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J. Dexter Peach  
Director

Enclosures - 2

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D R A F T

DRAFT OF A  
PROPOSED REPORT  
OBSERVATIONS ON THE  
PROJECT TO CLEANUP, REHABILITATE AND  
RESETTLE ENEWETAK ATOLL  
(952208)

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PREPARED  
BY THE STAFF  
OF THE  
U.S. GENERAL ACCOUNTING OFFICE

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D R A F T

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C O V E R

The Enewetak Atoll was a nuclear weapons testing site for the United States from 1948 to 1958. The people were relocated to another, less desirable, atoll prior to starting tests. The testing blew away some islands and left others contaminated with radioactive elements. The United States has a project underway to cleanup, rehabilitate and resettle the Atoll at a cost of about \$120 million.

Attention recently focused on Bikini, a similar but less-comprehensive project, when abnormal quantities of radioactive elements were detected in some of the people resettled there. This discovery triggered the decision to again relocate the people at a cost of \$15 million.

As work progresses on the cleanup of radiological debris and soil on Enewetak there are indications that more living pattern restrictions may be imposed on the returning people than may be acceptable to them or to the United States.

In spite of well-intentioned efforts of the United States at Enewetak, the potential exists for future legal and political difficulties because of loss of land, loss of land usage, loss of cash crops, and the absence of long-term agreements with the Enewetak people.

Additionally, significant radiological aspects of the Enewetak project are not independently assessed by organizations with no connection or interest in the nuclear test program.

GAO believes these issues need to be resolved to prevent a Bikini-like incident from occurring at Enewetak.

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COMPTROLLER GENERAL'S  
REPORT TO THE CONGRESS

OBSERVATIONS ON THE PROJECT TO  
CLEANUP, REHABILITATE, AND  
RESETTLE ENEWETAK ATOLL

D I G E S T

The United States acquired Enewetak Atoll from the Trust Territory of the Pacific Islands in 1946 to use as a nuclear weapons proving ground. Before the testing began, the United States relocated the people of Enewetak, then numbering 142, to Ujelang Atoll, a smaller less desirable atoll, where they still reside. Forty-three nuclear tests were conducted at Enewetak from 1948 to 1958 which left some of the islands of the Atoll contaminated with radioactive elements. (See p. 1.)

In 1972, the United States announced it was prepared to release Enewetak Atoll to the Trust Territory with the expectation it would eventually be cleaned up and resettled. The cleanup, rehabilitation and resettlement project is underway and is expected to be completed in 1980 at a cost of about \$120 million. The Departments of Defense, Energy and Interior are responsible for the project. (See p. 3.)

As work progresses on the cleanup of radiological debris and soil on Enewetak, there are several developments suggesting that the original plan will not be achieved. The returning people of Enewetak may have more living pattern restrictions imposed on them than initially planned. Some islands designated for agricultural or food gathering purposes may be quarantined indefinitely. (See p. 9.)

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connection or interest in the nuclear test program. (See p. 22.)

The Enewetak Atoll cleanup, rehabilitation and resettlement project was preceded by a similar but less-comprehensive project at Bikini Atoll. Attention recently focused on the Bikini project when abnormal quantities of radioactive elements were detected in some of the people living there. These discoveries triggered a decision by Interior to request \$15 million from the Congress to again relocate the people of Bikini. (See p. 5.)

The people of Enewetak, displaced now for more than 30 years, suffered the physical hardship of living on a much smaller atoll with significantly increasing numbers of people and the psychological hardship of being removed from their traditional land. This latter hardship is the greater burden because land is considered all important to the Marshallese people.

Land is not only the source of subsistence, but also social status and family unity. When asked at a Congressional hearing why a monetary settlement instead of returning to Enewetak was not acceptable, Enewetak representatives replied that money was not and never could be a substitute for their islands. (See p. 1.)

### RECOMMENDATIONS

The Secretaries of State and Interior should determine whether a modified solution to the radiological contamination problem on Enewetak Atoll is acceptable to the people of Enewetak's quality of life and is in the best interest of the United States. (See p. 14.)

They should assure that agreements are reached between the people of Enewetak and the United States concerning:

- compensation for lost land or land usage as a result of the nuclear tests;
- compensation for the loss of cash crops if the crops are found unacceptably contaminated with radioactive elements;
- obtaining formal unqualified assurances that living pattern restrictions will be effectively enforced after the Trust Agreement is ended;
- the specifics of follow-on radiological surveys, of monitoring the health of the resettled people and the radioactivity in the environment, and of periodically monitoring and inspecting the entombed radioactively contaminated soil and debris on the island of Runit;

- the future status of the entombed radioactively contaminated soil and debris and how future monitoring and inspection can be accomplished, and
- the specifics of a supplemental feeding program, if required until the time the people are agriculturally self-sufficient (See pp. 20 and 21.)

