ADDENDUM H
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H CLOSURE

This addendum describes the performance standards that will be met and the closure and postclosure activities that will be conducted for the LLBG Trench 94. Mixed waste subject to the closure requirements is defined as dangerous waste containing a radioactive component disposed of after August 19, 1987. This addendum for LLBG Trench 94 complies with WAC 173-303-610.

H.1 Closure Plan

Mixed waste that meets land disposal restrictions (LDR) is, and will be, disposed in the LLBG – Trench 94 that is exempt from lined trench requirements in accordance with "*Request for Exemption from Lined Trench Requirements at 218-E-12B Burial Ground Trench 94*" (Addendum C, Processes Information).

The LLBG Trench 94 will be closed according to the applicable dangerous waste regulations, DOE requirements, and the best management practices available at the time of closure.

H.2 Closure Performance Standards

The disposal trench cover will be designed and located to comply with WAC 173-303-665(6) and WAC 173-303-610. The final detailed specification and/or variation for other cover designs will be provided sufficiently ahead of the desired closure date to allow for regulatory agencies to review and approve this closure plan before the initiation of the closure activities. Although a final detailed cover design cannot be provided at this time, at closure, the LLBG Trench 94 cover will be designed to adequately protect human health and the environment and meet the standards of WAC 173-303-665(6).

H.3 Pre-Closure Activities

At this time there are no plans for pre-closure activities for LLBG Trench 94. To maximize the disposal capacity of the LLBG Trench 94, the best operating method is to delay backfilling until the LLBG Trench 94 is filled with defueled reactor compartments. The selection of a final cover design has not been identified. Once a decision is made to construct final cover over LLBG Trench 94, a cover will be designed that satisfies the dangerous waste disposal requirements as defined in WAC 173-303-610. The design of LLBG Trench 94 final cover will depend on the timing of when the final cover will be installed is dependent on timing with adjacent areas and solid waste management units (SWMUs). The final cover design will satisfy the minimum requirements found in WAC 173-303-665(6) and will be designed to adequately protect human health and the environment.

The LLBG Trench 94 is located in an arid climate. To date, no known releases of mixed waste have been detected from the LLBG (Addendum D Groundwater Monitoring for Land-Based Units). Maintenance activities (Addendum C) and inspection activities (Addendum I) have been implemented during the active operation of LLBG Trench 94. As stated previously, when the LLBG Trench 94 is filled, soil will be added to make the trench match the surrounding topography and a program of erosion prevention will be initiated.

H.4 Maximum Extent of Operation

The design capacity of the LLBG Trench 94 for mixed waste conservatively is calculated to be 1,500,000 cubic meters (1,962,000 cubic yards) (Addendum A, Part A Form).

H.5 Decontaminating Structures, Equipment, and Soil

All equipment used during closure will be decontaminated as required to ensure the safety of personnel. If, after decontamination activities, waste retrieval equipment or structures are shown to have contamination above the established decontamination standards, the use of such items will be restricted or discontinued. Equipment and structures that cannot be decontaminated to operational standards and contaminated soils, pavements, and waste residuals will be disposed in accordance with WAC 173-303-610(5).

H.6 Closure of Landfill Units

Closure of the LLBG Trench 94 will be consistent with the closure requirements specified in WAC 173-303-610. The cover design(s) will also satisfy the requirements for dangerous waste disposal as defined by WAC 173-303-665(6).

H.6.1 Cover Design

The covers will consist of several layers constructed on top of a native soil base. A generalized cross-section of an example cover is shown on Figure H.1. It is assumed that before construction of the final cover, the waste form would be stabilized appropriately.

H.6.1.1 Grade Layer

The surface of the landfills will be graded and/or shaped, if necessary, to match the slope of the desired low permeability layer. Additional soil will be placed over the landfill to achieve the required cover grade. This grade layer will taper from zero thickness near the edge of the cover boundary to perhaps several meters at the center of the cover; the thickness will depend on the lateral dimensions of the particular cover and the grade of the cover.

H.6.1.2 Low Permeability Layer

The selection of an appropriate material for this layer will be based on the hazard that is to be isolated. The low permeability layer will be the primary barrier in preventing soil and/or water from migrating into the waste zone.

H.6.1.3 Drainage Layer

The drainage layer will conduct any water that percolates through the overlying layers laterally to the drainage ditch. Thus, the drainage layer will prevent hydraulic pressure from building up directly on the low permeability liner, and thereby eliminate one set of forces that will drive moisture through the primary moisture control barrier.

H.6.1.4 Plant, Animal, and Human Intrusion Layer (optional)

The performance objectives for the permanent isolation surface barrier are summarized as follows:

- Function in a semiarid to sub humid environment
- Limit the recharge of water through the waste to near zero amounts [0.05 centimeter per year ($1.6x10^{-9}$ centimeters per second)]
- Be maintenance free
- Minimize the likelihood of plant, animal, and human intrusion
- Limit the exhalation of noxious gases
- Minimize erosion related problems
- Meet or exceed WAC 173-303-655(6) cover performance requirements
- Isolate waste for 1,000 years.

To satisfy the intrusion performance objectives for Trench 94, optional layers will be included in the design of barriers that require the additional human and/or biointrusion protection to reduce either the environmental or human health risk.

H.6.1.5 Graded Filter Layer

A graded filter for each Trench consisting of crushed rock overlaid by sand will be placed on the plant, animal and human intrusion layer if incorporated into the design, or directly over the drainage layer. The graded filter will serve to separate the surface soil layer from the drainage layer. A geotextile will be placed on the top of the graded filter to decrease the potential for fine material to enter the filter and

drainage zone. The geotextile will be permeable, allowing drainage, and will not support a standing head of water.

