

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26

RENEWAL APPLICATION
CHAPTER I
CLOSURE PLAN

Waste Isolation Pilot Plant
Hazardous Waste Facility Permit
Draft Renewal Application
May 2009

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

(This page intentionally blank)

RENEWAL APPLICATION CHAPTER I

CLOSURE PLAN

TABLE OF CONTENTS

1		
2		
3		
4		
5		
6	List of Tables	I-ii
7	List of Figures	I-ii
8	Introduction	I-1
9	I-1 Closure Plan	I-2
10	I-1a Closure Performance Standard	I-3
11	I-1a(1) Container Storage Units	I-3
12	I-1a(2) Miscellaneous Unit	I-4
13	I-1a(3) Post-Closure Care	I-5
14	I-1b Requirements	I-6
15	I-1c Maximum Waste Inventory	I-6
16	I-1d Schedule for Closure	I-6
17	I-1d(1) Schedule for Panel Closure	I-7
18	I-1d(2) Schedule for Final Facility Closure	I-7
19	I-1d(3) Extension for Closure Time	I-9
20	I-1d(4) Amendment of the Closure Plan	I-9
21	I-1e Closure Activities	I-10
22	I-1e(1) Panel Closure	I-10
23	I-1e(2) Decontamination and Decommissioning	I-12
24	I-1e(2)(a) Determine the Extent of Contamination	I-13
25	I-1e(2)(b) Decontamination Activities	I-14
26	I-1e(2)(c) Dismantling	I-17
27	I-1e(2)(d) Closure of Open Underground HWDU	I-18
28	I-1e(2)(e) Final Facility Closure	I-18
29	I-1e(2)(f) Final Contouring and Revegetation	I-19
30	I-1e(2)(g) Closure, Monuments, and Records	I-19
31	I-1e(3) Performance of the Closed Facility	I-20
32	I-2 Notices Required for Disposal Facilities	I-21
33	I-2a Certification of Closure	I-21
34	I-2b Survey Plat	I-21
35	I-3 List of References	I-22

List of Tables

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Table

Title

- I-1 Anticipated Earliest Closure Dates for the Underground HWDUs
- I-2 Anticipated Overall Schedule for Closure Activities
- I-3 Governing Regulations for Borehole Abandonment

List of Figures

Figure

Title

- I-1 Location of Underground HWDUs and Anticipated Closure Locations
- I-2 WIPP Panel Closure Schedule
- I-3 WIPP Facility Final Closure Schedule
- I-4 Design of a Panel Closure System
- I-5 Typical Disposal Panel
- I-6 Approximate Locations of Boreholes in Relation to the WIPP Underground

1 the impacts of methane flammable gas buildup and deflagration impacts that may be are
2 postulated for some closed panels. Renewal Application Chapter J (Post-Closure Plan) includes
3 the implementation of institutional controls to limit access and groundwater monitoring to assess
4 disposal system performance. Until final closure is complete and has been certified in
5 accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.115), a copy of the approved
6 Closure Plan and all approved revisions will be on file at the WIPP facility and will be available
7 to the Secretary of the NMED or the EPA Region VI Administrator upon request.
8

9 I-1 Closure Plan

10 This Closure Plan is prepared in accordance with the requirements of 20.4.1.500 NMAC
11 (incorporating 40 CFR §264 Subparts G, I, and X), Closure and Post-Closure, Use and
12 Management of Containers, and Miscellaneous Units. The WIPP underground HWDUs,
13 including Panels 1 through 7 8 on Figure I-1, will be closed under this permit to meet the
14 performance standards in 20.4.1.500 NMAC (incorporating 40 CFR §264.601). The WIPP
15 surface facilities, including ~~Waste Handling Building Container Storage~~ WHB Unit and the
16 Parking Area Container Storage Unit (Parking Area Unit), will be closed in accordance with
17 20.4.1.500 NMAC (incorporating 40 CFR §264.178). The Permittees may perform partial
18 closure of the WHB and or Parking Area PAU HWMUs prior to final facility closure and
19 certification. For final facility closure, this plan also includes closure of future waste disposal
20 areas including Panels 8 9 through and 10, and closure and sealing of the facility shafts in
21 accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.601).
22

23 Following completion of waste emplacement in each underground HWDU, the HWDU will be
24 closed. The Permittees will notify the NMED of the closure of each underground HWDU as
25 specified in the schedule in Figure I-2. For the purpose of this Closure Plan, panel closure is
26 defined as the process of rendering underground HWDUs in the repository inactive and closed
27 according to the facility Closure Plan. Renewal Application Chapter J addresses requirements
28 for future monitoring that are deemed necessary for the post-closure period, including
29 monitoring closed panels prior to final facility closure.
30

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

1 Boundary and ~~that~~ penetrate the Salado Formation will be plugged and sealed, and surface and
2 subsurface facilities and equipment will be decontaminated and removed. Final facility closure
3 will be completed to demonstrate compliance with the Closure Performance Standards contained
4 in 20.4.1.500 NMAC (incorporating 40 CFR §264.111, 178, and 601).

5
6 In the event the Permittees fail to obtain an extension of the hazardous waste permit in
7 accordance with 20.4.1.900 NMAC (incorporating 40 CFR §270.51) or fail to obtain a new
8 permit in accordance with 20.4.1.900 NMAC (incorporating 40 CFR §270.10(h)), the Permittees
9 will seek a modification to this Closure Plan in accordance with 20.4.1.900 NMAC
10 (incorporating 40 CFR §270.42) to accommodate a contingency closure. Under contingency
11 closure, storage units will undergo clean closure in accordance with 20.4.1.500 NMAC
12 (incorporating 40 CFR §264.178); ~~w~~ Waste handling equipment, shafts, and haulage ways will
13 be inspected for hazardous waste residues (using, among other techniques, radiological surveys
14 to indicate potential hazardous waste releases as described in Renewal Application Appendix I3
15 (Radiological Surveys to Indicate Potential Hazardous Releases) and decontaminated as
16 necessary. ~~and u~~ Underground HWDUs that contain radioactive mixed waste will be closed in
17 accordance with the panel closure design described in this Closure Plan. Final facility closure,
18 however, will be redefined and a request for a time extension for final closure will be requested.
19 A copy of this Closure Plan will be maintained by the Permittees at the WIPP facility and at the
20 Department of Energy (DOE) Carlsbad Field Office. The primary contact person at the WIPP
21 facility is:

22
23 Manager, Carlsbad Field Office
24 U.S. Department of Energy
25 Waste Isolation Pilot Plant
26 P. O. Box 3090
27 Carlsbad, New Mexico 88221-3090
28 (505) (575) 234-7300
29

30 I-1a Closure Performance Standard

31 The closure performance standard specified in 20.4.1.500 NMAC (incorporating 40 CFR
32 §264.111), states that the closure shall be performed in a manner that minimizes the need for
33 further maintenance; that minimizes, controls, or eliminates the escape of hazardous waste; and
34 that conforms to the closure requirements of §264.178 and §264.601. These standards are
35 discussed in the following paragraphs.