The Secretary of the Interior should have an appropriate independent organization assess:

- the radiological cleanup criteria used by Defense to meet project goals, and
- the post-cleanup radiation hazards.

The Secretary of Interior should also initiate independent laboratory quality control checks of the soil samples taken from Enewetak because they are essential to the final certification of the radiological condition of each island. (See pp. 25 and 26.)

The Secretary of Defense should arrange for some appropriate organization outside Defense to independently evaluate the radiological health and safety policies and practices for the personnel involved in the cleanup. (See p. 26.)

## C o n t e n t s

DIGEST CHAPTER		<u>Page</u>
1.	INTRODUCTION	1
	The situation	1
	The plight of the people of Enewetak	1
	Project responsibilities	3
	Project funding	4
	Comparison of the Enewetak and Bikini projects	5
	Similarities	6
	Differences	7
	Scope of review	7
2	RADIOLOGICAL CLEANUP EFFORTS: IS A MODIFIED SOLUTION ACCEPTABLE?	9
	The Enewetak cleanup plan	9
	Developments suggest that a modified solution of the Enewetak Atoll radio- logical contamination problem is likely	12
	Conclusions and recommendations	14
3	NEED FOR ACTION TO AVOID FUTURE CLAIMS AND POLITICAL DIFFICULTIES	15
	Compensation awarded and paid to the people of Enewetak	16
	Potential claims	16
	Loss of land	16
	Loss of use of land	17
	Loss of copra "cash crop"	17
	Need for guarantees that living pattern restrictions will be effectively enforced	18
	Need for agreement on follow-up radiological surveys and monitoring the health of the resettled people and the radioactivity in the environment	18
	Need to monitor and inspect entombed radio- actively contaminated soil and debris	19
	Advisability of leaving radiological contamination legacy on what is expected soon to be foreign soil	20
	Possibility of a supplemental feeding program	20
	Conclusions and recommendations	20



CHAPTER

4

POTENTIAL FOR ENHANCING PROJECT CREDIBILITY THROUGH INDEPENDENT ASSESSMENTS	22
Lack of independent assessments:	22
Cleanup criteria and objectives	22
Post-cleanup hazards	23
Health and safety practices for cleanup personnel	24
Lack of independent laboratory quality control checks of soil samples	25
Conclusion and recommendation	25

ABBREVIATIONS

AEC	Atomic Energy Commission
DNA	Defense Nuclear Agency
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
TTPI	Trust Territory of the Pacific Islands

Marshallese people, being the source of not only subsistence, but also social status and family unity. A comparison of Enewetak and Ujelang Atolls in square miles of area shows:

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1/ About 450 people are expected to resettle on Enewetak Atoll.

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	<u>Lagoon</u>	<u>Dry Land</u>
Ujelang Atoll	25.47	0.67
Enewetak Atoll	387.99	2.75

The limited food production potential on Ujelang has made it necessary to import more commodities than would normally be required on Enewetak.

In hearings on Department of the Interior appropriations for 1978, representatives of the people of Enewetak said that the desire of the people to return has never diminished but rather, with the passing time, has increased. They said that for them to live anywhere else in the world would make them squatters and vagabonds; the land, the atoll, is part of them and they are part of it in a way which is difficult to describe. They said every family and every person, including newborn infants, has a specific place there, inherited from their ancestors.

When asked why they do not just accept a monetary settlement instead of returning to Enewetak, they replied that money is not and never can be a substitute for their islands. They said it is against their nature and their custom to sell their land or to take money for it. They concluded that from their point of view they must return to Enewetak Atoll because it is the only place which God has set aside for them and for no other people.

The Senate Committee on Armed Services agreed to a one time authorization to accomplish the cleanup. Although the moral obligation to permit the people of Enewetak to return to their atoll was a major consideration, its decision was based primarily on the premise that the United States cannot walk away from the damage its testing program created

without making a responsible effort to restore the atoll to the degree that it can be made again habitable.

### Project responsibilities

In 1972, the United States announced it was prepared to release Enewetak Atoll to the TTPI with the expectation it would eventually be cleaned of the radioactive contaminants and resettled. Mobilization of the project began in May 1977. The project is expected to be completed in April 1980.

