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OFFICE MEMORANDUM

TO : DISTRIBUTION

DATE: October 3, 1973

FROM : Ron Lohrding

SUBJECT : ENVIRONMENTAL ASSESSMENT OF WASTE DISPOSAL PRACTICES

SYMBOL : C-5

Attached for your consideration is an attempt at a final copy of our outline of questions for Environmental Assessments of Past Transuranic Waste Disposal Practices.

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ENVIRONMENTAL ASSESSMENT OF

PAST TRANSURANIC WASTE DISPOSAL PRACTICES

(Please answer the following questions about each individual burial site where applicable.)

I. Description of Wastes and Disposal Sites

A. Locate (map) and identify all individual burial sites, pits, trenches, etc.

B. What were the approximate dates of usage?

C. What are the volumes (and weights) of wastes disposed?

D. What were the type(s) of waste disposed?

1. Relate the amount of combustible waste, the composition of this material, and if available, the breakdown (volume, weight, etc.) of combustibles by type.

2. Recount the amount of noncombustible waste, types of material, amounts of each type; e.g.,

a. sludges?

b. filters?

c. equipment, building debris?

d. scrap metal?

3. Portray the possible "special " wastes disposed of, in particular, pyrophoric materials, flammable liquids, oils, etc., potentially hazardous chemicals disposed of in bulk quantities, etc. Identify all especially hazardous wastes buried with radioactive material or in a separate pit in close proximity.

4. Was any waste disposed of as a liquid?

a. Describe the solvents.

b. What was the concentration of Pu in the liquid?

c. Was the Pu in suspension and/or solution?

d. If in suspension, what were the particle sizes?

5. What were the primary chemical contaminants that were present in the waste matrices?

E. What were the radioactive contaminants present?

1. What transuranics were present, and in what amounts (wt., curies, etc.)? In particular, identify ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Pu, ^{241}Am, ^{233}U.
2. What other radioactive isotopes were disposed of by burial at the same location? Identify and give amounts as available.

F. How were these wastes packaged when buried?

1. Identify the different types of basic container - and waste type contained.
2. Identify any inner containment material used, e.g., cans, liners, bags, etc.
3. How was the primary package sealed - how was any inner packaging sealed?
4. Was there an identification on the container?
5. Were any waste reduction or treatment techniques used? If so describe.

G. Describe the mode of the waste burial.

1. Was the burial in pits, trenches, cribs, underground tanks, shafts, etc.
2. What was the size of the burial excavation?
3. What, if any, material lined the excavation other than soil?
4. How were the wastes emplaced, i.e., stacked, dumped, etc?
5. Was there any attempt at layering the wastes? If so, describe.
6. Were wastes crushed or compacted during the emplacement? If so, to what extent? If not, were containers damaged in any other way?
7. What were the proportions of fill and wastes in the pit, trench, etc?
8. What type of cover was used, i.e., earth, asphalt, etc., and what was the original thickness(es)?
9. What is the condition of that cover today, i.e., intact, settled, partially eroded, planted, etc?

H. What steps were taken to ensure that the wastes would not go critical?

II. Geology and Hydrology Information

A. Describe the regional geology, in terms of stratigraphy, structure, and seismicity.

B. Describe the regional hydrology in terms of the following: (as a function of time where applicable)

1. Surface water.

a. Characterize the drainage basins.

b. Display discharge records.

c. Tabulate water quality parameters, for dissolved and suspended material.

d. Tabulate water usage, by source.

(1) Muncipal

(2) Industrial

(3) Domestic

(4) Recreational

(5) Agricultural

2. Ground water.

a. Characterize the occurrence of groundwater by the following criteria:

(1) Confined, unconfined (perched, non-perched)

(2) Location, areal extent and thickness(es) of major aquifer(s).

(3) Source and quantities of recharge, artificial and natural, by aquifer.

(4) Location and quantities of discharge, artificial and natural, by aquifer.

