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ATOMIC ENERGY COMMISSION

RETURN OF RONGELAPESE TO THEIR HOME ISLAND

Note by the Secretary

The General Manager has requested that the attached report by the Director of Biology and Medicine be circulated for consideration by the Commission during the week of February 11, 1957.

W. B. McCool
Secretary

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ATOMIC ENERGY COMMISSION

RETURN OF RONGELAPESE TO THEIR HOME ISLAND

Report to the General Manager by the
Director of Biology and Medicine

THE PROBLEM

1. To determine the advisability of an early return of the Rongelapese to their home island in the Marshalls.

SUMMARY

2. After the relatively heavy fallout on the Marshall Islands March 1, 1954, 82 inhabitants were evacuated first to Kwajalein and then to the Island of Ejit on Majuro Atoll where they are now living. There have been public statements, concurred in by the Atomic Energy Commission, Department of Interior, and the Department of State, to the effect that these people will be returned to their home island of Rongelap as soon as health considerations permit. Such a statement was submitted to the 17th Session of the U.N. Trusteeship Council, Subcommittee of Petitions, March 27, 1956 by Mr. D. Vernon McKay, Special Representative of the Administering Authorities for the Trust Territory of the Pacific Islands.

3. Since the Rongelapese are now subsidized by the United States Government, with little need or opportunity to actively engage in normal livelihood, there is the risk of an onset of indolence, to the detriment of the best interest of the Rongelapese.

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4. Several radiological surveys of the Marshall Islands especially Rongelap Atoll, have been made during the past two and one-half years. The latest survey (July 23-24, 1956) indicates a presence of a residual contamination on the island of Rongelap, but at a level that is acceptable from a health point of view, both for the potential external gamma radiation exposure and the strontium-90 content in the food supply, with the possible exception of land crabs.

5. Therefore, it is recommended that the position of the Atomic Energy Commission should be that the Rongelapese could be returned to their home island as soon as rehabilitation procedures on the island of Rongelap are completed, with the advice that land crabs not be eaten at this time.

6. The Department of the Interior is responsible for the welfare of the peoples of the Trust Territory of the Pacific Islands, and administers this area through its Office of Territories and the High Commissioner of the Trust Territory. The ultimate decision as to the return of the Rongelap people thus rests with the Department of the Interior; however, the Department of State must be consulted on all matters concerning the Trust Territory which may affect our international relations.

STAFF JUDGMENTS

7. The Divisions of Military Application, Information Services, Classification, Office of Special Projects, and Office of the General Counsel concur in the recommendation of this paper.

RECOMMENDATION

8. The General Manager recommends that the Atomic Energy Commission:

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a. Approve the position of the Atomic Energy Commission that the Rongelapese could be returned to their home island as soon as rehabilitation procedures have been completed on the island as described in Appendix "B".

b. Note that the Department of the Interior and the Department of State will be advised of this action by letter such as Appendix "C".

c. Note that a draft announcement such as Appendix "E" will be proposed to the Department of Interior for issuance when the Department determines that the natives can return.

d. Note that the Joint Committee on Atomic Energy, the GAC, and the MLC will be advised of this action by letter such as Appendix "D".

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APPENDIX "A"

BACKGROUND AND DISCUSSION

BACKGROUND

1. On March 1, 1954, a relatively heavy fallout occurred on some of the Marshall Islands as a result of a nuclear weapons test at the Eniwetok Proving Ground. Between the 36th and 50th hour after detonation 82 inhabitants were evacuated to Kwajalein where they were under the surveillance of a team of medical experts from the United States. On June 9, 1954, they were moved to the Island of Ejit (Majuro Atoll) where they are now living.

2. There have been public statements, concurred in by the Atomic Energy Commission, Department of Interior and the Department of State to the effect that these people will be returned to their home Island of Rongelap as soon as health considerations permit. Such a statement was submitted to the 17th Session of the U.N. Trusteeship Council, Subcommittee of Petitions, March 27, 1956 by Mr. D. Vernon McKay, Special Representative of the Administering Authorities for the Trust Territory of the Pacific Islands.