36 I-1a(1) Container Storage Units

37
38 Final or partial closure of the permitted container storage units (the ~~Waste Handling~~
39 ~~Building~~ WHB Unit and Parking Area Unit) will be accomplished by removing all waste and
40 waste residues. Indication of waste contamination will be based, among other techniques, on the
41 use of radiological surveys as described in Renewal Application Appendix I3 (Radiological
42 Surveys to Indicate Potential Hazardous Waste Releases). Radiological surveys use very
43 sensitive radiation detection equipment to indicate if there has been a potential release of TRU

1 mixed waste, including hazardous waste components, from a container. This allows the
2 Permittees to indicate potential releases that are not detectable from visible evidence such as
3 stains or discoloration. Visual inspection and operating records will also be used to identify
4 areas where decontamination is necessary. Contaminated surfaces will be decontaminated until
5 radioactivity is below free release limits². Once surfaces are determined to be free of radioactive
6 waste constituents, they will be tested for hazardous waste contamination. These surface
7 decontamination activities will ensure the removal of waste residues to levels protective of
8 human health and the environment. ~~The facility is expected to require no~~ **No** decontamination **of**
9 **the WIPP facility is expected** at closure because any waste spilled or released during operations
10 will be contained and removed immediately. ~~Solid waste management units associated described~~
11 ~~in Permit Module VII will be subject to closure.~~ In the event areas ~~portions of these units~~
12 ~~which~~ **that** require decontamination cannot be decontaminated, these ~~portions~~ will be removed
13 and the resultant wastes will be managed as appropriately.
14

15 Once the container storage units are decontaminated and certified by the Permittees to be clean,
16 no further maintenance is required. The facilities and equipment in these units will be reused for
17 other purposes as needed.
18

19 I-1a(2) Miscellaneous Unit

20 Post-closure migration of hazardous waste or hazardous waste constituents to ground or surface
21 waters or to the atmosphere, above levels that will harm human health or the environment, will
22 not occur due to facility engineering and the geological isolation of the unit. The engineering
23 aspects of closure are centered on the use of panel closures on each of the underground HWDUs
24 and final facility seals placed in the shafts. The design of the panel closure system is based on
25 the criteria that the closure system for closed underground HWDUs will prevent migration of
26 hazardous waste constituents in the air pathway in concentrations above health-based levels
27 beyond the WIPP land withdrawal boundary during the ~~thirty-five (35)~~ year operational and
28 facility closure period, and ~~to~~ **will** withstand any flammable gas deflagration that may occur prior
29 to final facility closure.
30

31 Consistent with the definitions in 20.4.1.101 NMAC (incorporating 40 CFR §260.10), the
32 process of panel closure is considered partial closure because it is a process of rendering a part of
33 the repository inactive and closed according to the approved underground HWDU partial closure
34 plan. Panel closure will be complete when the panel closure system is emplaced and operational,
35 when that underground HWDU and related equipment and structures have been decontaminated
36 (if necessary), and when the NMED has been notified of the closure.
37

38 Shaft seals are designed to provide effective barriers to the inward migration of ~~ground~~
39 ~~water~~ **groundwater** and the outward migration of gas and contaminated brine over two discrete
40 time periods. Several components become effective immediately and are expected to function

² The free release criteria for items, equipment, and areas is < 20 ~~dpm~~ **disintegrations per minute (dpm)** per 100 **square centimeters (cm²)** for alpha radioactivity and < 200 dpm/100 cm² for beta-gamma radioactivity.

1 for ~~one hundred (100)~~ years. Other components become effective more slowly, but provide
2 permanent isolation of the waste. The final shaft seal design is specified in Renewal Application
3 Appendix I2 (Waste Isolation Pilot Plant Shaft Sealing System Compliance Submittal Design
4 Report).

5
6 The facility will be finally closed (i.e., decontaminated and decommissioned) to minimize the
7 need for continued maintenance. Protection of human health and the environment includes, but
8 is not limited to:

- 9
- 10 • Prevention of any releases that may have adverse effects on human health or the
11 environment due to the migration of waste constituents in the groundwater or in the
12 subsurface environment ~~{(20.4.1.500 NMAC, incorporating 40 CFR §264.601(a))}~~.
 - 13 • Prevention of any releases that may have adverse effects on human health or the
14 environment due to migration of waste constituents in surface water, in wetlands, or on
15 the soil surface ~~{(20.4.1.500 NMAC, incorporating 40 CFR §264.601(b))}~~.
 - 16 • Prevention of any release that may have adverse effects on human health or the
17 environment due to migration of waste constituents in the air ~~{(20.4.1.500 NMAC,~~
18 ~~incorporating 40 CFR §264.601(c))}~~.

19 As part of final facility closure, surface recontouring and reclamation will establish a stable
20 vegetative cover, and further surface maintenance will not be necessary to protect human health
21 and the environment. Prior to cessation of active controls, monuments will be emplaced to serve
22 as long-term site markers to discourage activities that would penetrate the facility or impair the
23 ability of the salt formation to isolate the waste from the surface environment for at least 10,000
24 years. The Federal government will maintain administrative responsibility for the repository site
25 in perpetuity and will limit future use of the area.

26
27 If, during panel or final facility closure activities, unexpected events require modification of this
28 Closure Plan to demonstrate compliance with closure performance standards, a Closure Plan
29 amendment will be submitted in accordance with 20.4.1.900 NMAC (incorporating 40 CFR
30 §270.42).

31 **I-1a(3) Post-Closure Care**

32
33 The post-closure care period will begin after completion of the first panel closure and will
34 continue for ~~thirty (30)~~ years after final facility closure. The post-closure care period may be
35 shortened or lengthened at the discretion of the regulatory agency based on evidence that human
36 health and the environment are being protected or that they are at risk. During the post-closure
37 period, the WIPP facility shall be maintained in a manner that complies with the environmental
38 performance standards in 20.4.1.500 NMAC (incorporating 40 CFR §264.601). Post-closure
39 activities are described in Renewal Application Chapter J.

1 I-1b Requirements

2 The Permit specifies a sequential process for the closure of individual HWMUs at the WIPP
3 facility. Each underground HWDU will undergo panel closure when waste emplacement in that
4 panel is complete. Following waste emplacement in each underground HWDU, construction-
5 side ventilation will be terminated, and waste-disposal-side ventilation will be established in the
6 next underground HWDU to be used, and the underground HWDU containing the waste will be
7 closed. The Permittees will notify the NMED of the closure of each of the underground HWDUs
8 as they are sequentially filled on a HWDU-by-HWDU basis. The HWMUs in the WHB and in
9 the ~~parking area~~ Parking Area will be closed as part of final facility closure of the WIPP facility.

10
11 The Permittees will notify the Secretary of the NMED in writing at least ~~sixty (60)~~ days prior to
12 the date on which closure activities are scheduled to begin.

13 I-1c Maximum Waste Inventory

14
15 The WIPP will receive no more than 6.2 million ft³ (175,600 m³) of TRU mixed waste, which
16 may include up to 250,000 ft³ (7,080 m³) of remote-handled (**RH**) TRU mixed waste.
17 Excavations are mined as permitted when needed during operations to maintain a reserve of
18 disposal areas. The amount of waste placed in each room is limited by structural and physical
19 considerations of equipment and design. Waste volumes include waste received from ~~off-site~~
20 ~~generator locations~~ TRU waste sites as well as derived waste from disposal and decontamination
21 operations. ~~The maximum volume of TRU mixed waste in a disposal panel is established in~~
22 ~~Module IV, Table IV.A.1~~ For closure planning purposes, a maximum achievable volume of
23 685,100 ft³ (19,400 m³) of TRU mixed waste per panel is used. This equates to 662,150 ft³
24 (18,750 m³) of contact-handled (**CH**) TRU mixed waste and 22,950 ft³ (650 m³) of RH TRU
25 mixed waste per panel.

