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L. Joe Deal Division of Operational Safety

ENIWETOK CLEANUP CRITERIA FORMAT

I am providing the attached draft format in response to your suggestion at the April 18, 1973, meeting with General Camm and Dr. Biles that we work together on this matter. As we have discussed, radiological criteria representing acceptable residual radiation conditions for rehabitation must be formulated in anticipation of the return of the Eniwetokese people to their home islands. Although we are quite aware that these criteria cannot be expressed numerically until the results of the recent USAEC radiological survey are available, we visualize the format for the criteria as consisting of at least three essential parts; namely, assumptions, alternative actions, and the results of these alternative actions. With a short introductory statement and a concluding overview of the postcleanup radiological condition of the entire Eniwetok, we would like to suggest organization of the format as shown in enclosure (1). I hope that we can develop this format at an early date so that General Came may discuss it with General Dunn in the near future.

Please let Commander Wolff or me know when you would like to discuss this.

(signed) John H. Carlson

William W. Gay Captain, USN Assistant Director for Tests Division of Military Application

Attachment: Eniwetok Cleanup Criteria (Format)

BEST COPY AVAILABLE

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ENIWETOK CLEANUP CRITERIA

(FORMAT)

Viewed in any context, the radiologically safe resettlement of the Eniwetok Atoll is the ultimate goal of the prepartory cleanup/rehabilitation program. Since the repatriation of the Eniwetok natives is imminent, it is essential that the responsible U. S. government agencies insure that cleanup operations and resettlement of the atoll are effected in a manner that poses no unacceptable present or future radiological hazard http://distributes.com/ to the returning Eniwetokese. Moreover, the safety of the environment following cleanup and the projected well-being of the Eniwetokese people mead by intransfer and drame and its factor as the should be publicized. As a minimum, and mindful of any resettlement restrictions, the same favorable sanction that was issued by the Ad Hoc

Committee during the rehabilitation of the Bikini Atoll (Reference 1) should be reiterated by the appropriate authority.

Combining the assessments of the radiological survey and knowledge of the expected lifestyles of the Eniwetokese, the atoll has been partitioned into a number of different entities which have within themselves commonality of geography or radiological environment or both. These are therefore termed "georadiological entities" and are listed in Attachment 1, which also shows their radiological conditions as determined by the AEC Radiological Survey.

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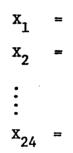
Certain radiological categories are established which correspond to the gradations in radiological conditions reasonably expected to characterize Eniwetok Atoll geographically after cleanup operations. These radiological categories are given in Attachment 2 with accompanying descriptions and limiting radiological criteria. The following assumptions and alternative actions constitute the approach in trying to attain the best radiological category for each geographical segment of the Eniwetok atoll.

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ASSUMPTIONS

- (a) AEC rad survey reflects present radiological condition on Eniwetok Atoll, Island.
- (b) That the living and dietary habits of the Eniwetokese are thoroughly studied to ascertain, properly weight, and assess the various pathways leading to total radiation exposure of the populace. The details of such habits will be included.
- (c) That the maximum acceptable exposure doses (external plus internal radiation) to the fesettled Eniwetokese people will not exceed FRC guidelines and will be kept as low as practicable. The following table has been developed to state these guidelines in terms of doses to the population. The entries in this table equivalent to the FRC guidelines are:



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ADULTS (older than X years)

YEARS	WHOLE BODY	BONE	THYROID	LUNGS
5	X ₁ (Rads)	x ₂	x ₃	x ₄
30 .	x ₅	х ₆	x ₇	x ₈
70	x ₉	x ₁₀	x ₁₁	x ₁₂

CHILDREN (younger than X years)

YEARS	WHOLE BODY	BONE	THYROID	LUNGS
5	X ₁₃ (Rads)	x ₁₄	x ₁₅	x ₁₆
30	x ₁₇	x ₁₈	x ₁₉	x ₂₀
70	x ₂₁	x ₂₂	x ₂₃	x ₂₄

(d) That the contributions to accumulated dose arising from the indigenous f_{ccd} reverses such as

marine plants, fish, vegetation, land animals, and fowl can be assessed. Estimated hand appen any guter resultement mode (

(e) That the bioenvironmental influence of the lagoon waters and lagoon ecosystems is sufficiently well known throughout the entire atoll.

- (f) That, if required, the necessary supplementary foodstuffs will be provided the Atell result is made available to the natives for as long as necessary to compensate the denial of the intervention of which they be considered for naturally occuring food items prohibited for radiological reasons. It have a muldiplet Salpent
- (g) That selected islands, parts of islands, or other areas on Eniwetok atoll can be effectively quarantined or otherwise limited if deemed radiologically necessary.