The Enewetak project involves three phases--cleanup, rehabilitation, and resettlement 1/. The first phase, cleanup, is being managed by the Department of Defense's (DOD's) Defense Nuclear Agency (DNA) and consists of removal of debris, structures, and soil which pose radiation or other hazards to human habitation. ERDA, now the Department of Energy (DOE), assumed responsibility for providing technical data and advice on all radiological matters. It also assumed responsibility, including funding, for follow-up radiological surveys, monitoring the health of the resettled people, and monitoring the radioactivity in the environment subsequent to rehabilitation. The Department of the Interior (DOI), which administers the Trust Territory of the Pacific Islands under a trusteeship agreement with the Security Council of the United Nations, is responsible for the rehabilitation and resettlement of Enewetak Atoll and for the enforcement of living pattern restrictions.

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1/ Long range development has been recognized as a fourth and continuing phase but is not considered part of the current project.

Project funding

About \$32.4 million has been appropriated by the Congress for the Enewetak Atoll cleanup, rehabilitation, and resettlement program:

<u>Department</u>	<u>Purpose</u>	<u>Amount</u> (millions of dollars)
Defense	Cleanup	\$ 20.0
Interior	Rehabilitation	<u>12.4</u>
		<u>\$ 32.4</u>

The Military Construction Appropriation Act of 1977 includes funds for the Enewetak Atoll cleanup. The Act stipulated that the \$20 million appropriated for military construction could not be spent until the Enewetak people agreed that it constituted the total commitment of the United States for the cleanup. The people of Enewetak agreed to this on September 16, 1976. The Act enjoined DOD to achieve every possible economy through maximum use of its resources. In this regard, it directed that military forces and support activities funded for normal operations should be used on the project without reimbursement from military construction funds. In effect, the cleanup phase of the project is limited by DOD's willingness to use other funds and resources.

The Director, DNA, recently estimated the cost of cleaning up, rehabilitating, and resettling Enewetak Atoll could amount to about \$120 million. This cost includes use of military forces and support activities.

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Comparison of the Enewetak and  
Bikini projects

The Enewetak Atoll cleanup, rehabilitation, and resettlement program was preceded by a similar project at Bikini Atoll.

In December 1966, the Atomic Energy Commission (now DOE) in response to a request from the DOI, agreed to determine if Bikini Atoll and its lagoon were safe for habitation. In April and May 1967 an extensive radiological survey was made of the atoll. A year was required to analyze the radiation data and environmental samples collected during the survey as well as data from all previous surveys and Trust Territory reports concerning the living habits and diets of the people of Bikini. After reviewing all available data, an ad hoc committee of eight consultants appointed by the Atomic Energy Commission (AEC) concluded radiation offered no significant threat to the health and safety of any of the people of Bikini who might elect repatriation. The committee also recommended actions that would further reduce exposure to radiation, for example, dietary supplements, periodic resurveys of the atoll, and removal of radioactive scrap.

Based on the favorable findings of the ad hoc committee and the expressed desires of the people of Bikini, the Secretary of Interior recommended to the President that the United States take action as necessary to return the people of Bikini to their home atoll. In 1968 the President announced that the people of Bikini would be returned to their former home. Cleanup and rehabilitation work began in February 1969. DOD and AEC were responsible for the cleanup and radiological health and safety aspects of the cleanup, and DOI was

responsible for rehabilitation and resettlement. The cleanup was completed in October 1969. The AEC certified that the program of radiological scrap removal, environmental sampling and general radioactive cleanup had been satisfactorily completed.

The Bikini project was the focus of recent publicity and congressional concern when abnormal quantities of radioactive elements were detected in some of the people living there. These discoveries triggered a DOI decision this year to request \$15 million from Congress to again relocate the people of Bikini.

Although similar in nature, there are significant differences in the Enewetak and Bikini projects. For example, some radioactive contaminated Enewetak soil is being excised and disposed of, whereas there was no cleanup of such contaminated soil at Bikini. Moreover, residences for the people of Enewetak, unlike those for the people of Bikini, are being constructed on islands which are essentially free of radioactive contamination. Following is a partial comparison made by DNA of the Bikini and Enewetak cleanup projects.

#### Similarities

Both atolls are located in the Western Pacific near the international date line just north of the equator. The diet and living habits of both people are about the same - they tend to live in family groups on the largest islands, to grow subsistence crops near the family living area and develop larger areas for cash crops. Birds, bird's eggs and other edible wildlife are gathered from the smaller islands. Fish are taken from the lagoon and clams and other shell fish gathered from the reef. They are primarily gatherers rather than producers. An extensive survey was conducted in both cases to determine the impact of testing on the environment. This was followed by an extensive report of the findings and an evaluation of the physical and radiological hazards. On both atolls the radionuclides of principal concern are

cesium-137, strontium-90 and plutonium. The likelihood of an individual receiving a dangerous dose of radiation from external radiation on either atoll is extremely small because of the low average of surface radioactivity levels. The lagoon water has very low radioactivity levels, the fish and shell fish were found to have low levels of radioactivity also. However, the foods which are grown in the soil containing cesium and strontium were found to have high levels of activity and were predicted to be the principal sources of exposure. In some cases the ground water contains cesium and strontium.

