RECEIVED
VIA TELECOPY

402981

TO: TOMMY F. McCRAW
AEC Headquarters
Department of Safety
Germantown, Maryland

FROM: Walter B. Herrick
Lawrence Livermore Laboratory
Livermore, CA

ROUGH DRAFT
10 Sept. 1973
W.Kerrick/D.Wilson

2. Radiological Implications of Data Obtained from the Survey

a. Guidelines against which Survey findings will be compared.

The radiological survey of Enewetak Atoll provides a comprehensive data base needed to derive judgements and recommendations relative to the radiologically safe return of the Enewetak people. These judgements are based on an evaluation of the significance of all radioactivity on the Atoll in terms of the total exposure to be expected in the returning population, and recommendations as to reasonable actions and constraints which, where made, will result in minimum exposures.

The guidelines used in deriving these recommendations can be summarized as two interdependent considerations:

1. Expected exposure levels should be minimized and should fall in a range consistent with guidance put forward by the International Commission on Radiological Protection (ICRP) (see Table 1 and Appendix I for summaries of these radiation protection standards).
2. Actions taken to reduce exposures should be those which show promise of significant exposure reduction when weighed against total expected exposures and the "costs" of the actions. "Costs" in this context, are measured primarily in terms of costs to the Enewetak people as constraints on their activities or as dollar costs for cleanup or remedial action.

In these evaluations, it should be emphasized that dosages through various pathways are estimated on the basis of environmental data and considerations of expected living patterns and dietary habits. While "radiation standards" do not exist for environmental contamination levels in substances such as soil and foodstuffs, there is general

agreement in terms of conservative models of these pathways and the relationships between a certain level in the environment and the likely dose to result from the pathway exposure.

The area of plutonium in soils, however, is one for which there is no general agreement as to the quantitative relationship between levels in soils and dosages to be expected through the inhalation pathway, the primary one through which man can receive a significant dose from plutonium. The ICRP recommends a maximum permissible average concentration (MPC) of 1 picocurie per cubic meter (pCi/m^3) of air for "insoluble" plutonium and 0.06 pCi/m^3 for "soluble" plutonium for unrestricted areas. While the plutonium in the soil at Enewetak is thought to be typical of world-wide fallout, and therefore insoluble, we will use the 0.06 pCi/m^3 value for the sake of conservatism.

A guide for assessing the importance of a certain soil level of Pu on Enewetak can be arrived at by a set of conservative assumptions regarding the resuspension pathway. This is the "critical" pathway since the inhalation route to man is more hazardous than the soil-root-pathway for ingestion of plants by man. These assumptions are:

1. Plutonium in soil is resuspended at rates similar to the soil material, e.g., the specific activity of soil equals the specific activity of air particulates.
2. All particles in air originate from local soil.
3. Plutonium in air is all in the respirable range of particle size and is soluble in lung fluids.

Appendix II develops average lifetime exposure to particulates in air by the returning population, combining the arguments outlined above with an analysis of air concentrations and time-of-exposure

weightings to be expected for the mix of environmental conditions associated with routine activities (ambient) and under special conditions which stir up the soil.

~~[illegible] reported~~ airborne particulate concentration data are published by the U. S. Dept. of Health, Education, and Welfare* for the year 1966 for thirty non-urban locations in the United States. No similar data are available for Eniwetok or an equivalent south sea atoll location. The average mean value for the 30 locations ~~[illegible]~~ is ~~378~~ 38 microgram per cubic meter (microgram/m^3). Assuming, to be conservative, that the average airborne particulate concentration level at Eniwetok is ~~300~~ 150 microgram/m^3, and further assuming that all of this particulate matter consists of local soil (i.e., no salt spray from the ocean) one obtains a value of ~~600~~ 410 pCi/gm as an average surface soil concentration which corresponds to the 10CFR guide for maximum permissible average airborne concentration of plutonium.

In the evaluation of the radiological condition of Eniwetok we will apply the criteria that areas in which any soil samples show concentrations greater than ~~600~~ 410 pCi/gm should receive corrective action, areas which show soil concentrations between 60 and ~~600~~ 410 pCi/gm may receive corrective action, depending on other radiological conditions present, and areas showing less than 60 pCi/gm do not require corrective action because of the presence of plutonium alone.

