

ATTACHMENT I

CLOSURE PLAN

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1 Introduction
2

3 This Permit Attachment contains the Closure Plan that describes the activities necessary to close
4 the Waste Isolation Pilot Plant (**WIPP**) individual units and facility. Since the current plans for
5 operations extend over several decades, the Permittees will periodically reapply for an operating
6 permit in accordance with Title 20 of the New Mexico Administrative Code, Chapter 4, Part 1
7 (**20.4.1 NMAC**), Subpart 900 (incorporating 40 CFR §270.10(h)). Consequently, this Closure Plan
8 describes several types of closures. The first type is panel closure, which occurs as underground
9 hazardous waste disposal units (**HWDUs**) are filled. Final closure at the end of the Disposal Phase
10 will entail “clean” closure of the two storage units on the surface and construction of the four shaft
11 seal systems. Finally, in the event a new permit is not issued prior to expiration of an existing
12 permit, a modification to this Closure Plan will be sought to perform contingency closure.
13 Contingency closure defers the final closure of waste management facilities such as the Waste
14 Handling Building Container Storage Unit (**WHB Unit**), Staging Areas, the conveyances, the shafts,
15 and the haulage ways because these will be needed to continue operations with non-mixed
16 Transuranic (**TRU**) waste.
17

18 The hazardous waste management units (**HWMUs**) addressed in this Closure Plan include the
19 aboveground HWMU in the WHB, the parking area HWMU, and Panels 1 through 8, each
20 consisting of seven rooms. In addition, the disposal area access drifts shown as E-300, E-140, W-
21 30, and W-170 between S-1600 and S-3650 on Figure I-1 may, at some time in the future, be
22 needed for waste disposal. These access drifts, if used for disposal, are also subject to this Closure
23 Plan.
24

25 This plan was submitted to the New Mexico Environment Department (**NMED**) and the U.S.
26 Environmental Protection Agency (**EPA**) in accordance with 20.4.1.900 NMAC (incorporating 40
27 CFR §270.14(b)(13)). Closure at the panel level will include the construction of barriers to limit the
28 emission of hazardous waste constituents from the panel into the mine ventilation air stream below
29 levels that meet environmental performance standards¹ and to mitigate the impacts of methane
30 buildup and deflagration that may be postulated for some closed panels. The Post-Closure Plan
31 (Permit Attachment J) includes the implementation of institutional controls to limit access and
32 groundwater monitoring to assess disposal system performance. Until final closure is complete and
33 has been certified in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.115), a copy

¹ The mechanism for air emissions prior to closure is different than the mechanism after closure. Prior to closure, volatile organic compounds (VOC) will diffuse through drum filters based on the concentration gradient between the disposal room and the drum headspace. These VOCs are swept away by the ventilation system, thereby maintaining a concentration gradient that is assumed to be constant. Hence, the VOCs in the ventilation stream are a function of the number of containers only. After closure, the panel air will reach an equilibrium concentration with the drum headspace and no more diffusion will occur. The only mechanism for release into the mine ventilation system is due to pressure that builds up in the closed panel. This pressure arises from the creep closure mechanism that is reducing the volume of the rooms and from the postulated generation of gas as the result of microbial degradation of organic matter in the waste. Consequently, the emissions after panel closure are a direct function of pressurization processes and rates within the panel.

1 of the approved Closure Plan and all approved revisions will be on file at the WIPP facility and will
2 be available to the Secretary of the NMED or the EPA Region VI Administrator upon request.
3

4 I-1 Closure Plan

5
6 This Closure Plan is prepared in accordance with the requirements of 20.4.1.500 NMAC
7 (incorporating 40 CFR §264 Subparts G, I, and X), Closure and Post-Closure, Use and
8 Management of Containers, and Miscellaneous Units. The WIPP underground HWDUs, including
9 Panels 1 through 8 and the disposal area access drifts, designated as Panels 9 and 10 on Figure
10 I-1, will be closed to meet the performance standards in 20.4.1.500 NMAC (incorporating 40 CFR
11 §264.601). The WIPP surface facilities, including Waste Handling Building Container Storage Unit,
12 the Waste Handling Building Staging Areas, the TMF Staging Area, the Parking Area Staging Area
13 and the Parking Area Container Storage Unit, will be closed in accordance with 20.4.1.500 NMAC
14 (incorporating 40 CFR §264.178). For final facility closure, this plan also includes closure and
15 sealing of the facility shafts in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.601).
16

17 Following completion of waste emplacement in each underground HWDU, the HWDU will be
18 closed. The Permittees will notify the NMED of the closure of each underground HWDU as
19 specified in the schedule in Figure I-2. For the purpose of this Closure Plan, panel closure is
20 defined as the process of rendering underground HWDUs in the repository inactive and closed
21 according to the facility Closure Plan. The Post-Closure Plan (Permit Attachment J) addresses
22 requirements for future monitoring that are deemed necessary for the post-closure period, including
23 monitoring closed panels prior to final facility closure.
24