H.6.1.6 Surface Soil Layer

The two most important factors in engineering the surface soil thickness will be the assignment of the water retention characteristics for soil and climate information. Surface soil will be placed over the geotextile to intercept, store, recycle water, and prevent damage to the underlying structure from natural and synthetic processes.

H.6.1.7 Vegetative Cover

The vegetative cover would perform three functions.

(1) The plants will return water stored in the surface soil back to the atmosphere, significantly decreasing net infiltration and reducing the amount of moisture available to penetrate the cover.

(2) The vegetation will stabilize the surface soil component of the cover against wind and water erosion.

(3) The vegetative cover will restore the appearance of the land to a more natural condition and appearance.

A mixture of seeds would be used to establish vegetation. The seed types would be selected based on resistance to drought, rooting density, and ability to extract water.

H.6.2 Wind Erosion

The principal hazard associated with wind erosion is the thinning of the cover surface soil layer. This in turn potentially could lead to breaching of the moisture barriers, gradually allowing larger quantities of water to reach the waste. The engineering approaches to mitigating wind erosion of the cover would be:

(1) Designing the surface soil layer with an appropriate total thickness to compensate for future soil loss that might result from wind erosion

(2) Establishing a vegetative cover on the surface to reduce wind erosion, and

(3) Including an appropriate coarse material (admix) in the upper layer of the surface soil to form an armor layer.

H.6.3 Water Erosion

The potential hazard associated with water erosion is the same as that for wind erosion, namely the loss of soil from the top or surface layer. Several of the following engineering approaches could be adopted to minimize the potential for water erosion:

- Limiting the surface slopes.
- Providing run-on control with the sideslope drainage ditches.
- Compacting the surface soil in a way that promotes significant infiltration rather than excessive run-off.
- Properly designing the sideslopes to prevent gully formation.
- Establishing a vegetative cover to slow surface run-off.
- Incorporating coarse material (pea gravel admix) in the upper portion of the surface soil layer to help form an erosion-resistant armor.
- Limiting flow path lengths through the use of vegetation and admix.

The cover design would be evaluated for potential erosion damage from overall soil erodibility, sheet flow, and gully formation).

H.6.4 Deep-Rooted Plants

The following design features could minimize the potential for problems with deep-rooted plants. The surface soil (top two layers) would retain most of the precipitation, because the underlying drainage layer would have significantly higher permeability and much less water retention capacity. Therefore, it is expected that vegetation preferentially would occupy the surface soil layer and not have an affinity for growing into the drier underlying layers.

The thickness of the surface soils would be sized to promote the development of semiarid deep-rooted perennial grasses and to discourage the development of deep-rooting intrusive species.

H.7 Schedule for Closure

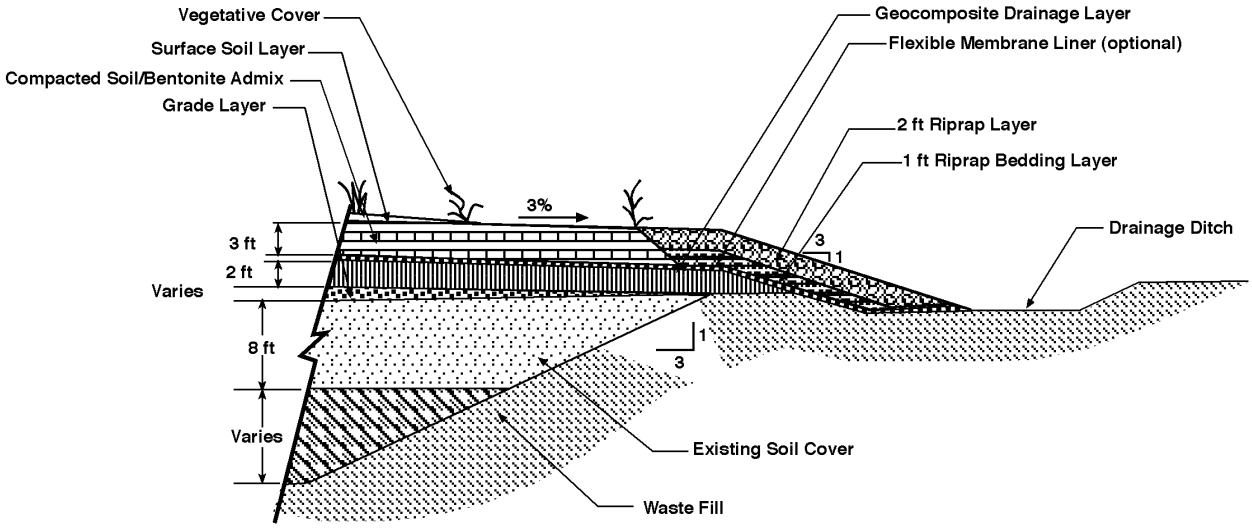
Closure of the LLBG Trench 94 is not expected to occur within the next 30 or more years. At the time of closure, this closure plan will be updated to reflect the current closure plan schedule per WAC 173-303-830, Appendix I. In addition, when a closure date is established, a revised closure plan and closure schedule will be submitted to Ecology that contains detailed information regarding specific activities and implementation timeframes.

H.8 Extension for Closure

An extension for closure request is anticipated to complete the closure/postclosure process of the LLBG Trench 94.

H.9 Postclosure Plan

Because of the long active life of the LLBG Trench 94, a comprehensive postclosure plan will be developed when closure becomes imminent.



Notes:

1. Drawing not to scale.
2. Cover shown for unlined trench.
   Similar configuration for lined trench.

To convert feet (ft) to meters, multiply by 0.3048.

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Figure H.1 Typical Hanford Site Landfill Cover Design.

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