(5) Water level maps of aquifer(s), as available, or description of groundwater movement.

(6) History of water level trends at selected observation wells, by aquifer.

b. Give the range of values, and method(s) of determination, for the following aquifer characteristics, by aquifer:

(1) Coefficient of transmissibility

(2) Coefficient of permeability

(3) Specify capacity of producing wells

(4) Yields from producing wells

(5) Rates of groundwater movement.

c. Tabulate water quality parameters and "in situ" water temperature, by aquifer.

d. Tabulate withdrawal amounts, by aquifer, for the following usages:

(1) Municipal

(2) Industrial

(3) Domestic

(4) Agricultural

(5) Recreational

C. Describe the site geology in detail.

1. Soil

2. Stratigraphy

3. Structure

4.

D. Give details of site hydrology (as a function of time, where applicable).

1. Surface water

a. Describe in detail site drainage, basins, including location and extent of all surface water bodies.

b. Describe nature and extent of any local drainage into storage pits, shafts, etc.

c. Give discharge records of flowing water on or adjacent to site.

d. Tabulate water quality parameters for above flows.

e. Describe any uses of above flows.

2. Groundwater

a. Characterize the occurrence of groundwater by at least the following criteria:

(1) Confined, unconfined (perched, non-perched)

(2) Location with respect to burial site, areal extent, and thickness of saturated material.

(3) Sources, amounts and quality of recharge, artificial and natural.

(4) Extent and nature of hydrologic connection with regional aquifers.

(5) Location, type, amounts, and quality of discharge; artificial and natural.

(6) Water level maps of data, as available, or description of groundwater movement.

(7) History of water level trends at selected observation wells within each aquifer.

b. Give values (average and extremes) for the following parameters, for all saturated material beneath or adjacent to the site:

(1) Coefficient of transmissibility

(2) Coefficient of permeability (horizontal and vertical)

(3) Rates of groundwater movement

(4) Yields of producing wells

(5) Specific capacities of producing wells.

c. Describe the water quality "in situ" temperature, and usages, by aquifer.

3. Zone of aeration

a. Describe the soil and rock type.

(1) Erosion rates

(2) Total porosity

(3) Effective porosity

(4) Specific yield

(5) Specific retention

(6) Pore size distribution

(7) Saturated and/or unsaturated hydraulic conductivity.

(8) Ion exchange capacities.

(9) Particle size distribution

b. Characterize the soil moisture using at least the following parameters:

(1) Distribution of soil moisture

(2) Rates of infiltration

(3) Evapotranspiration rates

E. Give other miscellaneous data that may be of value, such as:

1. Well and test hole inventory

2. Geologic logs

3. Aquifer tests

4. Geophysical logs.

III. Meteorological Information

A. Provide wind roses as a function of the following:

1. Stability
2. Time of day
3. Seasons of year

B. Provide frequencies of inversion conditions.

C. Describe frequencies of occurrence and intensities of high winds:

1. Tornados
2. Hurricanes
3. Other high intensity winds

D. Provide precipitation records, including:

1. Frequency distribution of hourly rainfall
2. Frequency distribution of daily rainfall
3. Give the distribution of the number of days without precipitation
4. Give the mean and extremes of monthly precipitation

E. Provide air temperature data, including monthly means and extremes.

IV. Environmental Control and Monitoring Data

A. Describe any past practices or incidents that may have resulted in dispersion of contaminated material from the immediate burial site, e.g.:

1. Transient storage above ground with potential ground surface contamination.
2. Any spillage of liquids on the ground surface
   a. Quantities and areas involved
   b. Was the contaminated material in solution or suspension?
   c. If suspended, what were the particle sizes?
3. Interaction of winds with uncovered or partially covered materials.
4. Fires or explosions in waste materials.
   a. Have any fires occurred in waste disposal areas:
      (1) during disposal operation?
      (2) after completion or closing of an area?
   b. Supply any available information obtained during or following any fires listed in (a), with respect to:

(1) cause of the fire

(2) combustible materials that were involved

(3) combustion rates, i.e. mass burned and time of burning

(4) quantities of transuranic nuclides contained in the burned materials

(5) quantities of transuranic nuclides released to the atmosphere by the fire

(6) resultant extent of ground surface contamination

B. Atmospheric monitoring

1. Is there now, or has there ever been, a routine air sampling program conducted in the immediate vicinity of the waste disposal area?

   a. If affirmative, provide information as to sampling equipment, number and locations of samplers, frequency and methods of analysis and results obtained.

   b. If negative, please state the rationale for not conducting air surveillance near waste disposal areas.

2. Describe any special air sampling that has been conducted in connection with incidents listed under IV. A.

   a. What was the particle size distribution of released transuranic elements?

   b. What were the airborne concentrations as a function of distances downwind?

C. Provide information on any sampling that has been conducted on surface waters, sediments and aquatic biota:

1. Types and frequency of sampling
2. Analyses performed
3. Results

D. Terrestrial biota

1. Describe the vegetation cover in the waste disposal area

   a. Types and densities of natural vegetation

   b. Vegetation cover directly on waste disposal sites

2. What herbivorous animals are found in the general area of the waste disposal sites?
   a. Major game species
   b. Non-game species
3. Provide information on any sampling that has been conducted on vegetation and/or animals
   a. Types, frequency of sampling
   b. Analyses performed
   c. Results

E. Underground Water
1. Describe any sampling wells located in the vicinity of the waste disposal areas:
   a. Locations
   b. Aquifer intercepted
   c. Gradients observed
2. Provide information on the sampling from these wells:
   a. Frequency and methods of sampling
   b. Analyses performed
   c. Results

F. Soil
1. Provide any available information on soil sampling conducted in the vicinity of the waste disposal areas:
   a. Locations
   b. Depth(s) and types of samples
   c. Sampling frequencies
   d. Analyses performed
   e. Results

V. Biosphere Information

A. Human population
1. Locate (map) and identify homes, schools, business, etc. and give population during working hours, evenings and nights in areas or sectors. (Degree of detail should be dependent upon proximity to, and directions from the site.)
2. Describe the composition and distribution in various areas at various times of day.

3. What is the location of human population in relation to surface water?

B. Agricultural crops

1. Describe the seasonality of the crops?
2. What is the immediate use of the crops?
3. What is the local economic importance of the crops?

C. Domestic livestock

1. What are their numbers and distribution by species?
2. What are their feeding practices?
3. What are the grazing allotments in surrounding areas?
4. What is their economic importance?

D. Native vegetation

1. Describe the major vegetation types, species and distribution.
2. What are the climax and subclimax successions on disturbed areas?
3. Ecological aspects of vegetation.
   a. What is the food base for terrestrial wildlife and domestic livestock?
   b. How much is the vegetation used for shelter and what are the implications of its removal?
   c. What has been the modification of microclimate?
   d. How has minipulation by agricultural and other agencies affected the following:
      (1) Altered plant succession
      (2) Introduced species
      (3) Current vegetative inventory

E. Wildlife resources

1. Characterize big game populations in the area.
   a. Relate State and Federal management policies
   b. Discuss populations and distributions
   c. Characterize harvesting by sportsmen and/or subsistence hunting populations

2. Describe the following local small game animal population distribution and management policies:
   a. Mammals
   b. Upland game birds
   c. Migratory waterfowl and shorebirds
3. What are the populations and distributions of the following non-game animals:
   a. Mammals?
   b. Birds?
   c. Reptiles?
   d. Amphibians?
4. Describe the aquatic biota of the waters identified above.
   a. Species (if possible) and abundance of:
      (1) fish
      (2) shellfish
      (3) waterfowl
   b. What is the relative importance of the aquatic biota:
      (1) economically?
      (2) for recreational purposes?
5. What are local rare or endangered species?

F. Supply radiation ecology studies reports.