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CHAPTER 11.0
CLOSURE

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1 **11.0 CLOSURE**

2 This chapter discusses preclosure, closure, and post closure activities for the IDF. This closure plan
3 complies with [WAC 173-303-610](#) and represents the baseline for closure.

4 The IDF has been constructed on 25 hectares of vacant land southwest of the PUREX Plant in the 200
5 East Area [see the topographic map on file at the Department of Ecology library (3100 Port of Benton
6 Boulevard, Richland, WA 99354)]. The landfill is segregated into a RCRA permitted side and a
7 non-RCRA permitted side. The scope of this permit is limited to the western side of the landfill where
8 the RCRA waste will be placed. The waste containers and bulk waste that meet the IDF waste acceptance
9 criteria will be inventoried, and disposed in this lined landfill. Leachate collected from the lined landfill
10 will be transferred to leachate collection tanks located in proximity to the landfill for subsequent
11 treatment.

12 A more detailed discussion of IDF waste types and the identification of the IDF processes and equipment
13 are provided in Chapters 3.0 and 4.0, and attendant appendices. The IDF only will accept and dispose
14 waste containers and bulk waste that meet the IDF waste acceptance criteria, RCRA and LDR.

15 The closure process will be the same for partial closure or closure of the entire IDF. The remainder of
16 this chapter describes the performance standards that will be met, and the closure/post closure activities
17 that will be conducted.

18 **11.1 Closure Plan**

19 Waste containers and bulk waste that meet the IDF waste acceptance criteria will be disposed in the lined
20 landfill that complies with [WAC 173-303-665](#) standards (Chapter 4.0). The IDF will be closed according
21 to current applicable [WAC 173-303](#) regulations, DOE requirements, best management practices, and will
22 be integrated with the overall cleanup activities performed under the Tri-Party Agreement (HFFACO).

23 The disposal landfill cover will be designed and located to comply with [WAC 173-303-665\(6\)](#) and
24 [WAC 173-303-610](#). The specification and/or variation for other cover designs will be provided at the
25 time of closure once a hazard(s) has been defined.

26 **11.2 Closure Performance Standards**

27 Closure requirements found in [WAC 173-303-665\(6\)](#), incorporated by reference, and detailed here in
28 Chapter 11.0 of the IDF portion of the permit, will make up the closure performance standards for the
29 IDF.

30 **11.3 Preclosure Activities**

31 Preclosure activities could include, at a minimum, placing interim or final covers over the filled portions
32 of the landfill as the landfill is expanded to accept more waste. Placement of covers over the filled
33 portions might be deferred until closure of all the IDF. Once a decision is made to construct the final
34 cover over the landfill, a closure cover design will be used that satisfies the dangerous waste disposal
35 requirements defined in [WAC 173-303](#).

36 The selection of a final cover design has not been identified. Figure 11-1 shows an example of a typical
37 Hanford Site landfill cover design. Design(s) will include features to satisfy the minimum requirements
38 found in [WAC 173-303-665\(6\)](#).

39 **11.4 Maximum Extent of Operation**

40 The maximum process design capacity of the IDF conservatively is calculated to be 100 hectare-meters,
41 which is 1,000,000 cubic meters (Chapter 1.0, Part A, Form, Section III). The IDF landfill will be
42 segregated into a RCRA permitted side of 50 hectare-meters and a non-RCRA permitted side of
43 50 hectare-meters.

44 **11.5 Decontaminating Equipment and Structures**

45 All ancillary equipment and its secondary containment, and instrumentation (e.g., level-indicating

1 devices, leak detection devices, pumps, piping) meet the definition of "debris" as defined in
2 [WAC 173-303-040](#). Items in direct contact with mixed waste are assumed to meet the definition of
3 "hazardous debris" as defined in [WAC 173-303-040](#).

4 Currently, three options are available for treating hazardous debris. The first option is to treat the debris
5 using one of the three debris treatment technologies-extraction, destruction, or immobilization-as
6 described in [40 CFR 268.45](#). If the hazardous debris is treated using approved extraction or destruction
7 technologies, the debris is no longer required to be managed as a dangerous waste as long as the debris
8 does not exhibit a characteristic of a dangerous waste. If hazardous debris contaminated with a listed
9 waste is treated using an immobilization technology, it remains a listed waste, even after the LDR
10 treatment standards are met unless Ecology makes a case-by-case determination that the debris "no longer
11 contains" a mixed waste. In effect, by making this "contained-in" determination on a case-by-case basis,
12 Ecology will be setting clean closure standards in accordance with the closure performance standards of
13 [WAC 173-303-610\(2\)\(a\)\(ii\)](#).

