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BURIAL OF HANFORD RADIOACTIVE WASTES

BY

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PURPOSE

The purpose of this report is to present the current policies and procedures and future plans of Hanford relative to the disposal of solid radioactive waste. The feasibility and practicability of burial ground consolidation are discussed and maps are included which indicate the location of both active and retired burial grounds.

CURRENT PRACTICES

Within the Hanford reservation there are 16 burial grounds now in active use and 35 others which have been retired. There is at least one burial ground associated with each major operating area.

Because the types of solid wastes generated by different facilities and because the geological conditions at the various burial ground locations in the operating areas are different, distinctive disposal practices have been developed for different burial grounds. The 100 Area burial grounds are near the river and are relatively close to the water table, the soils beneath some of these burial trenches have little ion adsorption capacity. Radioactive materials placed in the 100 Area trenches are normally well fixed, of short-half life or of little biological significance. Consequently, once these materials are properly disposed in the burial grounds, radiological effects on the environs are, for all practical purposes, nonexistent.

The burial grounds used by the 300 Area are 60 to 90 feet above the water table but are in locations where the soils have little ion exchange capacity.

The total curie content of the waste disposed to these burial grounds is comparatively small. The types of material placed in the 300 'N' and WYE burial grounds are necessarily diverse, because of the research facilities located in the 300 Area which are served by them. Only nonirradiated uranium contaminated waste is disposed to the other active 300 Area burial ground.

The 200 Area burial grounds are well above the water table and the soil columns, between the burial trenches and the water table, have good ion exchange capabilities. Precipitation in this area does not leach through the soil to the ground water but is taken up by plants and returned to the atmosphere or is transported to the surface via capillary action and evaporates to the atmosphere. Therefore, a mechanism for transporting radioactive materials from the burial ground to the ground water does not exist and materials properly disposed to these burial grounds do not present significant radiological problems regardless of half-life, physical or chemical nature, or biological significances. Reasonably large quantities of long-lived and very long-lived materials are deposited in these burial grounds. The kinds of materials disposed to burial grounds in the 100 or 300 Areas could be disposed to burial grounds in the 200 Area, however, the converse is not true.

Table I contains pertinent data for each active burial ground. Their locations and the locations of the terminated burial grounds are shown on Figures 1 through 8. The burial ground in 'N' Area is not shown since a definite decision has not been made on its location.

TABLE I

ACTIVE DISPOSAL FACILITIES FOR SOLID WASTE - 100 AREAS

Name	Date of First Use	Approximate Location	
B-Burial Ground	1944	N 67,000 W 83,500	~ 800' x 400' Fenced - Large area available for expansion Room for one more trench in fenced area
C-Burial Ground	1953	N 67,000 W 80,000	~ 500' x 400' Fenced - Large area available for expansion Room for no more trenches in fenced area
D-DR Burial Ground	1958	N 91,200 W 52,200	~ 300' x 250' Fenced - Limited area available for expansion Room for one more trench
F-Burial Ground	1955	N 78,100 W 31,700	~ 500' x 150' Fenced - No area available for expansion Room for one more trench in fenced area
H-Burial Ground	1949	N 94,000 W 40,100	669' x 320' Fenced - Large area available for expansion Room for two more trenches in fenced area
KE-KW Burial Ground	1955	NK 5,200 WK 3,400	~ 600' x 600' Fenced - Large area available for expansion Extension of fenced area planned
N-Burial Ground	1964	Not Yet Determined	
		200 AREAS	
Burial Ground #2	1956	N-43200 W-77000	~ 700' x 600' Fenced - Large area available for expansion
Burial Ground #4	1959	N-42300 W-77500	~ 700' x 700' Fenced - Large area available for expansion

200 AREAS (Cont'd)

Name	Date of First Use	Approximate Location	
222-S Building Dry Waste Crib	1952	N-34200 W-73600	No expansion planned
Burial Ground #10	1955	N-45800 W-55100	∿ 700' x 200' Fenced - Large area available for expansion
Burial Ground #12	1959	N-44000 W-49000	500' x 200' Fenced - Large area available for expansion
202-A Building Burial Tunnel	1956	N-40000 W-48000	Limited area for expansion

300 AREA

300 'N' Burial Ground	1953	S-6000 E-3000	480' x 570' Fenced - Can be expanded if necessary - less than one year's capacity. Room for no more trenches in the fenced area.
300 WYE Burial Ground	1962	N-12500 W-3600	1000' x 1500' Fenced - One trench being filled - less than one year's capacity. Room for 14 more trenches.
Burial Ground #7	1960	N-56600 E-12600	∿ 350' x 650' Fenced - Large area available for expansion

FUTURE PLANS

As shown in Table I, each major 100 Area site has one active burial ground, with the exception of the B-C Area which has two: the 300 Area has three active burial grounds; 200-W has two principal active burial grounds and the small 222-S Building crib; and 200-E Area has three active burial grounds (the Purex tunnel is considered here as a burial ground).

There is some consideration being given to terminating the use of one of the 100-BC Area burial grounds and expanding the boundaries of the other to accommodate the waste from both reactor buildings in that Area. If this consolidation is made, it will not be during 1963, i.e., not until the trench in the burial ground to be retired is filled.

It will be necessary to develop a new solid waste disposal facility at 100-F Area in the near future because topographical features of the existing burial ground prevent further expansion. A site on relatively high ground has been tentatively selected for the new facility.

No other burial ground location changes are now planned in the 100 Areas. Routine extensions of the burial ground boundary markers will be made in several areas during the next few years.

No extensive changes in normal operating practices in the 200 Areas are planned for the immediate future, and present burial sites are scheduled for continued use.

Use of one of the 300 Area sites will be terminated in the future. In accordance with instructions from the AEC, use of the "Wye" burial ground will be continued

only until the capacity of the existing trench is exhausted. From an operational point of view, it is desirable to continue use of this burial ground and terminate use of the "300-N" burial ground. A principal reason for this choice is contamination control. Accidents such as fire and/or windborne contamination blown from a ruptured container would be much less likely to contaminate Highway 4S because of the distance from the road and the probability that the wind direction would be from the highway toward the burial site. Other items which influenced the selection of this location are the somewhat higher elevation, as compared to the 300-N site, and the availability of telephone lines to provide emergency communication.

The state of the art of solid waste disposal is such that it is impractical at present to consolidate disposal sites beyond that outlined above, for the following reasons:

1. The only sites suitable for all types of solid waste are located on the 200 Area plateau. Transportation of all wastes to the 200 Areas would entail a substantial increase in cost, manpower and new equipment.
2. The potential for contamination spreads and higher radiation exposures to personnel handling the waste increases considerably with distance and time required for disposal.
3. It is, on occasion, undesirable to mix wastes from different areas. The radioactive materials in 100 Area wastes have reasonably short half lives, making it possible to recover equipment or other materials with minor, if any, radiation or contamination problems. Recovery would be difficult or impossible if the equipment became cross contaminated from waste generated in the 200 Areas.

4. Administrative problems would increase considerably, e.g. when high radiation levels were involved other facilities would be unable to use the burial ground until the burial was completed. During the shipment, roadways and railroad crossings would have to be barricaded to prevent undue radiation exposure. They would not be available for other traffic during the time required to transport the waste and perform the following contamination survey.
5. Any severe contamination spread at a single burial site would limit the use of the site for extended periods of time causing contaminated waste to build up in temporary storage areas which would increase the potential for other contamination spreads and higher radiation exposure.

The possibility of consolidating materials now contained in burial grounds which are no longer in use can also be considered. Many of the old 100 Area disposal sites and the old 300 Area burial grounds which contain waste contaminated only with unirradiated uranium could be consolidated without encountering severe radiation and contamination problems, but the cost would be high. Where no pressing need exists, it would be prudent to leave the burial sites undisturbed after the prescribed terminal conditions are met in order to avoid potential spread of contamination and radiation exposure. (It may be possible to release some of these sites because the radioactive material will, in time, decay to insignificant levels.)

The burial grounds in the 200 Areas would be much more difficult to consolidate. Radiation and contamination problems would be severe. Since the 200 Area plateau is the best area for underground storage on the project, there appears to be little justification to disturb these sites.

There are other items of interest which have some bearing on the quantity of space used for land burials. In the Redox Waste Handling and Decontamination Operation, considerable success has been experienced in decontaminating equipment removed from service. In several instances, where a defective unit could not be repaired, cleaning was so effective that subsequent burial was accomplished with an inexpensive plastic shroud, replacing the expensive and bulky burial box previously required. This practice will be continued whenever feasible.

Some effort is being directed toward waste incineration throughout the plant as a volume reduction measure, and it may be possible to apply this technique at other locations in the future. In the 200 Areas incineration has been primarily employed as a method for recovering plutonium; however, considerable volume reduction is realized.

HAPO personnel will continue to foster development in the radioactive waste disposal area and as technology and equipment continue to improve, better and more economical disposal methods will be employed.

POLICIES AND PROCEDURES

In the near future revised sections of the Radiation Protection Standards pertaining to solid radioactive waste disposal will be issued. Excerpts from pertinent sections are contained herein.

Standard No. 06 - Control of Exposure to Persons in the Hanford Environs

Control of Disposal of Radioactive Materials to the Ground

The number, location and use of ground disposal sites shall be controlled to minimize the number of sites and the amount of land requiring long-term radiological control. Areas containing ground disposal sites shall be

released from Hanford control only upon demonstration that the residual radioactivity in the disposal site does not and shall not constitute a radiation hazard to the public in the future.

Procedure 06.5.1 - Ground Disposal of Radioactive Waste

Introduction

Radioactive or contaminated materials which are no longer useful should be promptly removed to locations where the potential for these materials to cause personnel exposure is minimized. A basic method employed in the disposal of radioactive waste, is to place them underground. Proper disposal of radioactive materials to the ground requires that the following conditions be fulfilled:

1. The radioactive materials do not migrate from the disposal site at a rate or in sufficient amounts that may represent a significant radiation exposure source to personnel.
2. Each location where radioactive materials are disposed to the ground is identified positively and complete records are maintained of these locations as long as significant quantities of radiation materials are present.

The purpose of this Procedure is to establish for HAPO a mechanism for controlling the disposition of radioactive materials to the ground to assure that the above requirements are met.

Solid Radioactive Wastes

"Solid radioactive waste" is defined as radioactive waste which is essentially dry, or whose fluids are of small volume and contained or absorbed to the extent that they are essentially immobile during

storage. Such wastes should be disposed by underground burial whenever practicable. Liquid wastes, or non-radioactive wastes should be disposed of in other facilities.

Solid waste disposal facilities may take the form of open trenches, or of pits. Open trenches are generally adequate for the disposal of wastes which are packaged in containers of sufficient integrity to prevent dispersal of the radioactivity until the trench is backfilled. If contamination spread is likely, waste shall be disposed of in a pit with a cover, or in a trench which is immediately backfilled. Even though all waste may be packaged, a partially filled solid waste trench can give rise to very high dose rates in the vicinity of the trench, and frequent backfilling is desirable.

Solid waste disposal pits or trenches shall be enclosed by an effective barrier throughout the period of its effective use. This barrier should be established at a sufficient distance from the trench or pit to assure that the Radiation Zone boundary criteria will be met under all anticipated use. Solid waste disposal facilities shall be posted as Radiation Zones.

The effective life of a solid waste ground disposal facility can be increased in some cases by prior treatment of the waste to reduce its volume. Various methods such as baling, burning or incineration can be used. Such compaction is also beneficial in order to avoid settling subsequent to closure, which may cause waste to be exposed. There are no radiological restrictions on the volume reduction methods which may be employed, provided adequate control can be maintained over the release and spread of contamination.

Required Terminal Conditions

Solid waste burial trenches and pits shall be backfilled to normal grade, providing at least two feet of dirt cover and a radiation level of not more than 1 mrem/hour at normal grade. Erection of a mound to meet these requirements is not permitted.

The boundaries of the disposal facility shall be permanently identified with markers described in Hanford Engineering Standard AC-5-40, "Identification Markers for Buried Radioactive Material".

Barricades should be erected to prohibit vehicular traffic over any facility having a potential for cave-in.

Vegetation and animal control shall be carried out as necessary to prevent contamination problems and burial ground markers from being concealed.

It should be realized that these revised sections are in the draft stage and when the final draft is issued there may be additions, deletions, or wording changes.

SUMMARY

Solid radioactive wastes at Hanford are accommodated by local burial. Treatment such as compaction or incineration is not ordinarily practiced. The Hanford posture is to limit the burial sites to the lowest number consistent with good radiation control and sound economic practices.

It does not appear feasible to reduce the present number of active burial sites significantly in the near future. However, any plan or program which appears to have application for reducing volume and/or the number of burial sites will be given close scrutiny and adopted if found practical.

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