3. Several radiological surveys have been made of the Marshall Islands, especially Rongelap Atoll, since March 1, 1954. The results of these surveys are contained in the several reports by the cognizant laboratories and are being summarized in one report by the Division of Biology and Medicine (in preparation).

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Appendix "A"

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4. The Rongelapese have received complete medical investigations at six months, one year, and two year post-detonation, by a team headed by Dr. Robert Conard of Brookhaven National Laboratory, as well as several routine examinations.

DISCUSSION

5. Status of Rongelapese Health. Pertinent to any discussion of the return of the Rongelapese to their home island is the body insult suffered from the fallout on March 1, 1954. One group of 64 people received about 175 roentgens whole body gamma radiation, and a second group of 18 received about 69 roentgens. The most highly exposed group might have received an additional 100 - 150 reps to the thyroid from internally deposited isotopes of iodine. The deposition of bone seeking isotopes was very small and at two years the body burden of strontium-90, as estimated by urinalysis, was little greater than for controls in the United States. Of the 82 individuals exposed, 45 experienced superficial skin lesions and 13 deep lesions while 35 showed some degree of loss of hair.

6. The present condition of the Rongelap people is best described by the results of the two year medical examination:*

"The medical survey of the Rongelap people two years after exposure to fallout radiation shows that the people appear to have been in generally good state of health and nutrition and are making satisfactory recovery from their radiation exposure. Serious illness has occurred in two individuals but neither these illnesses nor clinical findings in other individuals can be attributed to radiation effects. One death in May 1956, that of a 46-year-old Rongelap man, was due to hypertensive heart disease. Previous examinations had shown that the disease was undoubtedly present at the time of exposure to fallout radiation.

"There is evidence of continued improvement of hemopoiesis. The mean lymphocyte count is slightly increased over the one-year levels, but is still

*Medical Survey of Marshallese Two Years After Exposure to Fallout Radiation. Conard, R.A. et al, Brookhaven National Laboratory, March, 1956.

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slightly below the mean control count. The mean platelet level is about the same as found at one year after exposure and is still slightly below the control level. The mean neutrophile count at one year after exposure had reached the control level. The delay in complete recovery of lymphocytes and platelets is similar to that reported in the two-year follow-up studies of the Japanese casualties of the atomic bombings. Evidence from the Marshallese experience indicates that the lowered levels of these blood elements have not lowered the resistance of the people to disease, and the present levels are not considered to represent a serious condition.

"Residual changes in the skin from the beta irradiation continue to show improvement. Pigment aberrations are still evident in 15 cases and in four of these there is also scarring with some adherence of the skin to the subcutaneous tissue. However, there is no gross evidence of tissue breakdown or malignant change in any of these lesions, and surgical repair is not considered necessary at this time. Histological examination of skin biopsies at sites of radiation lesions shows residual effects of radiation damage, but no evidence of pre-malignant or malignant changes.

"Ophthalmological survey reveals that there are no radiation-induced lens opacities, and the incidence of ocular lesions is similar in exposed and control populations.

"The radiochemical analysis of the urine of the Rongelap people shows measurable activity which is largely due to cerium-144-praseodymium-144 with only slight activity due to strontium-90. The body burden of these isotopes is estimated to be well below the permissible levels. Examination of bone specimens in the case of the one man who died shows no radiation that can be definitely associated with fallout deposition in the bones. Studies of radiographs of the femurs of the exposed children show no evidence of any bone defects from possible deposits of radionuclides."

7. External Gamma Dose Rates on Rongelap Atoll. The external gamma dose rates at three feet above the ground on the Island of Rongelap, up to the end of October 1955, are shown in the attached graph (Annex "A" to Appendix "A"). It might be expected that this curve will flatten out with time due to dominance of the 33 year half-life cesium-137. If the data on the graph were extrapolated to the time of the last

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survey at the end of July 1956, a dose rate of 0.1 mr/hr would be anticipated. However, the survey of Rongelap Island at the end of July 1956 showed a range of values from 0.2 - 0.5 mr/hr, with an average of 0.4 mr/hr. The higher value found at the time of the survey is undoubtedly due to the small additional fallout that occurred during Operation REDWING. Since this is relatively fresh radioactive material, the decay will be more rapid so that the dose rates on Rongelap Island at the time of repatriation should be less than 30 milliroentgens/week.