14 The second option is to treat the hazardous debris to meet the constituent-specific LDR treatment standard
15 for the waste or waste-specific constituents contaminating the debris; however, such debris, even after
16 treatment, may be considered a dangerous waste under the dangerous waste regulations and may require
17 management at a facility permitted to manage dangerous waste.

18 The third option involves obtaining a "contained-in determination" for the hazardous debris, thereby
19 rendering the waste "non-hazardous" for those waste-specific-listed constituents that fall below MTCA
20 method B risk-based health limits. Moreover, it must be proven that the debris does not designate as a
21 characteristic waste under [WAC-173-303](#).

22 **11.5.1 Contaminated Soil**

23 Contaminated soil could be generated as a result of spill cleanup. Since the majority of IDF operations
24 will be performed within secondary containment (see Chapters 4.0 and 6.0) the potential for spilling
25 dangerous waste into the surrounding soil is low. Contaminated soil generated as a result of a dangerous
26 waste spill will be managed pursuant to [WAC-173-303-200](#).

27 Once the soil is designated, appropriate treatment and disposal or storage options will be determined and
28 implemented.

29 A contained-in determination could also be sought for contaminated soil generated as a result of a spill.
30 For contaminated media the contained-in policy requires that a statistically based sampling plan be used
31 for obtaining the data to support a contained-in demonstration. The contained-in policy does not require
32 that the waste be analytically nondetectable for it to be considered nondangerous. However, the
33 analytical results must prove that the listed constituents in the soil are below health-based limits as
34 provided in [WAC 173-303-610\(2\)\(b\)\(i\)](#) and that the soil does not exhibit any dangerous waste
35 characteristics (i.e., soil does not designate for D codes). If approved by Ecology, this could allow waste
36 that falls below specific health-based levels to be disposed of without requiring treatment

37 **11.6 Closure of Landfill Units**

38 Closure of the IDF will be consistent with the closure requirements specified in [WAC-173-303-665\(6\)](#)
39 and [WAC 173-303-610](#). The cover design(s) will satisfy the requirements of [WAC 173-303-665\(6\)](#).

40 **11.6.1 Cover Design**

41 The cover could consist of several layers constructed on top of a native soil base. A generalized
42 cross-section of an example cover is shown on Figure 11-1. It is assumed that before construction of the
43 final cover, the waste form would be stabilized appropriately.

44 **11.6.1.1 Grade Layer**

45 The surface of the landfill would be graded and/or shaped, if necessary, to match the slope of the desired
46 low-permeability layer. Additional soil would be placed over the landfill to achieve the required cover

1 grade. This grade layer could taper from zero thickness near the edge of the cover boundary to perhaps
2 several meters at the center of the cover; the thickness would depend on the lateral dimensions of the
3 particular cover and the grade of the cover.

4 **11.6.1.2 Low-Permeability Layer**

5 The selection of an appropriate material for this layer would be based on the hazard that is to be isolated.
6 The low-permeability layer will be the primary barrier in preventing soil and/or water from migrating into
7 the waste zone and meet [WAC 173-303-655](#)(6) (v) "Have a permeability less than or equal to the
8 permeability of any bottom liner system or natural sub soils present".

9 **11.6.1.3 Drainage Layer**

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

14 **11.6.1.4 Plant, Animal, and Human Intrusion Layer (optional)**

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

- 16 • Function in a semiarid to sub-humid environment
- 17 • Limit the recharge of water through the waste to near zero amounts [0.05 centimeter per year
18 (1.6x10⁻⁹ centimeters per second)]
- 19 • Be maintenance free
- 20 • Minimize the likelihood of plant, animal, and human intrusion
- 21 • Limit the exhalation of noxious gases
- 22 • Minimize erosion-related problems
- 23 • Meet or exceed [WAC 173-303-665](#)(6) cover performance requirements
- 24 • Isolate waste for 1,000 years.

25 To satisfy the intrusion performance objective, an optional layer would be included in the design of
26 barriers that require the additional human and/or biointrusion protection to reduce either the
27 environmental or human health risk.

28 **11.6.1.5 Graded Filter Layer**

29 A graded filter consisting of crushed rock overlaid by sand would be placed on the plant, animal, and
30 human intrusion layer if incorporated into the design, or directly over the drainage layer. The graded
31 filter would serve to separate the surface soil layer from the drainage layer. A geotextile would be placed
32 on the top of the graded filter to decrease the potential for fine material to enter the filter and drainage
33 zone. The geotextile would be permeable, allowing drainage, and would not support a standing head of
34 water.

35 **11.6.1.6 Surface Soil Layer**

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

40 **11.6.1.7 Vegetative Cover**

41 The vegetative cover would perform three functions. First, the plants would return water stored in the
42 surface soil back to the atmosphere, significantly decreasing net infiltration and reducing the amount of
43 moisture available to penetrate the cover. Second, the vegetation would stabilize the surface soil

1 component of the cover against wind and water erosion. Finally, the vegetative cover would restore the
2 appearance of the land to a more natural condition and appearance.