25 For the purposes of this Closure Plan, final facility closure is defined as closure that will occur when
26 all waste disposal areas are filled or when the WIPP achieves its capacity of 6.2 million cubic feet
27 (ft³) (175,600 cubic meters (m³)) of TRU mixed waste. At final facility closure, the surface container
28 storage areas will be closed, and equipment that can be decontaminated and used at other
29 facilities will be cleaned and sent off site. Equipment that cannot be decontaminated plus any
30 derived waste resulting from decontamination will be placed in the last open underground HWDU.
31 Stockpiled salt may be placed in the underground; it may be used as the core material for the berm
32 component of the permanent marker system; or it must be otherwise disposed of in accordance
33 with Sections 2 and 3 of the Minerals Act of 1947 (30 U.S.C. §§602 and 603). In addition, shafts
34 and boreholes which lie within the WIPP Site Boundary and penetrate the Salado will be plugged
35 and sealed, and surface and subsurface facilities and equipment will be decontaminated and
36 removed. Final facility closure will be completed to demonstrate compliance with the Closure
37 Performance Standards contained in 20.4.1.500 NMAC (incorporating 40 CFR §264.111, 178, and
38 601).
39

40 In the event the Permittees fail to obtain an extension of the hazardous waste permit in accordance
41 with 20.4.1.900 NMAC (incorporating 40 CFR §270.51) or fail to obtain a new permit in accordance
42 with 20.4.1.900 NMAC (incorporating 40 CFR §270.10(h)), the Permittees will seek a modification
43 to this Closure Plan in accordance with 20.4.1.900 NMAC (incorporating 40 CFR 270.42) to

1 accommodate a contingency closure. Under contingency closure, storage units will undergo clean
2 closure in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.178) waste handling
3 equipment, shafts, and haulage ways will be inspected for hazardous waste residues (using,
4 among other techniques, radiological surveys to indicate potential hazardous waste releases as
5 described in Permit Attachment I3) and decontaminated as necessary, and underground HWDUs
6 that contain radioactive mixed waste will be closed in accordance with the panel closure design
7 described in this Closure Plan. Final facility closure, however, will be redefined and a request for
8 a time extension for final closure will be requested. A copy of this Closure Plan will be maintained
9 by the Permittees at the WIPP facility and at the Department of Energy (DOE) Carlsbad Field
10 Office. The primary contact person at the WIPP facility is:

11
12 Manager, Carlsbad Field Office
13 U.S. Department of Energy
14 Waste Isolation Pilot Plant
15 P. O. Box 3090
16 Carlsbad, New Mexico 88221-3090
17 (505) 234-7300
18

19 I-1a Closure Performance Standard
20

21 The closure performance standard specified in 20.4.1.500 NMAC (incorporating 40 CFR §264.111),
22 states that the closure shall be performed in a manner that minimizes the need for further
23 maintenance; that minimizes, controls, or eliminates the escape of hazardous waste; and that
24 conforms to the closure requirements of §264.178 and §264.601. These standards are discussed
25 in the following paragraphs.
26

27 I-1a(1) Container Storage Units
28

29 Closure of the permitted container storage units (the Waste Handling Building Unit and Parking
30 Area Unit) and Staging Areas will be accomplished by removing all waste and waste residues.
31 Indication of waste contamination will be based, among other techniques, on the use of radiological
32 surveys as described in Permit Attachment I3. Radiological surveys use very sensitive radiation
33 detection equipment to indicate if there has been a potential release of TRU mixed waste, including
34 hazardous waste components, from a container. This allows the Permittees to indicate potential
35 releases that are not detectable from visible evidence such as stains or discoloration. Visual
36 inspection and operating records will also be used to identify areas where decontamination is
37 necessary. Contaminated surfaces will be decontaminated until radioactivity is below free release
38 limits². Once surfaces are determined to be free of radioactive waste constituents, they will be
39 tested for hazardous waste contamination. These surface decontamination activities will ensure
40 the removal of waste residues to levels protective of human health and the environment. The facility

² The free release criteria for items, equipment, and areas is < 20 dpm/100 cm² for alpha radioactivity and < 200 dpm/100 cm² for beta-gamma radioactivity.

1 is expected to require no decontamination at closure because any waste spilled or released during
2 operations will be contained and removed immediately. Solid waste management units associated
3 described in Permit Module VII will be subject to closure. In the event portions of these units which
4 require decontamination cannot be decontaminated, these portions will be removed and the
5 resultant wastes will be managed as appropriately.
6

7 Once the container storage and staging areas/ units are decontaminated and certified by the
8 Permittees to be clean, no further maintenance is required. The facilities and equipment in these
9 units will be reused for other purposes as needed.