8. The maximum permissible external gamma exposure to adult workers recommended by the National Committee on Radiation Protection is 0.3 roentgens/week with an added restriction that the maximum permissible accumulated dose, in rems at any age is equal to five times the number of years beyond age 18, provided no annual increment exceeds 15 rem (this applies to all critical organs except the skin, for which the value is double). The maximum permissible exposure for the population as a whole from all sources of radiation, including medical and other man-made sources, and background shall not exceed 14 million rem per million of population over the period from conception up to age 30. It is difficult to extrapolate precisely far into the future, but the data suggest that the gamma doses on Rongelap Island would not greatly exceed (if at all) 0.5 roentgens for the first year of reoccupancy, with lesser doses in subsequent years.

9. The gamma dose rates on other islands of Rongelap Atoll have not been followed as closely as on Rongelap but the data suggest the relative dose rates now are the smallest as measured in the first part of March 1954; i.e. the highest

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activity on any island is about a factor of 10 higher than Rongelap.

10. The Rongelapese go on fishing expeditions to other islands, including those showing both higher and lower activity. However, these Rongelapese spend an appreciable part of their time in boats over water where the external gamma activity is near background values. Thus, the yearly average for these probably would not differ greatly from those on Rongelap Island.

11. Food Supply. The basic data on the normal food supply of the Rongelapese are contained in the Table One attached as Annex "B" to Appendix "A". There are wide variances in the data so that estimated average values are used. This is not an unreasonable approach since it would be expected that the food actually consumed would be about as variable as the individual samples collected for analyses.

12. The isotope of principal concern in the food chain is strontium-90. For an adult worker the maintained maximum permissible body burden is 1000 Sunshine Units (1000 micromicro-curies of Sr^{90} per gram of calcium). Values for maximum permissible exposures to the general population are 1/10 that for adult workers, or 100 Sunshine Units, maintained level in the body. The National Academy of Sciences report stated "--- There seems no reason to hesitate to allow a universal human strontium--burden of 1/10 of the permissible---" for adult workers. This corresponds to the 100 Sunshine Units.

13. Table One indicates that the average concentration of strontium-90 in the total food supply might be less than 360 Sunshine Units. (The data on land crabs shown in Table One are

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from the Island of Kabelle which is more heavily contaminated than the Island of Rongelap). However, if crabs were eliminated from the diet, the intake might average about 107 Sunshine Units. Further, elimination or restriction of the consumption of pandanus would reduce the strontium-90 intake to well under 100 Sunshine Units.

14. There is some doubt concerning the correct strontium-90 activity in the land crabs, since the data are higher than for previous surveys which is contrary to all other data. Additional surveys should clarify this point. In any event the land crabs tested are from the island of Kabelle (there were no collections of land crabs made on Rongelap Island during the last survey). The general contamination on Rongelap is about one-fifth that of Kabelle. The difference in strontium-90 content may not be as great as this, but since these are land crabs it would be expected those on Rongelap Island to be lower than on Kabelle Island.

15. Estimated Future Body Burden of Strontium-90. Although precise values have not been established, there is a discriminatory factor between Sr/Ca ratio in the food supply and that found in the bones. Animal experiments and limited human data suggest values of at least a factor of two or three.

16. If the Rongelapese are returned to their home island, their diet would be supplemented by imported (relatively uncontaminated) foods, especially rice. Also, the cisterns would be cleaned out and refilled with fresh water.

17. Despite the wide variances in the data, analysis of the results from all of the surveys on the Pacific Islands show

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a general decline of Sr⁹⁰ with time in the food chain (except the land crabs).