26
27 The maximum extent of operations during the term of this ~~p~~Permit is expected to be Panels 1
28 through ~~7~~8 as shown on Figure I-1, the WHB Container Storage Unit, and the Parking Area
29 Container Storage Unit. ~~Note that panels 8, 9, and 10 are scheduled for excavation only under~~
30 ~~the initial term of this p~~Permit. If other waste management units are permitted during the
31 Disposal Phase, this Closure Plan will be revised to include the ~~additional~~ waste management
32 units. At any given time during disposal operations, it is possible that multiple rooms may be
33 receiving TRU mixed waste for disposal at the same time. Underground HWDUs in which
34 disposal has been completed (i.e., in which CH and RH TRU mixed waste emplacement
35 activities have ceased) will undergo panel closure.

36 I-1d Schedule for Closure

37
38 For the purpose of establishing a schedule for closure, an operating and closure period of no
39 more than ~~thirty-five (35)~~ years (~~twenty-five (25)~~ years for disposal operations and ~~ten (10)~~ years
40 for closure) ~~is assumed~~. This operating period may be extended or shortened depending on a
41 number of factors, including the rate of waste approved for shipment to the WIPP facility and the

1 schedules of TRU mixed waste generator sites the certified characterization programs, and future
2 decommissioning activities.

3 4 I-1d(1) Schedule for Panel Closure

5 The anticipated schedule for the closure of the underground HWDUs known as Panels 3 through
6 8 is shown in Figure I-2. This schedule assumes there will be little contamination within the
7 exhaust drift of the panel. Underground HWDUs should be ready for closure according to the
8 schedule in Table I-1. These dates are estimates for planning and permitting purposes. Actual
9 dates may vary depending on the availability of waste from the generator sites certified
10 characterization programs.

11
12 In the schedule in Figure I-2, notification of intent to close occurs ~~thirty~~ (30) days before placing
13 the final waste in a panel. Once a panel is full, the Permittees will initially block ventilation
14 through the panel as described in Renewal Application Appendix M2 (Geologic Repository), and
15 then will assess the closure area for ground conditions and contamination so that a definitive
16 schedule and closure design can be determined. If as the result of this assessment the Permittees
17 determine that a panel closure cannot be emplaced in accordance with the schedule in this
18 Closure Plan, a modification will be submitted requesting an extension to the time for closure.

19
20 The Permittees will initially block ventilation through Panel 2 as described in Renewal
21 Application Appendix M2 once Panel 2 is full to ensure continued protection of human health
22 and the environment. The Permittees will then install the explosion-isolation wall portion of the
23 panel closure system that is described in Renewal Application Appendix I1, (Detailed Design
24 Report for an Operation Phase Panel Closure System) Section 3.3.2, Explosion- and
25 Construction-Isolation Walls. Construction of the explosion-isolation wall will not exceed 180
26 days after the last receipt of waste in Panel 2. Final closure of Panels 1 and 2 will be completed
27 ~~as specified in this Permit~~ no later than January 31, 2016.

28
29 To ensure continued protection of human health and the environment, the Permittees will
30 initially block ventilation through Panel 3 as described in Renewal Application Appendix M2,
31 Section M2-2a(3), after waste disposal in Panel 3 has been completed. The Permittees shall
32 continue VOC monitoring in Panel 3 until final panel closure. If the measured concentration, as
33 confirmed by a second sample, of any VOC in Panel 3 exceeds the “95% Action Level” in
34 Module IV, Table IV.F.3.b, the Permittees will initiate closure of Panel 3 by installing the 12-
35 foot explosion-isolation wall as described in Section I-1e(1) and submit a Class 1* permit
36 modification request to extend Panel 3 closure, if necessary. Regardless of the outcome of
37 disposal room VOC monitoring, final closure of Panel 3 will be completed as specified in this
38 Permit no later than January 31, 2016.

39 40 I-1d(2) Schedule for Final Facility Closure

41 The Disposal Phase for the WIPP facility is expected to require a period of ~~twenty-five~~ (25)
42 years beginning with the first receipt of TRU waste at the WIPP facility, which occurred on
43 March 26, 1999, and followed by a period ranging from seven to ~~ten~~ (7-10) years for

1 decontamination, decommissioning, and final closure. ~~Assuming the first waste receipt occurs in~~
2 ~~July 1998,~~ The Disposal Phase may extend until 2023, and so the latest expected year of final
3 closure of the WIPP facility (i.e., date of final closure certification) would be 2033. If, as is
4 currently projected, the WIPP facility is dismantled at closure, all surface and subsurface
5 facilities (except the hot cell portion of the WHB, which will remain as an artifact of the
6 Permanent Marker System ~~{(PMS)}~~) will be disassembled and either salvaged or disposed in
7 accordance with applicable standards. In addition, asphalt and crushed caliche that was used for
8 paving will be removed, and the area will be recontoured and revegetated in accordance with a
9 land management plan. A detailed closure schedule will be submitted in writing to the Secretary
10 of the NMED, along with the notification of closure. Throughout the closure period, all
11 necessary steps will be taken to prevent threats to human health and the environment in
12 compliance with all applicable Resource Conservation and Recovery Act (RCRA) permit
13 requirements. Figure I-3 presents the best estimate of a final facility closure schedule.

14
15 The schedule for final facility closure is considered to be a best estimate because closure of the
16 facility is driven by policies and practices established for the decontamination, if necessary, and
17 decommissioning of radioactively contaminated facilities. These required activities include
18 extensive radiological contamination surveys and hazardous constituent surveys using, among
19 other techniques, radiological surveys to indicate potential hazardous waste releases. Both types
20 of surveys will be performed at all areas of the WIPP site where hazardous waste were managed.
21 These surveys, along with historical radiological survey records, will provide the basis for
22 release of structures, equipment, and components for disposal or decontamination for release off
23 site. Specifications will be developed for each structure to be removed. A cost benefit analysis
24 will be needed to evaluate decontamination options if extensive decontamination is necessary.
25 Individual equipment surveys, structure surveys, and debris surveys will be required prior to
26 disposition. Size-reduction techniques may be required to dispose of mixed or radioactive waste
27 at the WIPP ~~facility~~ site. Current DOE policy, as reflected in the WIPP facility Safety Analysis
28 Report (SAR) (DOE 1997), requires the preparation of a final decommissioning and
29 decontamination (D&D) plan immediately prior to final facility closure. A final
30 decommissioning and decontamination (D&D) plan will be prepared in accordance with DOE
31 policy to reflect In this way, the specific conditions of the facility at prior to the time D&D is
32 initiated ~~will be addressed~~. Section I-1e(2) provides a more detailed discussion of final facility
33 closure activities.