---

*Air Quality Data, 1966 Edition APTD 68-9

TABLE I

JOINT DOSE LIMITS

	Individuals	Population
Gonads, red bone-marrow	0.5 rems/yr	
Skin, bone, thyroid	3.0 rems/yr	
Hands and forearms; feet and ankles	7.5 rems/yr	
Other single organs	1.5 rems/yr	
Genetic dose		5.0 rems/30 yrs

TABLE II: SUSPENDED PARTICULATES, NONURBAN FREQUENCY DISTRIBUTIONS

Station Filter Site & State	Micrograms Per Cubic Meter: Max	Arith Mean	Geo Mean	Std Geo Dev
ARIZONA GRAND CANYON PK	[illegible]	[illegible]	[illegible]	[illegible]
ARKANSAS MONTGOMERY CO	[illegible]	[illegible]	[illegible]	[illegible]
CALIFORNIA HUMBOLDT COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
COLORADO MONTEZUMA COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
DELAWARE KENT COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
INDIANA MONROE COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
PARKE COUNTY	[illegible]	[illegible]	40	[illegible]
IOWA DELAWARE COUNTY	110	40	[illegible]	[illegible]
MAINE ACADIA NAT PARK	[illegible]	[illegible]	[illegible]	[illegible]
MARYLAND CALVERT COUNTY	[illegible]	40	[illegible]	[illegible]
MISSISSIPPI JACKSON COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
MISSOURI SHANNON COUNTY	[illegible]	[illegible]	30	[illegible]
MONTANA GLACIER NAT PARK	[illegible]	[illegible]	12	[illegible]
NEBRASKA THOMAS COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
NEVADA WHITE PINE CO	[illegible]	8	6	[illegible]
NEW HAMPSHIRE COOS COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
NEW MEXICO RIO ARRIBA COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
NEW YORK CAPE VINCENT	[illegible]	[illegible]	[illegible]	[illegible]
NORTH CAROLINA CAPE HATTERAS	[illegible]	[illegible]	[illegible]	[illegible]
NORTH DAKOTA WARD COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
OKLAHOMA CHEROKEE COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
OREGON CURRY COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
PENNSYLVANIA CLARION COUNTY	[illegible]	[illegible]	[illegible]	[illegible]

Station Filter Site & State	Micrograms Per Cubic Meter: Max	Arith Mean	Geo Mean	Std Geo Dev
RHODE ISLAND WASHINGTON CO	116	46	40	[illegible]
SOUTH CAROLINA RICHLAND COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
SOUTH DAKOTA BLACK HILLS	[illegible]	20	[illegible]	[illegible]
TEXAS MATAGORDA COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
VERMONT ORANGE COUNTY	[illegible]	[illegible]	[illegible]	[illegible]
VIRGINIA SHENANDOAH PARK	[illegible]	[illegible]	30	[illegible]
WYOMING YELLOWSTONE PARK	[illegible]	[illegible]	9	[illegible]

"URBAN" LOCATION

HONOLULU 74 35 33 1.35

1/15/85

REYNOLDS ELECTRICAL & ENGINEERING CO., INC.
LSDB BIBLIOGRAPHIC DIRECT ENTRY DATA FORM

REPOSITORY _____
COLLECTION _____
LOCATION _____

1. TITLE/IDENT

DOCUMENT NUMBER 44865

TITLE Memo to multiple addressees, Subject: Draft material for report by AEC Task Group on Recommendations For Cleanup of Eniwetok Atoll

YR MO DA

DOCUMENT DATE 73 08 - 29
ORIG DOC NBR _____
ORIGINATING AGENCY _____
CONTRIBUTING AGENCY DOE/NCCRAW
DOCUMENT CLASS U
ORIGINATING CLASS U
DOCUMENT TYPE CO RT

MICROFILM REEL 1051
MICROFILM FRAME 0846
MEDIA TYPE X
DOCUMENT PAGES 2
PRIVACY ACT CODE -----
KEYWORD PRIORITY _____
DOCUMENT APPROVED ---
DOCUMENT COMPLETE -------
MARGINALIA Y
SIGNIFICANCE ----------
REVIEWER _____

12. DUPLICATE CHECK: LAST THREE WORDS OF TEXT

by September 14, 1973

13. ENCODER COMMENTS: This is an incomplete document.