### Differences

The differences are significant. At Enewetak there were 43 tests, one of which was a safety test which produced no nuclear yield but a large amount of contamination, compared to only 23 detonations on Bikini. All of the tests at Bikini were over water placing the craters and most of the debris in the lagoon. At Enewetak the majority of tests were conducted on or over land. All but two of the tests were on the northern islands where all the significant radiological contamination is found. On Bikini the contamination is principally the result of fallout while at Enewetak induced radiation as well as fallout contributed to the contamination. During testing Enewetak had well-established base camps to support scientific and other test personnel in the southern half of the atoll which is relatively free of contamination whereas all of the islands on Bikini Atoll were contaminated to a degree, some more than others, by fallout.

### Scope of review

We reviewed the Enewetak Atoll cleanup, rehabilitation, and resettlement project to identify significant issues which should be resolved before the United States considers the project finished. We interviewed officials of agencies involved in the project and representatives of the people of Enewetak. We also reviewed pertinent files, reports, and other materials and observed conditions on the atoll.

The review was principally performed at

- DNA headquarters, Arlington, Virginia;
- DOE headquarters, Germantown, Maryland;
- DOI headquarters, Washington, D.C.;



--Field Command, DNA, Albuquerque, New Mexico;

--Nevada Operations Office, DOE, Las Vegas, Nevada;

--Office of the High Commissioner, TTPI, Saipan, Mariana Islands; and

--Enewetak Atoll.

## CHAPTER 2

### RADIOLOGICAL CLEANUP EFFORTS: IS A MODIFIED SOLUTION ACCEPTABLE?

As work progresses on the radiological debris and soil cleanup portion of the program, there are several developments that suggest only a modified solution of the original plan will be achieved. Thus, more living pattern restrictions than initially envisioned may have to be imposed on the returning people of Enewetak. Some islands designated for agricultural or food gathering purposes may have to be quarantined indefinitely. DNA plans to do what it can within a prescribed time limit and available resources. As it stands now, once that commitment is satisfied the cleanup will cease.

#### The Enewetak cleanup plan

DNA and the Energy Research and Development Administration (ERDA), now DOE, agreed that the cleanup of Enewetak Atoll would remove and dispose of the radiological hazard so that the people could be safely resettled. They acknowledged that it was impossible to reduce radiological contamination to pre-test levels. They agreed that it was possible and feasible, however, to rehabilitate the atoll in a manner that would assure the safety of the returning people by employing certain restrictions on land use and locally grown foods and by continual surveillance of the residual radioactivity.

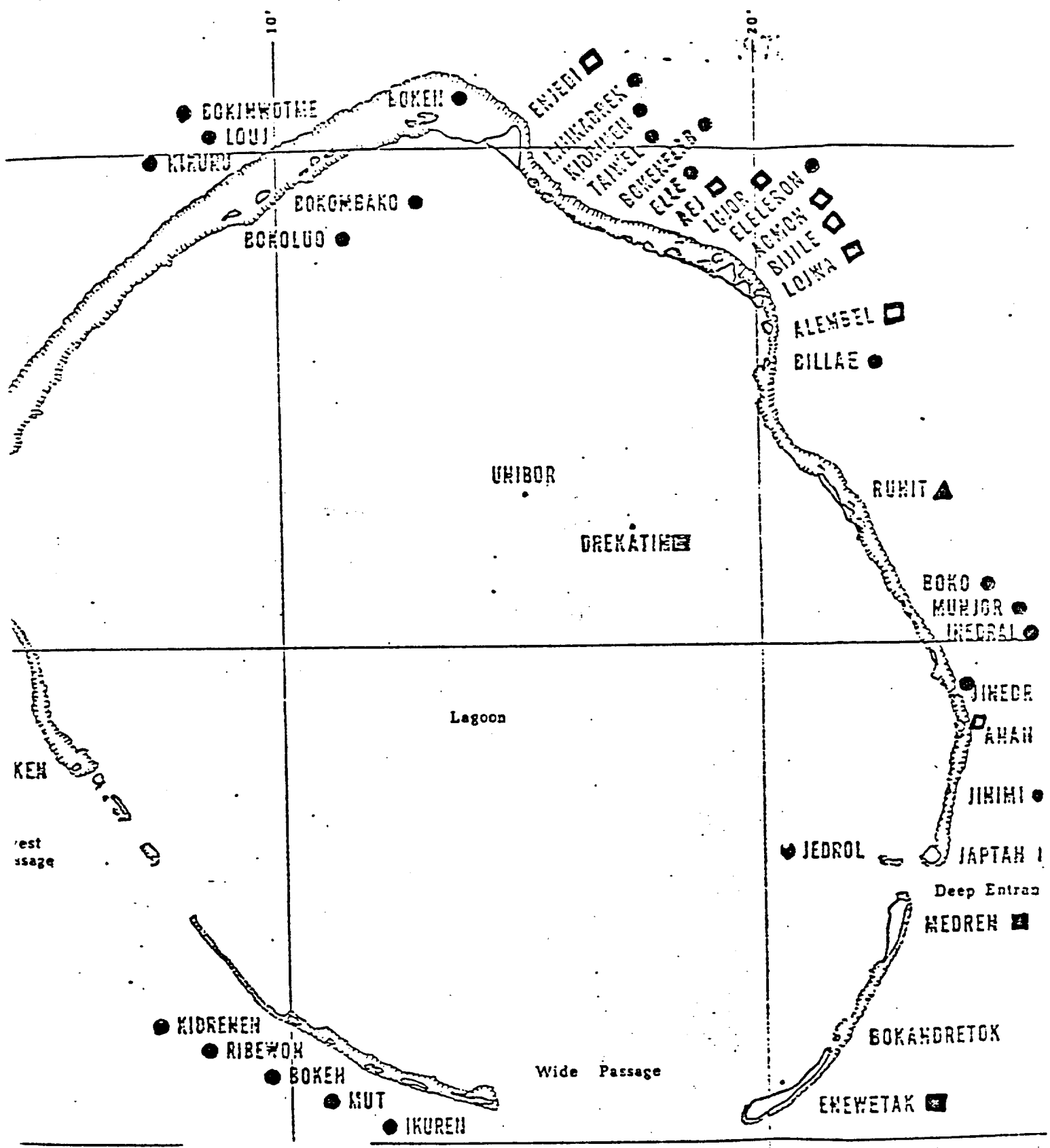
The Enewetak Atoll Master Plan divides the islands of the atoll into three categories reflecting the primary functional use of each island. The plan designates the islands as inhabited, agricultural, or food gathering sites as decided upon by the Enewetak people.

- Remove obstructions to development or habitation and agriculture.
- Remove radioactive scrap from all islands in the atoll.
- Excise plutonium concentrations greater than 400 picocuries per gram from Boken, Lujor, and Runit. Concentrations of less than 40 picocuries per gram were not to be disturbed. Concentrations between 400 and 40 picocuries per gram were to be dealt with on an individual basis. 1/
- Remove plutonium from the three burial crypts on Aomon.
- Dump unsalvageable nonradioactive and noncombustible material in the lagoon at selected locations to form artificial reefs.
- Mix excised plutonium contaminated soil with cement and water to form a slurry and place it in a crater on Runit. Also dump radioactive debris into the crater.

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1/ These criteria have since been made more stringent.

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- - Living & Agricultural Islands
- - Agricultural Islands
- ▲ - Food Gathering & Picnic Islands
- ▼ - Quarantined

The habitation plan also provides that the people of Enewetak live and obtain food as follows:

- Residence restricted to the southern islands, Jinedrol through Kidrenen.
- Runit quarantined until plutonium cleanup effected and crater containment completed. No other restrictions on travel.
- Cultivate pandanus, breadfruit, arrowroot and other subsistence food on the southern islands only.
- Coconuts could be grown only on the southern islands and the northern islands of Mijikadrek through Billae. The northwest islands of Bokoluo through Enjebi and Runit were not to be cultivated.
- Raise livestock to be used for food on the southern islands only.
- Eat coconut crabs taken from the southern islands only.
- Eat fish from the lagoon and wild birds and their eggs without restrictions (except for Runit).

Developments suggest that a modified solution of the Enewetak Atoll radiological contamination problem is likely

Several developments have increased the probability that a modified solution to the Enewetak Atoll radiological contamination problem is likely. These developments require the excision of more soil and a need for more resources and/or time to accomplish the cleanup or, alternatively, a need to place more living pattern restrictions on the returning people of Enewetak. They include:

- The Enewetak Radiological Survey assessments of radiological hazards to the returning people of Enewetak were based on average measured radiation values. DOE subsequently determined that such hazards should be assessed more conservatively to allow for uncertainties. In order to meet the

transuranic element 1/ cleanup criteria for the island of Enjebi, for example, which would eventually allow it to be used as a residence island (once suburanic elements 2/ no longer pose a health hazard), about 50 percent more soil would have to be excised using the more conservative philosophy.