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

5 **11.6.2 Wind Erosion**

6 The principal hazard associated with wind erosion is the thinning of the cover surface soil layer. This in
7 turn potentially could lead to breaching of the moisture barriers, gradually allowing larger quantities of
8 water to reach the waste. The engineering approaches to mitigating wind erosion of the cover would be
9 (1) designing the surface soil layer with an appropriate total thickness to compensate for future soil loss
10 that might result from wind erosion, (2) establishing a vegetative cover on the surface to reduce wind
11 erosion, and (3) including an appropriate coarse material (admix) in the upper layer of the surface soil to
12 form an armor layer.

13 **11.6.3 Water Erosion**

14 The potential hazard associated with water erosion is the same as that for wind erosion, namely the loss of
15 soil from the top or surface layer.

16 Several of the following engineering approaches could be adopted to minimize the potential for water
17 erosion:

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

27 The cover design would be evaluated for potential erosion damage from overall soil erodibility, sheet
28 flow, and gulying.

29 **11.6.4 Deep-Rooted Plants**

30 The following design features could minimize the potential for problems with deep-rooted plants.

- 31 • The surface soil (top two layers) would retain most of the precipitation, because the underlying
32 drainage layer would have significantly higher permeability and much less water retention
33 capacity. Therefore, it is expected that vegetation preferentially would occupy the surface soil
34 layer and not have an affinity for growing into the drier underlying layers.
- 35 • The thickness of the surface soils would be sized to promote the development of semiarid
36 deep-rooted perennial grasses and to discourage the development of deep-rooting intrusive
37 species.

38 **11.7 Schedule for Closure**

39 As stated previously, closure of the IDF will be a complex process. At the time of closure, this closure
40 plan will be updated to reflect the current closure plan schedule per [WAC 173-303-830](#), Appendix I. In
41 addition, when a closure date is established, a revised closure plan and closure schedule will be submitted
42 to Ecology that contains detailed information regarding specific activities and implementation
43 timeframes.

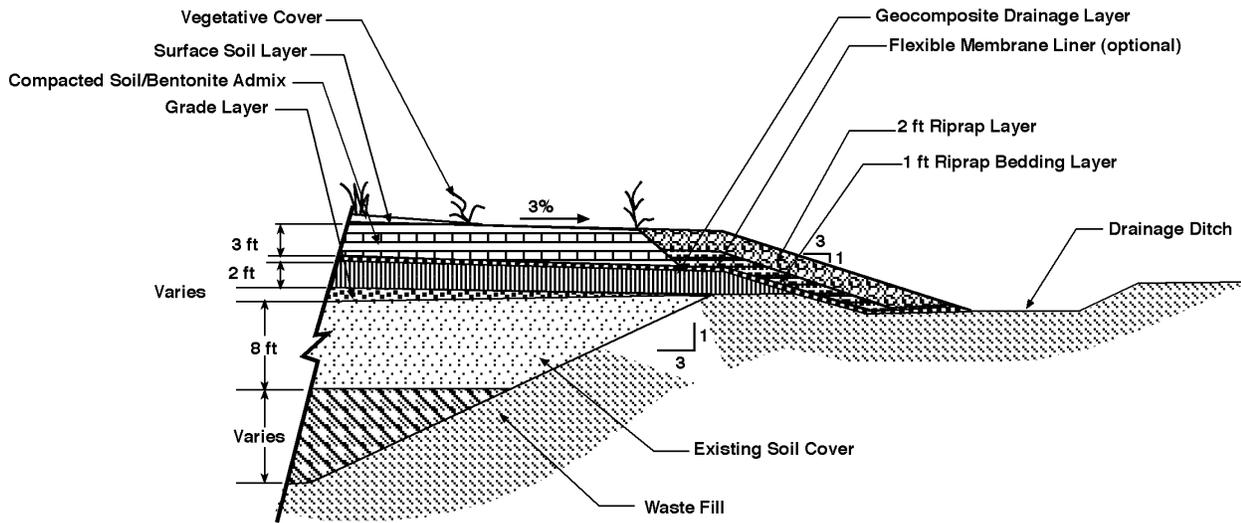
1 **11.8 Extension for Closure**

2 An extension for closure request is anticipated to complete the closure/post closure process of the IDF.

3 **11.9 Postclosure Plan**

4 Because of the long active life of the IDF, a comprehensive post closure plan will be developed when
5 closure becomes imminent or when 200 Areas cleanup activities prescribed by the Tri-Party Agreement
6 require integration.

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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 11.1. Typical Hanford Site Landfill Cover Design