10 I-1c Maximum Waste Inventory

11 The WIPP will receive no more than 6.2 million ft³ (175,600 m³) of TRU mixed waste. Excavations
12 are mined as permitted when needed during operations to maintain a reserve of disposal areas.
13 The amount of waste placed in each room is limited by structural and physical considerations of
14 equipment and design. Waste volumes include waste received from off-site generator locations as
15 well as derived waste from disposal and decontamination operations. Maximum waste volumes in
16 the disposal panels are calculated as follows: for contact-handled (CH) TRU mixed waste,
17 assuming 100 percent 55-gallon drums--11,502 7-packs consisting of 80,514 drums and 591,800
18 ft³ (16,760 m³) of waste; for 100 percent standard waste boxes (SWB)--11,580 SWBs and 767,750
19 ft³ (21,740 m³) of waste; and for remote-handled (RH) TRU mixed waste: 730 canisters containing
20 22,976 ft³ (650.6 m³) of waste for each panel except Panels 1 and 2, which contains no RH TRU
21 mixed waste. Since the CH TRU mixed waste can arrive in any combination of 7-packs, 4-packs,
22 3-packs, SWBs and TDOPs and SWBs, a fixed volume is not set for each panel. Furthermore, the
23 placement of backfill materials to modify chemical nature of brines over the long-term will likely
24 result in fewer containers per panel as described in Permit Attachment M2. For closure planning
25 purposes, ~~a maximum achievable volume is used. of This equates to 662,400 ft³ (18,750 m³) of~~
26 ~~contact handled (CH) TRU mixed waste per panel is used. 81,000 containers were assumed in~~
27 ~~design calculations since, for air dispersion modeling, it is important to maximize the number of~~
28 ~~container vents through which volatile organic compounds (VOC) may be released. In reality, using~~
29 ~~the 40 percent-60 percent mix, there would be only 51,000 containers in a panel, containing 56,000~~
30 ~~vents (2 vents per SWB).~~

31 The maximum extent of operations during the term of this permit is expected to be Panels 1
32 through 4 and Panels 9 and 10 as shown on Figure I-1, the WHB Container Storage Unit, and the
33 Parking Area Container Storage Unit. Note that panels 4, 9, and 10 are scheduled for excavation
34 only under this permit. If other waste management units are permitted during the Disposal Phase,
35 this Closure Plan will be revised to include the additional waste management units. At any given
36 time during disposal operations, it is possible that two rooms may be receiving waste for disposal
37 at the same time. Underground HWDUs in which disposal has been completed (i.e., in which CH
38 and RH TRU mixed waste emplacement activities have ceased) will undergo panel closure.

1 I-1d(1) Schedule for Panel Closure

2 The anticipated schedule for the closure of each of the underground HWDUs known as Panels 2
3 through 8 is shown in Figure I-2. This schedule assumes there will be little contamination within the
4 exhaust drift of the panel. The following assumptions are made in estimating the time that closure
5 will be initiated at each underground HWDU: waste operations are assumed to begin in July 1998
6 for planning purposes; throughput for CH waste is 784 drums per week (7 pallets per day, 4 days
7 per week, 28 drums per pallet); and the capacity of a panel is 81,000 drums; RH TRU mixed waste
8 emplacement does not impede CH TRU mixed waste throughput. Under these assumptions, a
9 minimum of 104 weeks is needed to emplace the waste. Allowing a 25 percent contingency for
10 maintenance delays and time to transition from one room to another, it is estimated that a panel
11 will be filled 2.5 years after emplacement is initiated. This means that underground HWDUs will be
12 ready for closure according to the schedule in Table I-1. These dates are estimates for planning
13 and permitting purposes. Actual dates may vary depending on the availability of waste from the
14 generator sites. Waste availability at maximum throughput is not anticipated immediately as
15 assumed here.

16 I-1e(2)(b) Decontamination Activities, Surface Container Storage Units

17 The procedures employed for waste receipt at the WIPP facility minimize the likelihood for any
18 waste spillage to occur outside the WHB. TRU mixed waste is shipped to the WIPP facility in
19 approved shipping containers (e.g. Contact- or Remote-Handled Packages) that are not opened
20 until they are inside the WHB. Therefore, it is unlikely that soil in the Parking Area Unit or
21 elsewhere in the vicinity of the WHB will become contaminated with TRU mixed waste constituents
22 as a result of TRU mixed waste management activities. An evaluation of the soils in the vicinity of
23 the WHB will only be necessary if a documented event resulting in a release has occurred outside
24 the WHB.

TABLE I3-3
RADIOLOGICAL SURVEYS DURING RH TRU MIXED WASTE PROCESSING

<u>Steps in TRU Mixed Waste Processing</u>	<u>Surface Contamination Survey</u>	<u>Dose Rate Survey</u>
<u>Exterior of cask on arrival at WIPP</u>	<u>X</u>	<u>X</u>
<u>During removal of outer lid closure from RH-TRU 72-B cask</u>	<u>X</u>	<u>X</u>
<u>During removal of lid closure from RH-TRU 72-B cask inner vessel</u>	<u>X</u>	
<u>After removal of upper impact limiter on the CNS 10-160B cask</u>	<u>X</u>	<u>X</u>
<u>After removal of the CNS 10-160B cask from the lower impact limiter</u>	<u>X</u>	<u>X</u>
<u>During transfer of waste drums in the Hot Cell into the disposal canister</u>	<u>X</u>	
<u>During transfer of the waste canister from the cask to the facility cask</u>	<u>X</u>	
<u>Interior of cask inside the RH Bay after unloading of waste canister or drums</u>	<u>X</u>	
<u>Exterior of shield plug subsequent to final canister emplacement</u>		<u>X</u>