- The Enewetak Radiological Survey dose assessments were based on averages for islands and groups of islands. Now dose assessments require consideration of the worst region on each island. This leads to higher radiation dose estimates.
- During 1977 the Environmental Protection Agency (EPA) published proposed guidelines for dose limits for persons exposed to transuranic elements in the environment which are much more stringent than those recommended by the Atomic Energy Commission Task Group on Recommendations for Cleanup and Rehabilitation of Enewetak Atoll. The radiological cleanup criteria have been made more stringent in an effort to meet the proposed EPA guidelines.
- The Task Group's radiological cleanup guidelines considered only plutonium-239 and plutonium-240. The cleanup guidelines were broadened to include all transuranic elements. The greatest danger from plutonium-239 and plutonium-240 was calculated to be from inhalation and which was relatively small in comparison to all other dose pathways. The inhalation and ingestion pathways become more significant when considering additional transuranic elements and the more stringent EPA guidelines.
- The cleanup emphasis shifted from excising plutonium from islands originally programmed for agriculture or food gathering purposes immediately after cleanup to excising transuranic elements from islands which can be used for additional purposes sometime in the future when suburanic elements no longer pose a health hazard. Inherent in this philosophy change is that additional islands may have to be indefinitely quarantined because resource and time constraints may not permit cleaning them up.

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1/ Transuranic elements are those having atomic numbers greater than that of uranium.

2/ Suburanic elements are those having atomic numbers less than that of uranium.

--Projected coconut intake of the people of Enewetak was recently estimated to be about 10 times greater than was assumed when the plan was developed. Additionally, suburanic element problems discovered at Bikini Atoll are more serious than originally predicted. For example, uptake of cesium-137 by coconuts was found to be five times greater than assumed for the living pattern plan. Radiocontaminants in food come directly from the soil in which food plants grow. Internal radiation exposure to the people is directly related to the amount of fruit of these plants ingested.

#### Conclusions and recommendations

Several developments suggest that a modified solution to the radiological contamination problem on Enewetak Atoll will be necessary. Thus more living pattern restrictions than envisioned in the original plan may have to be imposed on the returning people of Enewetak. The Departments of Interior and State should determine whether a modified solution to the problem is acceptable to the people of Enewetak as well as the United States.

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CHAPTER 3

NEED FOR ACTION TO AVOID FUTURE  
CLAIMS AND POLITICAL DIFFICULTIES

In spite of the extensive and well-intentioned efforts of the United States to cleanup, rehabilitate, and resettle Enewetak Atoll, the potential exists for future legal and political difficulties for the United States. The issues include loss of land, loss of land usage, and loss of cash crops as a result of the nuclear weapons testing program, and an absence of established long-term commitments of the United States to the people of Enewetak. The expectation that the United States will soon end the Trust Agreement plus the fact that the future political status of the Marshall Islands, of which Enewetak Atoll is a part, is uncertain, further complicate matters.

The people of Enewetak have been paid various sums for use of the atoll by the United States and for war damage. These payments, however, have not included amounts for damage related to the nuclear testing program.

Compensation awarded and paid  
to the people of Enewetak

In 1956, 9 years after the people of Enewetak were relocated by the United States to Ujelang Atoll, the TTPI paid the people of Enewetak \$25,000 in cash and \$150,000 in trust for use of the atoll. In 1969 TTPI paid another \$1,020,000 in trust (1) for the hardships they suffered as a result of being displaced, (2) for their continued displacement in the foreseeable future, and (3) for the decline in productivity of subsistence



agriculture. In 1976, TTPI permanently transferred title to Ujelang Atoll to the people of Enewetak as additional consideration.

Also in 1976, the Micronesian Claims Commission awarded the people of Enewetak \$3,743,649 pursuant to titles I and II of the Micronesian Claims Act of 1971. <sup>1/</sup> The Micronesian Claims Commission's decision specifically provided that none of the award was for loss of use of or damage to land occurring after 1951 and directly related to the atomic testing program. The people of Enewetak were paid only \$1,698,307 of the award because the awards considerably exceeded the amount of funds then available under the Micronesian Claims Act. In 1977 the Congress authorized the appropriation of such additional sums as might be necessary to satisfy all adjudicated claims and final awards under the Act, provided Japan contributed 50 percent of the total awards made for World War II claims.

Potential claims  
Loss of land

It has been estimated that about 154 acres, or about 8 percent of Enewetak Atoll's acreage, was lost as a result of nuclear weapons testing. The tests reportedly vaporized five islands and a large portion of another. Representatives of the people of Enewetak told us in May 1978 that the United States should compensate them for the lost land.

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<sup>1/</sup> Title I deals with World War II claims and title II deals with post-World War II claims prior to July 1, 1951.

In July 1978, the Department of State established an interagency task force to undertake a comprehensive study of claims arising from the United States nuclear testing program and related activities in the Marshall Islands.

Loss of use of land

At least one island contaminated with radioactive elements from the nuclear tests (Runit) is expected to be quarantined indefinitely. Others may have to be quarantined or may be unfit for the use desired by the people of Enewetak. This situation opens the door for claims against the United States for compensation for loss of use, or intended use, of some of their islands.

Loss of Copra "cash crop"

Copra (dried coconut meat) is the traditional "cash crop" of the Marshallese. Coconut trees to be planted on Enewetak Atoll during the rehabilitation program will take 5 to 7 years to begin producing nuts. The Enewetak Atoll Master Plan of March 1975 estimated that copra could bring the people of Enewetak about \$100,000 per year at then-current prices. Should the "cash crop" copra be contaminated with radioactive elements in excess of acceptable limits, the people of Enewetak might initiate a claim against the United States for loss of the crop. Other matters to be resolved are:

- the particulars of testing cash-crop coconuts for radioactive elements uptake,

--the method of disposal if the copra is found to be unacceptably contaminated with radioactive elements, and

--compensation for any such loss.

Need for quarantees that living pattern restrictions will be effectively enforced

Several restrictions regarding living patterns, the growing of food-stuffs; food gathering, etc., were proposed to and accepted by the people of Enewetak. (See Chapter 2.) Implied in returning the people to their home atoll is the assumption that such restrictions will be effectively enforced. Although DOI through TTPI is responsible for enforcing such advisory controls, this arrangement is temporary since the United States expects to soon end the Trust Agreement. If restrictions are not effectively enforced, the people of Enewetak could receive excessive doses of radioactive elements as did some of the people who returned to Bikini Island.

The United States does not plan to clean up all the islands of Enewetak Atoll to the point where no restrictions would have to be imposed. Therefore, it is imperative that provision be made for enforcing living-pattern restrictions after the Trust Agreement is ended.

Need for agreement on follow-up radiological surveys and monitoring the health of the resettled people and the radioactivity in the environment

ERDA (now DOE) assumed responsibility, including funding, for future periodic follow-up radiological surveys of Enewetak Atoll and for periodically monitoring the health status of the resettled people.

It also assumed responsibility for monitoring the radioactivity in the environment subsequent to rehabilitation. These matters are vitally important because only through follow-up monitoring can developing potentially hazardous radiological situations be detected. There is, however, no official agreement between the United States and the people of Enewetak regarding these matters. Such an agreement could avert potential future conflict regarding such surveys and monitoring and would provide more assurance that any developing potentially hazardous radiological problem would be detected early and dealt with quickly.

Need to monitor and inspect  
entombed radioactively  
contaminated soil and debris

The radioactively contaminated soil excised at Enewetak Atoll for disposal is entombed on the atoll in a crater on Runit Island which is expected to be quarantined indefinitely. The soil is mixed with cement and water to form a soil-cement slurry which is then placed in the crater. Radioactive debris will also be dumped into the crater. An 18-inch thick concrete cap will be placed over the entire mass for erosion resistance and as a shield from alpha radiation. Some migration of plutonium particles to the surrounding environment could occur since this method of entombing, or containing, the contaminated material is not required nor intended to be leak-proof. Any such migration is not expected to pose a significant hazard. This method of containment will require periodic monitoring and inspection to ensure its integrity, but no organization has assumed such responsibility.

We previously mentioned that the United States expects to soon end the Trust Agreement. Thus, the United States will be leaving a radiological contamination legacy on foreign soil. However, there has been no agreement with the people of Enewetak on the future status of the entombed radioactively contaminated soil and debris or how future monitoring and inspection will be accomplished.

#### Possibility of supplemental feeding program

From the time the people of Enewetak return to their home atoll until their subsistence agricultural system is providing enough food for them, the United States may have to initiate a supplemental feeding program to fill the void. The possible extent of any such program is at this time uncertain; however, the particulars of any such program, including the criteria for starting and ending it, should be resolved.

#### Conclusions and recommendations

In the wake of the Bikini situation, the United States can ill-afford to leave several significant issues related to its nuclear testing program at Enewetak Atoll open. The Departments of State and Interior should assure that agreements are reached with the people of Enewetak concerning:

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- Compensation for lost land or land usage as a result of nuclear tests;
- compensation for loss of their cash crops if the crops are found to be unacceptable contaminated with radioactive elements;
- obtaining formal unqualified assurances that living pattern restrictions will be effectively enforced after the Trust Agreement is ended;
- the specifics of follow-up radiological surveys, of monitoring the health of the resettled people and the radioactivity in the environment, and of periodically monitoring and inspecting the entombed radioactively contaminated soil and debris on the island of Runit;
- the future status of the entombed radioactively contaminated soil and debris and how future monitoring and inspection can be accomplished, and
- the specifics of a supplemental feeding program, if required, until the time the people of Enewetak are agricultural self-sufficient.