34
35 Figure I-3 shows the schedule for the final facility closure consisting of decontamination, as
36 needed, of the TRU waste-handling equipment; and ~~of the aboveground equipment and facilities;~~
37 ~~including~~ closure of surface HWMUs; decontamination of the shaft and haulage ways; disposal
38 of decontamination-derived wastes in the last open underground HWDU; and subsequent closure
39 of this underground HWDU. Subsequent activities will include installation of repository shaft
40 seals.

41
42 An overall schedule for final facility closure, showing currently scheduled dates for the start and
43 end of final facility closure activities is shown in Table I-2. The dates ~~assume~~ reflect a start up
44 date of March 1999 and hazardous waste permit effective dates of September 1999, September
45 2009, and September 2019. Details for panel closures are shown on Table I-1.

1

2 **I-1d(3) Extension for Closure Time**

3 As indicated by the closure schedule presented in Figure I-3, the activities necessary to perform
4 facility closure of the WIPP facility will require more than ~~one hundred eighty (180)~~ days to
5 complete because of additional stringent requirements for managing radioactive materials.
6 Therefore, the Permit provides an extension of the 180-day final closure requirement in
7 accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.113). During the extended
8 closure period, the Permittees will continue to demonstrate compliance with applicable permit
9 requirements and will take all steps necessary to prevent threats to human health and the
10 environment as a result of TRU mixed waste management at the WIPP facility including all of
11 the applicable measures in Renewal Application Chapter E (Preparedness and Prevention).

12

13 In addition, according to the schedules in Figure I-3, the final derived wastes that are generated
14 as the result of decontamination activities will not be disposed of for ~~sixteen (16)~~ months after
15 the initiation of final facility closure. In accordance with 20.4.1.500 NMAC (incorporating 40
16 CFR §264.113(a)), the Permit provides an extension of the 90-day limit to dispose of final
17 derived waste resulting from the closure process. This provision is necessitated by the fact that
18 the radioactive nature of the derived waste makes placement in the WIPP **facility** the best
19 disposition, and the removal of these wastes will, by necessity, take longer than ~~ninety (90)~~ days
20 in accordance with the closure schedules. During this extended period of time, the Permittees
21 will take all steps necessary to prevent threats to human health and the environment, including
22 compliance with all applicable permit requirements. These steps include all of the applicable
23 preparedness and prevention measures in Renewal Application Chapter E.

24

25 Finally, in the event the hazardous waste permit is not renewed as assumed in the schedule, the
26 Permittees will submit to the NMED for approval a modification to the Closure Plan to
27 implement a contingency closure that will allow the Permittees to continue to operate for the
28 disposal of non-mixed TRU waste. This modification will include a request for an extension of
29 the time for final facility closure. ~~This modified Closure Plan will be submitted to the NMED for~~
30 ~~approval.~~

31

32 **I-1d(4) Amendment of the Closure Plan**

33 If it becomes necessary to amend the Closure Plan for the WIPP facility, the Permittees will
34 submit, in accordance with 20.4.1.900 NMAC (incorporating 40 CFR §270.42), a written
35 notification of or request for a permit modification describing any change in operation or facility
36 design that affects the Closure Plan. The written notification or request will include a copy of
37 the amended Closure Plan for approval by the NMED. The Permittees will submit a written
38 notification of or request for a permit modification to authorize a change in the approved plan, if:

39

40 • There are changes in operating plans or in the waste management unit facility design that
41 affect the Closure Plan

42 • There is a change in the expected year of closure

- 1 • Unexpected events occur during panel or final facility closure that require modification of
2 the approved Closure Plan
- 3 • Changes in State or Federal laws affect the Closure Plan
- 4 • Permittees fail to obtain permits for continued operations as discussed above

5 The Permittees will submit a written request for a permit modification with a copy of the
6 amended Closure Plan at least ~~sixty (60)~~ days prior to the proposed change in facility design or
7 operation or within ~~sixty (60)~~ days of the occurrence of an unexpected event that affects the
8 Closure Plan. If the unexpected event occurs during final closure, the permit modification will
9 be requested within ~~thirty (30)~~ days of the occurrence. If the Secretary of the NMED requests a
10 modification of the Closure Plan, a plan modified in accordance with the request will be
11 submitted within ~~sixty (60)~~ days of notification or within ~~thirty (30)~~ days, if the change in facility
12 condition occurs during final closure.

13

14 I-1e Closure Activities

15 Closure activities include those instituted for panel closure (i.e., closure of filled underground
16 HWDUs), contingency closure (i.e., closure of surface HWMUs and decontamination of other
17 waste handling areas), and final facility closure (i.e., closure of surface HWMUs, D&D of
18 surface facilities and the areas surrounding the WHB, and placement of repository shaft seals).
19 Panel closure systems will be emplaced to separate areas of the facility and to isolate panels.
20 Renewal Application Appendices I1 and I2 provide panel closure system and shaft seal designs.
21 All closure activities will meet the applicable quality assurance (QA)/quality control (QC)
22 program standards in place at the WIPP facility. Facility monitoring procedures in place during
23 operations will remain in place through final closure, as applicable.

24

25 I-1e(1) Panel Closure

26 Following completion of waste emplacement in each underground HWDU, disposal-side
27 ventilation will be established in the next panel to be used, and the panel containing the waste
28 will be closed. A panel closure system will be emplaced in the panel access drifts, in accordance
29 with the design in Renewal Application Appendix I1 and the schedule in Figure I-2 and Table I-
30 1. The panel closure system is designed to meet the following requirements that were
31 established by the DOE for the design to comply with 20.4.1.500 NMAC (incorporating 40 CFR
32 §264.601(a)):

33

- 34 • the panel closure system shall limit the migration of VOCs to the compliance point so
35 that compliance is achieved by at least one order of magnitude
- 36 • the panel closure system shall consider potential flow of VOCs through the disturbed
37 rock zone (DRZ) in addition to flow through closure components

- 1 • the panel closure system shall perform its intended functions under loads generated by
2 creep closure of the tunnels
- 3 • the panel closure system shall perform its intended function under the conditions of a
4 postulated methane explosion
- 5 • the nominal operational life of the closure system is ~~thirty five (35)~~ years
- 6 • the panel closure system for each individual panel shall not require routine maintenance
7 during its operational life
- 8 • the panel closure system shall address the most severe ground conditions expected in the
9 waste disposal area
- 10 • the design class of the panel closure system shall be Design Class IIIb (which means that
11 it is to be built to generally accepted national design and construction standards)
- 12 • the design and construction shall follow conventional mining practices
- 13 • structural analysis shall use data acquired from the WIPP underground
- 14 • materials shall be compatible with their emplacement environment and function
- 15 • treatment of surfaces in the closure areas shall be considered in the design
- 16 • thermal cracking of concrete shall be addressed
- 17 • during construction, a QA/QC program shall be established to verify material properties
18 and construction practices
- 19 • construction of the panel closure system shall consider shaft and underground access and
20 services for materials handling

21 The performance standard for air emissions from the WIPP facility is established in Module IV
22 and Renewal Application Appendix M2. Releases shall be below these limits for the facility to
23 remain in compliance with standards to protect human health and the environment. The
24 following panel closure design has been shown, through analysis, to meet these standards, if
25 emplaced in accordance with the specifications in Renewal Application Appendix II.

26
27 The approved design for the panel closure system calls for a composite panel barrier system
28 consisting of a rigid concrete plug with removal of the DRZ, and an explosion-isolation wall.
29 The design basis for this closure is such that the migration of hazardous waste constituents from
30 closed panels during the operational and closure period would result in concentrations well
31 below health-based standards. The source term used as the design basis included the average
32 concentrations of VOCs from CH waste containers as measured in headspace gases through
33 January 1995. The VOCs are assumed to have been released by diffusion through the container

1 vents and are assumed to be in equilibrium with the air in the panel. Emissions from the closed
2 panel occur at a rate determined by gas generation within the waste and creep closure of the
3 panel.

4
5 Figures I-4 and I-5 show ~~a~~ **are diagrams** of the panel closure design and installation envelopes.
6 Renewal Application Appendix I1 provides the detailed design and the design analysis for the
7 panel closure system. Although the permit application proposed several panel closure design
8 options, depending on the gas generated by wastes and the age of the mined openings, the
9 NMED and EPA determined that only the most robust design option (**Option D**) would be
10 approved. This decision does not prevent the Permittees from continuing to collect data on the
11 behavior of the wastes and mined openings, or proposing a modification to the Closure Plan in
12 the future, using the available data to support a request for reconsideration of one or more of the
13 original design options. If a design different from Option D as defined in Renewal Application
14 Appendix I1 is proposed, the appropriate permit modification will be sought.

15 16 **I-1e(2) Decontamination and Decommissioning**

17 Decontamination is defined as those activities ~~that~~ **which** are performed to remove contamination
18 from surfaces and equipment that are not intended to be disposed of at the WIPP facility. The
19 policy at the WIPP **facility** will be to decontaminate as many areas as possible, consistent with
20 radiation protection policy. Decontamination is part of all closure activities and is a necessary
21 activity in the clean closure of the surface container management units. Decontamination
22 determinations are based upon radiological and hazardous constituent surveys.

23
24 Decommissioning is the process of removing equipment, facilities, or surface areas from further
25 use and closing the facility. Decommissioning is part of final facility closure only and will
26 involve the removal of equipment, buildings, closure of the shafts, and establishing active and
27 passive institutional controls for the facility. Passive institutional controls are not included in the
28 Permit.

29
30 The objective of D&D activities at the WIPP facility is to return the surface to as close to the
31 preconstruction condition as reasonably possible, while protecting the health and safety of the
32 public and the environment. Major activities required to accomplish this objective include, but
33 are not limited to the following:

- 34
35 1. Review of operational records for historical information on releases
- 36
37 2. Visual examination of surface structures for evidence of spills or releases
- 38
39 3. Performance of site contamination surveys
- 40
41 4. Decontamination, if necessary, of usable equipment, materials, and structures
- 42 including surface facilities and areas surrounding the WHB.
- 43

- 1 5. Disposal of equipment/materials that cannot be decontaminated but that meet the
2 treatment, storage, and disposal facility waste acceptance criteria (TSDF-WAC) in an
3 underground HWDU
4
- 5 6. Emplacement of final panel closure system
6
- 7 7. Emplacement of shaft seals³
8
- 9 8. Regrading the surface to approximately original contours
10
- 11 9. Initiation of active controls
12

13 This Closure Plan will be amended prior to the initiation of closure activities to specify the
14 methods to be used.
15

16 Health and Safety 17

18 Before final closure activities begin, health physics personnel will conduct a hazards survey of
19 the unit(s) being closed. A release of radionuclides could also indicate a release of hazardous
20 constituents. If radionuclides are not detected, sampling for hazardous constituents will still be
21 performed if there is documentation or visible evidence that a spill or release has occurred. The
22 purpose of the hazards survey will be to identify potential contamination concerns that may
23 present hazards to workers during the closure activities and to specify any control measures
24 necessary to reduce worker risk. This survey will provide the information necessary for the
25 health physics personnel to identify worker qualifications, personal protective equipment (PPE),
26 safety awareness, work permits, exposure control programs, and emergency coordination that
27 will be required to perform closure related activities.
28

29 **I-1e(2)(a) Determine the Extent of Contamination**

30 The first activities performed as part of decontamination include those needed to determine the
31 extent of any contamination that needs to be removed prior to decommissioning a facility. This
32 includes activities 1, **2, and** ~~to~~ 3 above, ~~and, A~~s can be seen by the schedules in Figures I-3 and
33 I-4 (Items B and C), these surveys are anticipated to take ~~ten~~ (10) months to perform, including
34 obtaining the results of any sample analyses. The process of identifying areas that require
35 decontamination include three sources of information. First, operating records will be reviewed
36 to determine where contamination has previously been found as the result of historical releases
37 and spills. Even though releases and spills will have been cleaned up at the time of occurrence,
38 newer equipment and technology may allow further cleaning. Second, surfaces of facilities and
39 structures will be examined visually for evidence of spills or releases. Finally, extensive detailed
40 contamination surveys will be performed to document the level of cleanliness for all surface

³ For the purposes of planning, the conclusion of shaft sealing is used by the DOE as the end of closure activities and the beginning of the Post-Closure Care Period.

1 structures and equipment. If equipment or areas are identified as contaminated, the Permittees
2 will notify NMED as specified in Permit Module I, and a plan and procedure(s) will be
3 developed and implemented to address decontamination-related questions, including such as:

- 4
- 5 • Should the component be decontaminated or disposed of as waste?
- 6 • What is the most cost-effective method of decontaminating the component?
- 7 • Will the decontamination procedures adequately contain the contamination?

8 Radiological and hazardous constituent surveys will be used in determining the presence of
9 hazardous waste and hazardous waste residues in areas where spills or releases have occurred.
10 Radiological surveys are described in Renewal Application Appendix I3. Once cleanup of the
11 radioactivity has been completed, the surface will be sampled for hazardous constituents
12 specified in Renewal Application Chapter O (Hazardous Waste Permit Application Part A) to
13 determine that they, too, have been cleaned up. Sampling and analysis protocols will be
14 consistent with EPA's document SW-846 (EPA, 1996).

15

16 I-1e(2)(b) Decontamination Activities

17 Once the extent of contamination is known, decontamination activities will be planned and
18 performed. Radiological control and the control of hazardous waste residues are the primary
19 criteria used in the design of decontamination activities. Radiation control procedures require
20 that careful planning and execution be used in decontamination activities to prevent the exposure
21 of workers beyond applicable standards and to prevent the further spread of contamination.
22 Careful control of entry, cleanup, and ventilation are vital components of radiation
23 decontamination. The level of care mandated by DOE orders and occupational protection
24 requirements results in closure activities that will exceed the ~~one hundred eighty (180)~~ days
25 allowed in 20.4.1.500 NMAC (incorporating 40 CFR §264.113(b)). Decontamination activities
26 are included as item 4 above and are shown on the schedules for contingency closure and final
27 facility closure (Figures I-3 and I-4) as activities D, E, and F. These activities are anticipated to
28 have a duration of ~~twenty (20)~~ months for both contingency closure and for final facility closure.
29 The result of these activities is the clean closure of the surface container management units.
30 Under contingency closure, the other areas that have been decontaminated will not be closed.
31 Instead they will remain in use for continued waste management activities involving non-mixed
32 waste. Under final facility closure, other areas that are decontaminated are eligible for closure.

33

34 The "Start Clean—Stay Clean" operating philosophy of the WIPP Project will provide for
35 minimum need for decontamination. However, the need for decontamination techniques may
36 arise. Decontamination activities will be coordinated with closure activities so that areas that
37 have been decontaminated will not be recontaminated. ~~All waste~~ Waste resulting from
38 decontamination activities will be surveyed and analyzed for the presence of radioactive
39 contamination and hazardous constituents specified in Renewal Application Chapter O. The
40 waste will be characterized as hazardous, mixed, or radioactive and will be packaged and
41 handled appropriately. Mixed and radioactive waste will be classified as TRU mixed waste

1 managed in accordance with the applicable Permit requirements. Derived mixed waste collected
2 during decontamination activities that are generated before repository shafts have been sealed
3 will be emplaced in the facility, if appropriate, or will be managed together with decontamination
4 derived waste collected after the underground is closed. This waste will be classified and
5 shipped off site to an appropriate, permitted facility for treatment, if necessary, and for disposal.
6

7 Removal of Hazardous Waste Residues

8

9 Because of the type of waste management activities that will occur at the WIPP facility, waste
10 residues that may be encountered during the operation of the facility and at closure may include
11 derived waste. Derived wastes result from the management of the waste containers or may be
12 collected as part of the closure activities (such as those during which wipes were used to sample
13 the containers and equipment for potential radioactive contamination or those involving
14 solidified decontamination solutions, the handling of equipment designated for disposal, and the
15 handling of residues collected as a result of spill cleanup). Derived wastes collected during the
16 operation and closure of the WIPP facility will be identified and managed as TRU mixed wastes.
17 These wastes will be disposed in the active underground HWDU. ~~The~~ D&D derived wastes and
18 equipment designated for disposal will be placed in the last underground HWDU panel before
19 closure of that unit.
20

21 Surface Container Storage Units

22

23 The procedures employed for waste receipt at the WIPP facility minimize the likelihood for any
24 waste spillage to occur outside the WHB. TRU mixed waste is shipped to the WIPP facility in
25 approved shipping containers (i.e., ~~Contact-Handled~~ CH or ~~Remote-Handled~~ RH Packages) that
26 are not opened until they are inside the WHB. Therefore, it is unlikely that soil in the Parking
27 Area Unit or elsewhere in the vicinity of the WHB will become contaminated with TRU mixed
28 waste constituents as a result of TRU mixed waste management activities. An evaluation of the
29 soils in the vicinity of the WHB will only be necessary if a documented event resulting in a
30 release has occurred outside the WHB.
31

32 The "Start Clean—Stay Clean" operating philosophy of the WIPP Project will minimize the need
33 for decontamination of the WHB during decommissioning and closure. Procedures for opening
34 shipping packages ~~containers~~ in the WHB limit the opportunity for waste spillage.
35

36 Should the need for decontamination of the WHB arise, the following methods may be
37 employed, as appropriate, for the hazardous constituent/contaminant type and extent:
38

- 39 • Chemical cleaning (e.g., water, mild detergent cleanser, and polyvinyl alcohol)
- 40 • Nonchemical cleaning (e.g., sandblasting, grinding, high-pressure water spray, scabblers
41 pistons and needle scalers, ice-blast technology, dry-ice blasting)
- 42 • Removal of contaminated components such as pipe and ductwork

1 Waste generated as a result of WHB decontamination activities will be managed as derived
2 waste in accordance with applicable permit requirements and will be emplaced in the last open
3 underground HWDU for disposal.

4 Waste Handling Equipment ~~and~~

6 The waste shaft conveyance and associated waste handling equipment will be decontaminated to
7 background or be disposed as derived waste as part of both contingency and final facility closure.
8 Procedures for detection and sampling will be as described above. Equipment cleanup will be as
9 above using chemical or nonchemical techniques.

11 Personnel Decontamination

12 Personal Protective Equipment PPE worn by personnel performing closure activities in areas
13 determined to be contaminated will be disposed of appropriately. Disposable PPE used in such
14 areas will be placed into containers and managed as TRU mixed waste. Non-disposable PPE
15 will be decontaminated, if possible. Non-disposable PPE that cannot be decontaminated will be
16 managed as TRU mixed waste.

17 In accordance with DOE policy, TRU mixed waste PPE will be considered to be contaminated
18 with all of the hazardous waste constituents contained in the containers that have been managed
19 within the unit being closed. Wastes collected as a result of closure activities and that may be
20 contaminated with radioactive and hazardous constituents will be considered TRU mixed wastes.
21 These wastes will be managed as derived wastes, as described in Renewal Application Appendix
22 M2. Such waste, collected as the result of closure of the WIPP facility, will be disposed of in the
23 final open underground HWDU.

27 Cleanup Criteria

28 Radiation decontamination will be less than or equal to the following levels, or to whatever
29 lesser levels that may be established by DOE Order at the time of cleanup:

33 <u>Contamination Type</u>	34 <u>Loose⁴</u>
	35 <u>Fixed plus removable</u>
36 alpha contamination (α)	37 20 dpm/100 cm ²
	38 500 dpm/100 cm ²
39 beta-gamma contamination (β - γ)	40 200 dpm/100 cm ²
	1000 dpm/100 cm ²

⁴ The unit “dpm” stands for “disintegration per minute” and is the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

1
2 Hazardous waste decontamination will be conducted in accordance with standards in 20.4.1.500
3 NMAC (incorporating 40 CFR §264.111) or as incorporated into the Permit.

4
5 Final Contamination Sampling and Quality Assurance

6
7 Verification samples will be analyzed by an approved laboratory that has been qualified by the
8 DOE according to a written program with strict criteria. The QA requirements of EPA/SW-846,
9 "Test Methods for Evaluating Solid Waste" (EPA, 1986~~1996~~); will be met for hazardous
10 constituent sampling and analyses.

11
12 Quality Assurance/Quality Control

13
14 Because decisions about closure activities may be based, in part, on analyses of samples of
15 potentially contaminated surfaces and media, a program to ensure reliability of analytical data is
16 essential. Data reliability will be ensured by following a QA/QC program that mandates
17 adequate precision and accuracy of laboratory analyses. Field documentation will be used to
18 document the conditions under which each sample is collected. The documented QA/QC
19 program in place at the WIPP facility will meet applicable RCRA QA requirements.

20
21 Field blanks and duplicate samples will be collected in the field to determine potential errors
22 introduced in the data from sample collection and handling activities. To determine the potential
23 for cross-contamination, rinsate blanks (consisting of rinsate from decontaminated sampling
24 equipment) will be collected and analyzed. At least one rinsate blank will be collected for every
25 20 field samples. Duplicate samples will be collected at a frequency of one duplicate sample for
26 every ten field samples. In no case will less than one rinsate blank or duplicate sample be
27 collected for a field-sampling effort. These blank and duplicate samples will be identified and
28 treated as separate samples. Acceptance criteria for QA/QC hazardous constituent sample
29 analyses will adhere to the most recent version of EPA SW-846 or other applicable EPA
30 guidance.

31
32 **I-1e(2)(c) Dismantling**

33 Final facility closure will include dismantling of structures on the surface and in the
34 underground. These are items 6 and 7 above and are represented as Activity G in the final
35 facility closure schedule in Figure I-4. During dismantling, priority will be given to
36 contaminated structures and equipment that cannot be decontaminated to assure these are
37 properly disposed of in the remaining open underground HWDU in a timely manner. All such
38 facilities and equipment are expected to be removed and disposed of ~~sixteen (16)~~
39 the initiation of closure. Dismantling of the balance of the **WIPP** facility, including those
40 structures and equipment that are not included in the application and are not used for TRU mixed
41 waste management, is anticipated to take an additional ~~sixty-six (66)~~ months. It should be noted
42 that the placement of D&D waste into the final underground HWDU may, by necessity, involve
43 the placement of uncontainerized bulk materials such as concrete components, building framing,
44 structural members, disassembled or partially disassembled equipment, or containerized

1 materials in non-standard waste boxes. Such placement will only occur if it can be shown that it
2 is protective of human health and the environment and all items are described in an amendment
3 to the Closure Plan. Identification of bulk items is not possible at this time since their size and
4 quantity will depend on the extent of non-removable contamination.

6 I-1e(2)(d) Closure of Open Underground HWDU

7 The closure of the final underground HWDU is shown by Activity H in Figure I-3. This closure
8 will be consistent with the description in Section I-1e(1) and the design in Renewal Application
9 Appendix I1. Detailed closure schedules for underground HWDUs are given in Figure I-2 and
10 Table I-1.

12 I-1e(2)(e) Final Facility Closure

13 Final facility closure includes several activities designed to assure both the short-term isolation
14 of the waste and the long-term integrity of the disposal system. These include the placement of
15 plugs in boreholes that penetrate the salt and the placement of the repository sealing system. In
16 addition, the surface will be returned to as near its original condition as practicable, and will be
17 readied for the construction of markers and monuments that will provide permanent marking of
18 the repository location and contents.

19
20 Figure I-6 identifies where ~~ten~~¹⁰ existing boreholes overlie the proximate area of the repository
21 footprint. Of these ~~identified~~ boreholes in Figure I-6, all but ERDA-9 are terminated hundreds of
22 feet above the repository horizon. Only ERDA-9, which is accounted for in long-term
23 performance modeling, is drilled through the repository horizon, near the WIPP excavations.

24
25 To mitigate the potential for migration beyond the repository horizon, the DOE has specified that
26 borehole seals be designed to limit the volume of water that could be introduced to the repository
27 from the overlying water-bearing zones and to limit the volume of contaminated brine released
28 from the repository to the surface or water-bearing zones.

29
30 Borehole plugging activities have been underway since the 1970s, from the early days of the
31 development of the WIPP facility. Early in the exploratory phase of the project, a number of
32 boreholes were sunk in Lea and Eddy counties. After the WIPP site was situated in its current
33 location, an evaluation of all vertical penetrations was made by Christensen and Peterson (1981).
34 As an initial criterion, any borehole that connects a fluid-producing zone with the repository
35 horizon becomes a ~~plugging~~ candidate for plugging.

36
37 Grout plugging procedures are routinely performed in standard oil-field operations; however,
38 quantitative measurements of plug performance are rarely obtained. The Bell Canyon Test
39 reported by Christensen and Peterson (1981) was a field test demonstration of the use of
40 cementitious plugging materials and modification of existing industrial emplacement techniques
41 to suit repository plugging requirements. Cement emplacement technology was found to be
42 "generally adequate to satisfy repository plugging requirements." Christensen and Peterson
43 (1981) also report "that grouts can be effective in sealing boreholes, if proper care is exercised in

1 matching physical properties of the local rock with grout mixtures. Further, the reduction in
2 fluid flow provided by even limited length plugs is far in excess of that required by bounding
3 safety assessments for the WIPP." The governing regulations for plugging and/or abandonment
4 of boreholes are summarized in Table I-3.

5
6 The proposed repository sealing system design will prevent water from entering the repository
7 and will prevent gases or brines from migrating out of the repository. The proposed design
8 includes the following subsystems and associated principal functions:

- 9
- 10 • Near-surface: to prevent subsidence at and around the shafts
 - 11 • Rustler Formation: to prevent subsidence at and around the shafts and to ensure
12 compliance with Federal and State of New Mexico groundwater protection requirements
 - 13 • Salado Formation: to prevent transporting hazardous waste constituents beyond the point
14 of compliance ~~specified in Permit Module V~~

15 The repository sealing system will consist of natural and engineered barriers within the WIPP
16 repository that will withstand forces expected to be present because of rock creep, hydraulic
17 pressure, and probable collapses in the repository and will meet the closure requirements of
18 20.4.1.500 NMAC (incorporating 40 CFR §264.601 and §264.111). Renewal Application
19 Appendix I2 presents the final repository sealing system design.

20
21 Once shaft sealing is completed, the Permittees will consider closure complete and will provide
22 the NMED with a certification of such within ~~sixty (60)~~ days.

23 24 **I-1e(2)(f) Final Contouring and Revegetation**

25 ~~In the preparation of its Final Environmental Impact Statement (DOE, 1980), the DOE~~ **The**
26 **Permittees have** committed to restore the site to as near to its original condition as is practicable.
27 This involves removal of access roads, unneeded utilities, fences, and any other structures built
28 by the DOE to support WIPP operations. Provisions would be left for active post-closure
29 controls of the site and for the installation of long-term markers and monuments for the purpose
30 of permanently marking the location of the repository and waste. Renewal Application Chapter
31 J, Section J-1a(1) discusses the active and long-term controls proposed for the WIPP.
32 Installation of borehole seals are anticipated to take twelve (12) months, shaft seals ~~fifty-two (52)~~
33 months, and final surface contouring eight (~~8~~) months.

34 35 **I-1e(2)(g) Closure, Monuments, and Records**

36 A record of the WIPP Project shall be listed in the public domain in accordance with the
37 requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.116). Active access controls
38 will be employed for at least the first ~~one hundred (100)~~ years after final facility closure. In
39 addition, a passive control system consisting of monuments or markers will be erected at the site

1 to inform future generations of the location of the WIPP repository (see "~~Permanent Marker~~
2 ~~Conceptual Design Report~~" [DOE, 1995b]).

3
4 This Renewal Application proposes ~~Permit requires only a thirty (30)-~~year post-closure period.
5 This is the maximum post-closure time frame allowed in an initial ~~Permit~~permit for any facility,
6 as specified in 20.4.1.500 NMAC (incorporating 40 CFR §264.117(a)) . The Secretary of the
7 NMED may shorten or extend the post-closure care period at any time in the future prior to
8 completion of the original post-closure period (30 years after the completion of construction of
9 the shaft seals). ~~The Permanent Marker Conceptual Design Report and other provisions during~~
10 ~~the first 100 years after closure are addressed under another Federal regulatory program.~~

11
12 Closure of the WIPP facility will contribute to the following:

- 13
14
- 15 • Prevention of the intrusion of fluids into the repository by sealing the shafts
 - 16 • Prevention of human intrusion after closure
 - 17 • Minimization of future physical and environmental surveillance

18 Detailed records shall be filed with local, State, and Federal government agencies to ensure that
19 the location of the WIPP facility is easily determined and that appropriate notifications and
20 restrictions are given to anyone who applies to drill in the area. This information, together with
21 land survey data, will be on record with the U.S. Geological Survey and other agencies. The
22 Federal government will maintain permanent administrative authority over those aspects of land
23 management assigned by law. Details of post-closure activities are in Renewal Application
24 Chapter J.