18. Although there is obviously a certain degree of uncertainty, the above data and estimates indicate that if land crabs are eliminated from their diet, the estimated future body burden of the Rongelapese would be substantially less than 100 μ g of Sr⁹⁰ per gram of calcium. Limiting the intake of pandanus would further reduce the estimated Sr⁹⁰ intake. By means of the continuing medical examinations described below it would be possible to note any tendency of untoward accumulation of strontium-90 with time, and appropriate action could be taken before excessive levels were reached.

19. Medical Surveillance. If the Rongelapese were returned to their home island, a program would be inaugurated of continuing medical inspections. The Rongelapese would be examined once a month and complete medical examination performed once a year by an American doctor. Arrangements have been made for urine collections and analyses every three months for the first year and afterward on a yearly basis unless the findings indicate the necessity for more frequent analyses. These samples will be collected and the radiochemical analyses made in such a manner as to give an indication of body burden. A radio would be provided on Rongelap for communication with the Trust Territories Office on Ebeye (Kwajalein Atoll) where a plane would be available at all times for any emergency. A fully equipped dispensary would be provided on Rongelap and an experienced health aide (a Marshallese) would be present at all times. Before their return, the Marshallese would be given a complete medical examination, and immunized against Smallpox, Typhoid and Tetanus.

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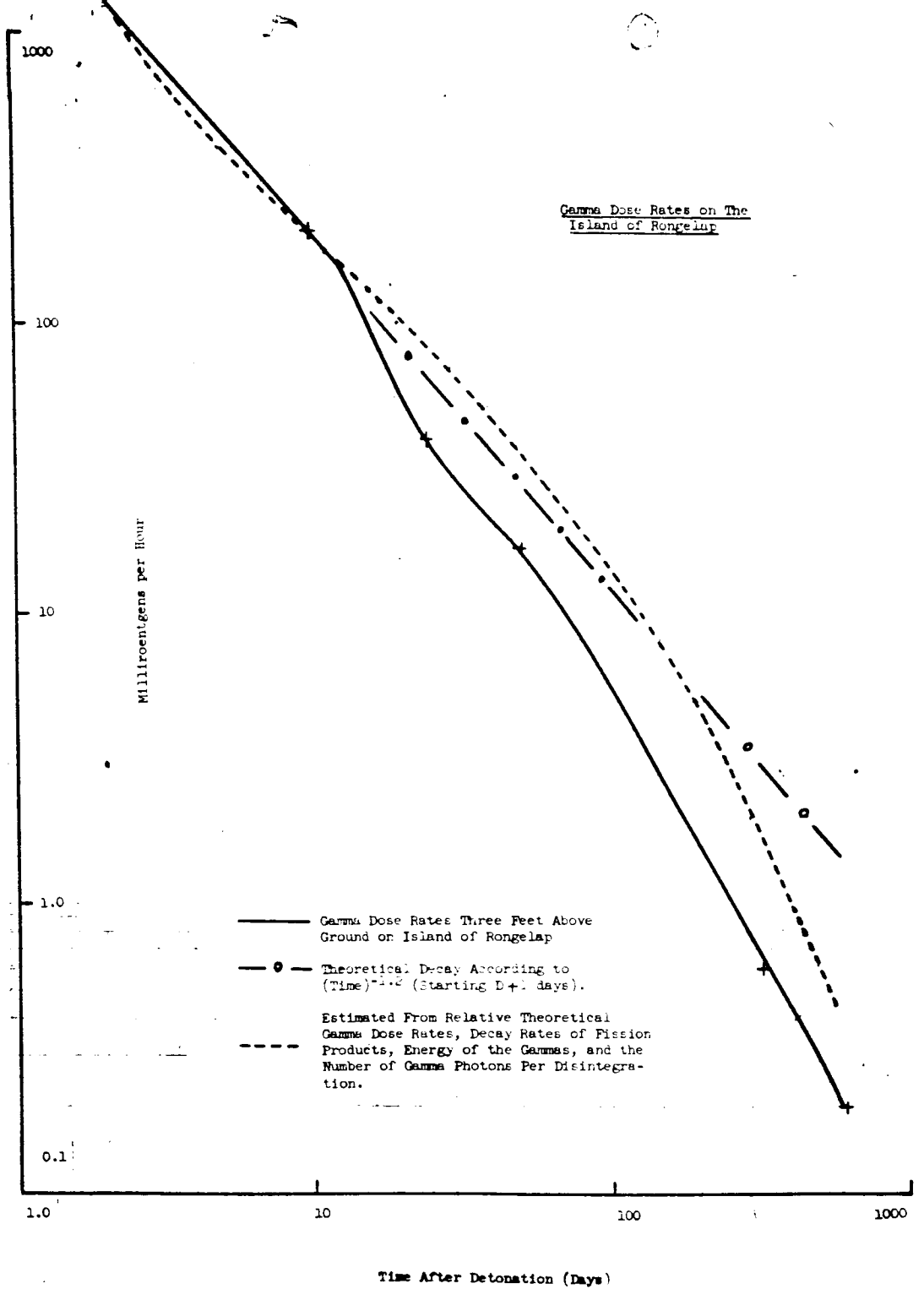
20. Radiological Resurveys. Plans are currently being developed for a continuing and long range program for radiological resurveys on and around the Marshall Island. The principle objective will be to monitor the environmental contamination especially from the viewpoint of estimating the strontium-90 intake of the Rongelapese.

21. Animals Living on Rongelap. Of considerable interest are the results obtained from animals (swine, chickens, ducks, rats) living on the island of Rongelap at the time of the fallout on March 1, 1954. These were collected and sacrificed serially in time. The last group of animals was collected and sacrificed about two years after the initial fallout. Like all of the other previous examinations there were no gross nor pathological changes in the animals that could be definitely ascribed to radiation. The estimated external gamma dose was near 500 roentgens for the two years.

22. Of equal interest is the body burden of strontium-90 in these animals. The analyses have not been completed but Table Two (Annex "C" to Appendix "A") is indicative of the data. These animals have continued to live (with their normal eating habits) in the environment during the time when the fission product intake by way of direct contamination was optimum and the strontium-90 was highest in the soil-plant-animal cycle. Also, due to their relatively short life span, it would be expected that their body burdens had approached equilibrium values. These data support the conclusion above that the estimated future body burden of the Rongelapese (under the condition stated) would be substantially less than 100 μc of Sr^{90} per gram of calcium.

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Gamma Dose Rates on The
Island of Rongelap



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ANNEX "B" TO APPENDIX "A"

TABLE ONE

ESTIMATES OF CONTAMINATION OF THE NORMAL FOOD SUPPLY OF RONGELAP

| A | B | C | D | E | F |
|---------------------------------------|--|-----------------------------|-------------------------------------|--|---|
| Daily Intake Pounds/day/ Person | Calcium Content (gms Ca/gm wet weight) | Daily Intake of Ca (gms) | Fraction of Total Ca In- take | Strontium-90 Content (S. U.) <u>a/</u> | Contribution To Total Sr ⁹⁰ . Intake (S. U.) (Column D X E) |
| Fish | 0.001 | 0.56 | 0.645 | 12 | 7.73 |
| Pandanus | 0.001 | 0.16 | 0.184 | 500 <u>b/</u> | 92.0 <u>b/</u> |
| Clams | 0.004 | 0.018 | 0.021 | 5 | 0.11 |
| Arrowroot | 0.0006 <u>d/</u> | 0.025 | 0.029 | 250 | 7.26 |
| Wild Birds (muscle) | 0.0001 | 0.004 | 0.0046 | 300 | 1.38 <u>b/,c/</u> |
| Land Crabs | 0.004 | 0.055 | 0.063 | (4000) <u>b/ c/</u> | (252.0) |
| Coconut Meat & Milk | 0.0004 | 0.004 | 0.0046 | 40 | 0.02 |
| Broad Fruit | 0.0006 | 0.003 | 0.0034 | 260 | 0.88 |
| Imported: | | | | | |
| Rice | | | | | |
| Flour | | | | | |
| Canned Beef | | | | | |
| Milk | 0.1 | ~ 0.0001 | ~ 0.045 | ~ 0.046 | few |
| Sardines | | | | | small |
| Shoyu | | | | | |
| Coffee | | | | | |
| Tea | | | | | |

/Average values

b/ These data are from island of Kabelle (no date from island of Rongelap for July 1956 survey). General contamination of island of Rongelap is about one-fifth that of Kabelle. Lagoon waters around these islands do not show as great a difference in activity.

c/ These are land crabs from island of Kabelle. The strontium-90 concentration is higher than from earlier surveys, which is contrary to the plant activity as well as to the soil, and marine life data. It has been estimated that about one-third of the intake of crab meat is from ocean crabs which have very little strontium-90 content.

d/Estimated.

e/An unknown part of this intake may be sea crabs, (which contain considerably less Sr⁹⁰) but is assumed here to be all land crabs.

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Annex "B" to Appendix "A"

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ANNEX "C" TO APPENDIX "A"

TABLE TWO

ANALYSIS OF A ROOSTER COLLECTED ON
ISLAND OF RONGELAP FEBRUARY 1956

| | <u>Wet Wt.</u> | <u>d/m Sr⁹⁰ /sample</u> | <u>Ca/sample (gm)</u> | <u>S. U.</u> |
|------------|--------------------|--|-----------------------|--------------|
| 1510 Femur | 26.0* | 1210 ± 39 | 5.19 | 105 ± 3 |
| 1510 Tibia | 41.0 | 5702 ± 119 | 9.50 | 272 ± 5 |

*Dry weight of 2 femur halves.

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radsafe and health support, and reconstruction assistance. However, it was originally thought that the construction effort involved would be minor, and JTF SEVEN included \$24,400 for this purpose in their FY 1955 and FY 1956 budgets. Because of this budgeting by JTF SEVEN, AEC has never included funds for this work in its budget. However, with the passage of time the buildings on Rongelap have deteriorated to the point where they can no longer be repaired and the entire village must be reconstructed. The cost of this reconstruction and other rehabilitation measures is \$280,000. In an effort to resolve this problem and in consonance with CINCPAC's statement, we requested CNO (the Executive Agent of the Joint Chiefs of Staff) to provide funds for the construction on Rongelap. The CNO reply (copy of which is attached) states that at no time has the cost of repatriation of the Rongelapese been considered a Navy responsibility. In view of this situation AEC will accept the responsibility for funding for the reconstruction and other rehabilitation measures on Rongelap and DMA will make the \$280,000 available out of funds presently available or budgeted for the Weapons Program.

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ANNEX TO APPENDIX "B"

Department of the Navy
Office of the Chief of Naval Operations
Washington 25, D. C.

November 14, 1956

In reply refer to
Op-215B/flf
Ser 0503P21

Dear General Starbird:

This is in reference to your letter of 1 November 1956 wherein you request necessary funds be made available to CJTF Seven for the purpose of reimbursing the Atomic Energy Commission contractor for the cost involved in construction for the Rongelap people on their home islands.

The suggestion that the Navy is in any way responsible for funding the costs involved in the return of the Marshall Islanders to their home islands indicates a misunderstanding must exist. At no time has there been any thought that the costs of the repatriation and restoration of the islanders would be a Navy responsibility. In consequence, no budgeting or other funding has been contemplated and funds for this purpose do not exist. The Navy co-operated by every feasible means in the emergency removal of the islanders during the 1954 tests and for their subsequent relocation, but no Navy responsibility attaches for the sequence of events which made these measures necessary.

In this connection, Commander in Chief Pacific stated in his letter serial 0283 of 27 June 1956 that "It is understood that no Navy funds other than for normal support should be expended for this operation without CNO approval. It is noted that Commander Joint Task Force Seven has been requested to budget for the return of the inhabitants and rehabilitation of their home island." This agreement was acknowledged and concurred in by your letter of 8 August 1956. It has never been requested, agreed or implied that the Navy would fund for construction by the AEC contractor. No appropriation has been sought or obtained for this purpose by the Navy and consequently no Navy funds are available.

In view of the foregoing it is suggested that you obtain the funds for reimbursement of your contractor from other sources which may be available to you.

Sincerely yours,

G. L. Russell
Deputy Chief of Naval Operations
(Administration)

Brigadier General Alfred D. Starbird, USA
Director of Military Application
Atomic Energy Commission
Washington 25, D. C.

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APPENDIX "C"

DRAFT LETTER TO THE DEPARTMENT OF THE INTERIOR
AND THE DEPARTMENT OF STATE

1. The Atomic Energy Commission has considered the problem of returning the Rongelap people to their home atoll in the Trust Territory, and has carefully weighed the data from radiological surveys made during the past two and one-half years, including that of the latest survey made in July 1956.

2. These data indicate a presence of a residual contamination on the Island of Rongelap, but at a level that is acceptable from a health point of view, both for the potential external gamma radiation exposure and the strontium-90 content in the food supply, with the possible exception of land crabs.

3. The Commission's position is that the Rongelapese could be returned to their home island as soon as rehabilitation procedures on the Island of Rongelap are completed, with the advice that land crabs not be eaten at this time.

4. In accordance with previous views of the Department of the Interior (Department of State) the Atomic Energy Commission is proceeding with implementation of the program for the reconstruction and rehabilitation of the homes and facilities on Rongelap. It is expected that these preparations will require approximately five months. Since the AEC has made a determination that it will be safe from a health standpoint to return the Rongelapese to their home island upon completion of these preparations, your concurrence in this plan to return these people to their home island is requested.

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APPENDIX "D"

DRAFT LETTER TO JCAE, MLC AND GAC

1. After the relatively heavy fallout on the Marshall Islands March 1, 1954, 82 inhabitants were evacuated first to Kwajalein and to Ejit where they are now living. There have been public statements, concurred in by the Atomic Energy Commission, Department of Interior and the Department of State to the effect that these people will be returned to their home Island of Rongelap as soon as health considerations permit. Such a statement was submitted to the 17th Session of the U.N. Trusteeship Council Subcommittee of Petitions, March 27, 1956 by Mr. Vernon D. McKay, Special Representative of the Administering Authorities for the Trust Territory of the Pacific Islands.

2. Several radiological surveys of the Marshall Islands especially Rongelap Atoll, have been made during the past two and one-half years. The latest survey (July 23-24, 1956) indicates a presence of a residual contamination on the Island of Rongelap, but at a level that is acceptable from a health point of view, both for the potential external gamma radiation exposure and the strontium-90 content in the food supply, with the possible exception of land crabs.

3. Therefore, the position of the Atomic Energy Commission is that the Rongelapese could be returned to their home island as soon as rehabilitation procedures on the Island of Rongelap are completed, with the advice that land crabs not be eaten at this time. The Department of the Interior, with whom the final decision for the return of the Rongelap people rests, and the

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Department of State have been so advised. We expect that, in accordance with previous views of both Departments, their concurrence will be forthcoming.

4. Reconstruction of homes and other facilities on the island, which have deteriorated during the period of inoccupance, will begin in the near future. It is expected that the inhabitants can be returned by early summer.

[REDACTED]

[REDACTED]

APPENDIX "E"

DRAFT PRESS RELEASE

1. Inhabitants of the island of Rongelap, who were evacuated following radioactive fallout resulting from a thermonuclear detonation at the Atomic Energy Commission's Eniwetok Proving Ground on March 1, 1954, will be returned to their home island the Department of the Interior announced today.

2. Reconstruction of homes and other facilities on the island, which have deteriorated during the period of unoccupancy, will begin in the near future. It is expected that the inhabitants can be returned by early summer.

3. The decision to return the Rongelap inhabitants was made after the Atomic Energy Commission had advised that it would be safe for them to live on the atoll. Periodic radiological surveys of the atoll have been made under the sponsorship of the Commission since March 1, 1954. According to the Commission, residual radioactivity on the island has decreased to non-hazardous levels.

4. The Rongelap inhabitants have been advised not to eat land crabs, which have the highest present concentrations of Strontium-90, pending the results of future radiological surveys. Land crabs are not a significant part of their normal diet.

5. Eighty-two residents of Rongelap were exposed to the fallout on March 1, 1954. They were moved to Kwajalein Atoll shortly thereafter. On June 9, 1954, they were moved to the Island of Ejit on Majuro Atoll and have been living there under the care of the U.S. Government. One death -- from heart

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[REDACTED]

disease not connected with the radiation exposure -- and nine births, all normal, have occurred among the exposed group.

6. A number of Rongelapese who were not on their home island at the time of the fallout also have been living on Ejit or elsewhere in the Marshall Islands. The size of the group has been increased by births and also by marriage with non-residents of Rongelap, bringing the total of those returning to the island to; approximately 200.

7. A comprehensive program for the return of the Rongelap people to their home atoll has been approved by the High Commissioner of the Trust Territories of the Pacific Islands, the Commander in Chief, U.S. Pacific Fleet, the Commander of Joint Task Force Seven, and the Atomic Energy Commission.

8. Under this program, the village on Rongelap will be reconstructed, and subsistence support for the inhabitants will be provided for a year after their return.

9. A fully equipped medical dispensary will be provided on Rongelap, and an experienced health aide will be on the island. They will be visited monthly by a Trust Territories physician, and each inhabitant will be given a complete medical examination yearly.

10. Of the 82 exposed persons, one group of 64 people received about 175 roentgens whole body gamma radiation, and a second group of 18 received 69 roentgens. Fifty-eight experienced skin lesions which have healed, and 35 showed some temporary loss of hair. The internal deposition of radioisotopes, including strontium-90, was small.

[REDACTED]

[REDACTED]

11. The Rongelapese have been given periodic medical examinations. The condition of the group two years after the fallout was summarized as follows in the report of the medical team which conducted the examinations:

"The medical survey of the Rongelap people two years after exposure to fallout radiation shows that the people appear to have been in a generally good state of health and nutrition and are making satisfactory recovery from their radiation exposure. Serious illness has occurred in two individuals but neither these illnesses nor clinical findings in other individuals can be attributed to radiation effects. One death in May 1956, that of a 46-year-old Rongelap man, was due to hypertensive heart disease. Previous examinations had shown that the disease was undoubtedly present at the time of exposure to fallout radiation.

"There is evidence of continued improvement of hemopoiesis. The mean lymphocyte count is slightly increased over the one-year levels, but is still slightly below the mean control count. The mean platelet level is about the same as found at one year after exposure and is still slightly below the control level. The mean neutrophile count at one year after exposure had reached the control level. The delay in complete recovery of lymphocytes and platelets is similar to that reported in the two-year follow-up studies of the Japanese casualties of the atomic bombings. Evidence from the Marshallese experience indicates that the lowered levels of these blood elements have not lowered the resistance of the people to disease, and the present levels are not considered to represent a serious condition.

"Residual changes in the skin from the beta irradiation continue to show improvement. Pigment aberrations are still evident in 15 cases and in four of these there is also scarring with some adherence of the skin to the subcutaneous tissue. However, there is no gross evidence of tissue breakdown or malignant change in any of these lesions, and surgical repair is not considered necessary at this time. Histological examination of skin biopsies at sites of radiation lesions shows residual effects of radiation damage, but no evidence of premalignant or malignant changes.

"Ophthalmological survey reveals that there are no radiation-induced lens opacities, and the incidence of ocular lesions is similar in exposed and control populations.

"The radiochemical analysis of the urine of the Rongelap people shows measurable activity which is

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largely due to cerium-144 praseodymium-144 with only slight activity due to strontium-90. The body burden of these isotopes is estimated to be well below the permissible levels. Examination of bone specimens in the case of the one man who died shows no radiation that can be definitely associated with fallout deposition in the bones. Studies of radiographs of the femurs of the exposed children show no evidence of any bone defects from possible deposits of radio-nuclides."

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