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CHAPTER 4POTENTIAL FOR ENHANCING PROJECTCREDIBILITY THROUGH INDEPENDENT ASSESSMENTS

Significant radiological aspects of the cleanup portion on the project to cleanup, rehabilitate, and resettle Enewetak Atoll are not being independently assessed by organizations having no connection or interest in the nuclear testing program. This situation could conceivably raise questions on the objectivity of the project. Independent assessments are, in our opinion, unequivocally dictated by the importance of the project to the people of Enewetak and the United States. Supporting this need is the recent Bikini incident; the concern focused on occupational and environmental radiation standards, specifically, on military personnel exposed to radiation from nuclear weapons tests conducted years ago in Nevada and in the Pacific; and finally by the project cost which is estimated at about \$120 million.

Lack of independent assessments:Cleanup criteria and objectives

The cleanup criteria and objectives have been revised; the criteria were made more stringent and the original objective of cleaning up plutonium-239 and plutonium-240 were expanded to include all transuranic elements. A recent DNA study showed, however, that the primary radiation hazard continues to be suburanic elements which will remain dominant over the transuranic element hazard for perhaps the next century.

EPA is the agency responsible for establishing guidance on radiation dose limits for persons exposed to radioactive elements in the general environment. In September 1977, EPA published proposed guidance on more stringent dose limits for persons exposed to transuranium elements. DOE revised the Enewetak cleanup criteria to try to meet these guidelines. EPA did not, however, participate in establishing the Enewetak Atoll radiological cleanup criteria nor has it evaluated the criteria being used.

DOE's advisory group on the cleanup criteria is of the opinion that the revised cleanup criteria will result in average transuranic radiation doses commensurate with the proposed EPA guidelines. But, it stated that it did not find it possible to develop reasonable guidance that would assure that radiation doses from transuranics to the returning people of Enewetak would not significantly exceed the proposed EPA guidelines. It pointed out the uncertainties inherent in our present understanding of the problem. Further, it advised DOE that perhaps more important, many of the factors that are involved in movement of transuranics in the environment and the disposition and retention of transuranics in human beings are not well established.

#### Post-cleanup hazards

DOE is responsible for providing radiological cleanup criteria for Enewetak Atoll as well as for assessing the post-cleanup suitability of the atoll for habitation.

EPA has analyzed the potential hazards to individuals in the general population as a result of present levels of transuranic elements existing



the recent concern about the adequacy of occupational radiation standards, the United States can ill-afford not to obtain independent assessments of the radiological health and safety practices for cleanup personnel at Enewetak Atoll. This concern has been expressed recently for military personnel connected with nuclear testing in Nevada and the Pacific years ago, shipyard workers exposed to nuclear powered submarines, and workers in a government nuclear plant. Preliminary reports suggest that some of these employees may have contacted cancer many years after exposure to radiation levels then thought harmless.

The Occupational Safety and Health Administration (OSHA) performs independent radiological health and safety inspections and investigations of businesses which affect commerce, but its authority does not extend to activities of the Government. The Nuclear Regulatory Commission (NRC) performs similar inspections and investigations of its licensees. However, neither OSHA, NRC, nor any other qualified independent agency has been required to assess the radiological health and safety practices for cleanup personnel at Enewetak Atoll.

Laboratory soil samples

A radiochemistry field laboratory under the direction of DOE has been established on Enewetak Atoll to support the radiological protection program and the plutonium soil assay operations. Representative soil samples are analyzed by the laboratory for americium and plutonium concentration data. Documentation of soil concentrations is essential to DOE's final certification of the radiological condition of each island. There is no quality control program by an independent laboratory verifying soil samples. We believe the importance placed on the soil sampling program to the outcome of its cleanup program dictates that such a program be instituted.

Conclusion and recommendations

Because of the importance of the radiological cleanup of Enewetak Atoll to the displaced people of Enewetak and the United States, the recent Bikini situation, and the recognized uncertainties surrounding radiation levels that constitute a hazard, the Secretary of Interior should initiate an independent assessment of the Enewetak project. Interior should initiate this action since it has the ultimate responsibility for rehabilitation and resettlement of the Enewetak people and must handle any problems that may develop during the intervening period before the Trust Agreement is ended. This is evident by the recent Bikini incident where Interior was responsible for the funding and action plan to again resettle the people. In this regard, the Secretary of Interior should have an appropriate independent organization assess:

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Involved in the Cleanup.

REPOSITORY PNNL  
COLLECTION Marshall Islands  
BOX No. 5686  
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