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(h) That subsequent radiological monitoring of the Eniwetokese natives and the atoll environment will be programmed and performed to assure continuing radiological safety. The degree of mathematic te recommendate coestimates and preastance measures. <u>ALTERNATIVE ACTIONS</u>

The alternative actions represent those options available under the cleanup program for improving, if possible, the radiological condition

of any contaminated areas. Plausible alternative actions are:

- (a) Leave in present condition
- (b) Remove all tangible radioactive weapon debris
- (c) Remove all tangible radioactive scrap, concrete, structures or other debris having activities greater than
- (d) Soil removal (______ inches), plowing (______ deep) or covering
 (______ inches) operations to achieve radioactive exposure levels
 and concentrations of ______ or lower
- (e) Impose specific use, occupancy or visit restrictions.
- (f) Wait for _____ years.
- (g) Perform selected combinations of (a), (b), (c), (d), (e), or (f).

With the georadiological entities defined, their present condition stated, and plausible alternatives listed, criteria can then be established and expressed in a form such as Attachment 3.

From the compilation of such forms for all georadiological entities, decisions can be made to select some optimized set of radiological conditions for achieving an appropriate category for that entity. A final statement can then be prepared describing what the overall radiological condition of Eniwetok Atoll will be based on whatever combination of alternatives may be selected.

ATTACHMENT 1

GEORADIOLOGICAL ENTITIES

(FORMAT)

ENTITY

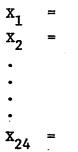
PRESENT CONDITION

All of island FRANK plus lagoon water to the _____ foot curve and the entire reef plate. The land area within coordinates _____, ____, ____, and _____ are excluded.

The land area within coordinates

____, ____, ____, and _____/

Radiological Category: Visitable Doses to man if allowed to live without cleanup (Refer to table in assumption (c))



Significant radiological problem(s) are:

Radiological Category: Restricted

x ₁				
x ₂	=			
•				
•			•	
•				
•				
×2	4 =			
Signif	icant	radiological	problem(s)	are:
1.				
2.			•	

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Lagoon area ____

etc.

.

. . .

. . x₁ = x₂ =

. x₂₄ =

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a,

•

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ATTACHMENT 2

Radiological categories have been established which provide guidelines about the safety and possible uses of specific atoll areas. The corresponding radiological criteria are presented as simple tables or rules.

Although the formal criteria appear to be quite straightforward, it is important to realize that the process of calculating or estimating a particular dose may be quite complex. In general, the cumulative dose is composed of the sum of the time-integrated constituent contributions. These constituent contributions include but are not limited to the following possible sources of radiological activity:

- (a) Distributions and concentrations of Sr⁹⁰, Co⁶⁰, Cs¹³⁷, and Pu²³⁹ etc., in air, soil, vegetation, land animals, water, fish, and other marine biota.
- (b) External exposure associated with the air, soil, scrap materials, structures, etc.

f

In examining any portion of Eniwetok atoll, the relative importance of these constituent contributions will vary on an island-by-island basis and will have to be assessed accordingly by knowledgeable technical personnel.

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RADIOLOGICAL CATEGORY

DESCRIPTION

Fully Habitable

Unconditionally Safe Permanent Occupancy -Surrounding media safe for fish, farming, and raising of livestock CRITERIA

 $X_2 =$ $X_{24} =$ Note: A12

X₁

Note: Allowances are made in these criteria for doses resulting from visits to areas designated "Arable" and "Visitable". This allowance is based on the Eniwetokese life-style models developed in the Radiological Survey Report.

X₁ through X₂₄ as above. Areas in this category are considered radiologically safe for occupancy provided that certain stated restrictions on potential sources of internal radiation, e.g., from suspect coconut crabs or pandanus, are adhered to. Occupants of such an area may or may not be obliged to obtain food products from other areas.

Limited Livability

Conditionally Safe Permanent Occupancy -Safety of Surrounding Ecological Media Uncertain

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RADIOLOGICAL CATEGORY

Arable

DESCRIPTION

No Permanent Occupancy Intermittent Visits Allowed -Ground and Water suitable for farming, fishing, and raising of livestock

CRITERIA

Visit durations not to exceed: x hours/day y hours/year See note under "Fully Habitable" category

Visitable

No Permanent Occupancy Intermittent Visits Allowed -No use of vegetation, no farming, and no raising of livestock Visit durations not to exceed: z hours/day q hours/year See note under "Fully Habitable" category

Restricted

No Occupancy No Visits Allowed

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ATTACHMENT 3

CLEANUP CRITERIA SUMMARY SHEET

- 1. Georadiological entity: Island FRANK ---- etc.
- 2. Present status: Category "Arable"
- 3. Actions required to place in a less restrictive category:
 - a. Limited Livability
 - (1) Leave in present condition
 - (2) Wait for 28 years

Estimated Cost:

b. Limited Livability

- (1) Remove all tangible radioactive weapon debris
- (2) Remove all tangible radioactive scrap, concrete structures and other debris having activities greater than _____.
- (3) Remove 2 inches of topsoil to achieve radioactive exposure levels and concentrations of ______ or lower.

Estimated Cost:

- c. Fully Habitable
 - (1) Remove all tangible radioactive weapon debris
 - (2) Remove all tangible radioactive scrap, concrete structures and other debris having activities greater than
 - (3) Remove 2 inches of topsoil to achieve radioactive exposure levels and concentrations of ______ or lower.
 - (4) Wait for 7 years

Estimated Cost: