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1973 SEP 10 PM 3 24
U.S. ATOMIC ENERGY COMM.
TWX UNIT

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

2. Radiological Implications of Data Obtained From the Survey

a. Guidelines against which survey findings will be compared.

The radiological survey of Inuvialuk Atoll provides a comprehensive data base needed to derive judgments and recommendations relative to the radiologically safe return of the Inuvialuk people. These judgments 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 radiologic 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 Inuvialuk 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 sediments, 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 ($\mu\text{Ci}/\text{m}^3$) of air for "insoluble" plutonium and $0.06 \mu\text{Ci}/\text{m}^3$ for "soluble" plutonium for unrestricted areas. While the plutonium in the soil at Knevetak is thought to be typical of world-wide fallout, and therefore insoluble, we will use the $0.06 \mu\text{Ci}/\text{m}^3$ value for the sake of conservatism.

A guide for assessing the importance of a certain soil level of Pu on Knevetak 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.

~~The average~~ ^{average} airborne particulate concentration ~~is~~ ^{is} 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 Brevetak or an equivalent South Sea Island location. The average mean value for the 30 locations in the U.S. is ~~37~~ ³⁸ micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). Assuming, to be conservative, that the average airborne particulate concentration level at Brevetak is ~~300~~ ¹⁵⁰ $\mu\text{g}/\text{m}^3$, 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~~ ¹⁵⁰ $\mu\text{Ci}/\text{g}$ as an average surface soil concentration which corresponds to the ICRP guide for maximum permissible average airborne concentration of plutonium.

In the evaluation of the radiological condition of Brevetak we will apply the criteria that areas in which any soil samples show concentrations greater than ~~600~~ ¹⁵⁰ $\mu\text{Ci}/\text{g}$ should receive corrective action, areas which show soil concentrations between ~~60~~ ⁶⁰ and ~~600~~ ¹⁵⁰ $\mu\text{Ci}/\text{g}$ may receive corrective action, depending on other radiological conditions present, and areas showing less than ~~60~~ ⁶⁰ $\mu\text{Ci}/\text{g}$ do not require corrective action because of the presence of plutonium alone.

*Air Quality Data, 1966 Edition AP-9

580
35
37

15
152

TABLE I

ICRP DOSE LIMITS

	<u>Individuals</u>	<u>Population</u>
Blood, red bone-marrow	0.5 rem/yr	
Skin, bone, thyroid	5.0 rem/yr	
Hands and forearms; feet and ankles	7.5 rem/yr	
Other single organs	1.5 rem/yr	
Genetic dose		5.0 rem/50 yrs

TABLE II: SUGGESTED PARTICULATES,
INDIVIDUAL PRIORITY DISTRIBUTIONS

Location State County	Priority Distribution			PM 10 µg/m ³
	No.	1st Year	2nd Year	
ARIZONA GRAND CANYON PK	98	38	21	2.11
ARKANSAS MONTGOMERY CO	248	90	38	1.98
CALIFORNIA SUTTER COUNTY	188	68	33	1.88
DELAWARE MONTESUMA COUNTY	79	34	14	2.17
ILLINOIS BENT COUNTY	114	44	28	1.82
INDIANA HUNTER COUNTY	88	48	44	1.82
INDIANA PARKE COUNTY	171	48	40	1.82
IOWA DELAWARE COUNTY	110	40	38	1.78
KANSAS ACACIA NAT PARK	87	38	22	1.84
MARYLAND CALVERT COUNTY	78	40	38	1.88
MISSISSIPPI JACKSON COUNTY	224	87	31	1.78
MISSOURI BRANSON COUNTY	62	32	30	1.88
MONTANA GLACIER NAT PARK	96	36	12	2.22
KENTUCKY THOMAS COUNTY	60	27	22	1.88
NEVADA WHITE PINE CO	78	8	6	2.88
NEW HAMPSHIRE COOS COUNTY	81	38	23	1.84
NEW MEXICO RIO ARriba COUNTY	84	36	23	1.87
NEW YORK CAPE VINCENT	89	31	28	2.08
NORTH CAROLINA CAPE MATTERAS	122	68	38	1.78
NORTH CAROLINA BARD COUNTY	141	48	32	2.38
OREGON CHESWASSEE COUNTY	267	88	48	1.82
OREGON CLATSOP COUNTY	129	36	18	1.88
PENNSYLVANIA CLATSOP COUNTY	67	31	28	1.88

Location State County	Priority Distribution			PM 10 µg/m ³
	No.	1st Year	2nd Year	
RHODE ISLAND WASHINGTON CO	114	46	40	1.72
SOUTH CAROLINA RICKLAND COUNTY	80	36	32	1.88
SOUTH DAKOTA BLACK HILLS	48	20	14	2.64
TEXAS MATAGORDA COUNTY	200	78	38	1.78
VERMONT DERRIDGE COUNTY	111	48	41	1.88
VIRGINIA SHERRODAN PARK	78	36	30	1.88
WEST VIRGINIA SHELLMOUND PARK	38	12	8	2.68

"UNION" LOCATION
INDICATED 74 35 33 1.35

1/15/75
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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/McCRAW

DOCUMENT CLASS U

ORIGINATING CLASS U

DOCUMENT TYPE CR 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:

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