.

These film badges are designed to detect ionizing radiation, and from the above it is shown that no radiation hazard exists except on Eberiru and Runit. At present, the film badge industry is running at full peak in order to supply the demand for essential work.

Probably between 30,000 and 50,000 additional badges will be required for future tests here. The production of this number of badges presents a serious problem of supply. It appears that we are not using good judgment in using so many film badges where no ionizing radiation hazard exists.

The processing of this large number of film badges ties up the entire film badge processing department at Los Alamos for several days each month.

Furthermore, the wearing of film badges presents an unfavorable psychological reaction in the workers, who assume a hazard must exist in the presence of these protective measures.

It is therefore recommended, subject to the approval of the Scientific Director of J.T.F.-3, that the wearing of film badges be discontinued immediately by all personnel except the workmen on

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Runit, and that these be discontinued as soon as grading operations on this island are completed.

J. P. COONEY, M.D.  
RAD-SAFETY OFFICER, JTF-3

JACK W. AEBY  
RAD-SAFE OFFICER, ENIWETOK ATOLL

A few months later, after all decontamination operations had been completed, another survey was made by Mr. Aeby and Dr. T. N. White, H-Division, LASL. Since this was the final survey, the complete report (SD-2017) is appended. After the departure of Mr. Aeby and Dr. White on 13 May 1950, no Rad-Safe Officer was assigned to the AEC Resident Engineer because it was believed to be entirely unnecessary.