25 26 I-1e(3) Performance of the Closed Facility

27 20.4.1.500 NMAC (incorporating 40 CFR §264.601) requires that a miscellaneous unit be closed
28 in a manner that protects human health and the environment. The 1997 RCRA Part B permit
29 application addressed the expected performance of the closed facility during the ~~thirty (30) year~~
30 post closure period. An update of this performance demonstration is provided with the Renewal
31 Application as supplemental information. Groundwater monitoring will provide information on
32 the performance of the closed facility during the post-closure care period, as specified in
33 Renewal Application Chapter J, Section J-1a(2) (Monitoring).

34
35 The principal barriers to the movement of hazardous constituents from the facility or the
36 movement of waters into the facility are the halite of the Salado Formation (natural barrier) and
37 the repository seals (engineered barrier). ~~Data and calculations that support this discussion were~~
38 ~~presented in the permit application.~~ The majority of the calculations performed for the
39 repository are focused on long-term performance and making predictions of performance over
40 10,000 years. In the short term, the repository is reaching a steady state configuration where the
41 hypothetical brine inflow rate is affected by the increasing pressure in the repository due to gas
42 generation and creep closure. These three phenomena are related in the numerical modeling
43 performed to support the permit application. ~~The modeling parameters, assumptions and~~
44 ~~methodology were described in detail in the permit application.~~

1

2 I-2 Notices Required for Disposal Facilities

3 **I-2a Certification of Closure**

4 Within ~~sixty (60)~~ days after completion of closure activities for a HWMU (i.e., for each storage
5 unit and each disposal unit), the Permittees will submit to the Secretary of the NMED a
6 certification that the unit (and, after completion of final closure, the facility) has been closed in
7 accordance with the specifications of this Closure Plan. The certification will be signed by the
8 Permittees and by an independent New Mexico registered professional engineer. Documentation
9 supporting the independent registered engineer's certification will be furnished to the Secretary
10 of the NMED with the certification.

11

12 **I-2b Survey Plat**

13 Within ~~sixty (60)~~ days of completion of closure activities for each underground HWDU, and no
14 later than the submission of the certification of closure of each underground HWDU, the
15 Permittees will submit to the Secretary of the NMED a survey plat indicating the location and
16 dimensions of hazardous waste disposal units with respect to permanently surveyed benchmarks.
17 The plat will be prepared and certified by a professional land surveyor and will contain a
18 prominently displayed note that states the Permittees' obligation to restrict disturbance of the
19 hazardous waste disposal unit. In addition, the land records in the Eddy County Courthouse,
20 Carlsbad, New Mexico, will be updated through filing of the final survey plats.

References

I-3 List of References

Christensen, C. L., and Peterson, E. W. 1981. "Field-Test Programs of Borehole Plugs in Southeastern New Mexico." In *The Technology of High-Level Nuclear Waste Disposal Advances in the Science and Engineering of the Management of High-Level Nuclear Wastes*, P. L. Hofman and J. J. Breslin, eds., SAND79-1634C, DOE/TIC-4621, Vol. 1, pp. 354–369. Technical Information Center of the U.S. Department of Energy, Oak Ridge, TN.

DOE, see U.S. Department of Energy

EPA, see U.S. Environmental Protection Agency

U.S. Department of Energy, 1980, "Final Environmental Impact Statement, Waste Isolation Pilot Plant," DOE/EIS-0026, U.S. Department of Energy, Washington, D.C.

U.S. Department of Energy, 1995b, "Permanent Marker Conceptual Design Report," from Appendix PMR of the *Draft Compliance Certification Application*, Draft-DOE/CAO-2056, U.S. Department of Energy, Carlsbad, NM.

U.S. Department of Energy, 1997, "WIPP Safety Analysis Report," DOE/WIPP-95-2065, Revision 1, U.S. Department of Energy, Carlsbad, NM.

U.S. Environmental Protection Agency, 1996, "Test Methods for Evaluating Solid Waste," SW-846, U.S. Environmental Protection Agency, Washington, D.C.

TABLES

1

(This page intentionally blank)

1
2
3
4

**TABLE I-1
 ANTICIPATED EARLIEST CLOSURE DATES FOR
 THE UNDERGROUND HWDUs**

HWDU	OPERATIONS START	OPERATIONS END	CLOSURE START	CLOSURE END
PANEL 1	3/99*	03/03*	3/03*	7/03* SEE NOTE 5
PANEL 2	3/03*	10/05*	10/05*	3/06* SEE NOTE 5
PANEL 3	4/05*	2/07*	2/07*	2/07* SEE NOTE 6
PANEL 4	1/07*	1/09	2/09	8/09 SEE NOTE 6
PANEL 5	1/09	1/11	2/11	8/11 SEE NOTE 6
PANEL 6	1/11	1/13	2/13	8/13 SEE NOTE 6
PANEL 7	1/13	1/15	2/15	8/15 SEE NOTE 6
PANEL 8	1/15	1/17	2/17	8/17
PANEL 9	1/17	1/28	2/28	SEE NOTE 4
PANEL 10	1/28	9/30	10/30	SEE NOTE 4

5
6
7
8
9
10
11
12
13
14
15
16
17

*Actual date

NOTE 1: Only Panels 1 to 4 will **may** be closed under the initial term of this permit **Permit**. Closure schedules for Panels 5 through 10 are projected assuming new permits will be issued in 2009 and 2019.

NOTE 2: The point of closure start is defined as ~~sixty (60)~~ days following notification to the NMED of closure.

NOTE 3: The point of closure end is defined as ~~one hundred eighty (180)~~ days following placement of final waste in the panel.

NOTE 4: The time to close these areas may be extended depending on the nature and extent of the disturbed rock zone. The excavations that constitute these panels will have been opened for as many as ~~forty (40)~~ years so that

1 the preparation for closure may take longer than the time allotted in Figure I-2. If this extension is needed, it
2 will be requested as an amendment to the Closure Plan.

3

4 NOTE 5: The anticipated closure end date for Panels 1 and 2 is for installation of the 12-foot explosion-isolation
5 wall. Final closure of Panels 1 and 2 will be completed as specified in this Permit no later than January 31,
6 2016.

7

8 NOTE 6: The anticipated closure end date for Panels 3 through 7 is for initially blocking ventilation through the
9 filled panel. Final closure of Panels 3 through 7 will be completed as specified in this Permit no later than
10 January 31, 2016.

1
2
3

**TABLE I-2
 ANTICIPATED OVERALL SCHEDULE FOR CLOSURE ACTIVITIES**

ACTIVITY	FINAL FACILITY CLOSURE	
	START	STOP
Notify NMED of Intent to Close WIPP (or to Implement Contingency Closure)	October 2030	N/A
Perform Contamination Surveys in both Surface Storage Areas <u>WHB Unit and Parking Area Unit</u>	October 2030	April 2031
Sample Analysis	December 2030	July 2031
Decontamination as Necessary of both Surface Storage Areas <u>WHB Unit and Parking Area Unit</u>	June 2031	January 2032
Final Contamination Surveys of both Surface Storage Areas <u>WHB Unit and Parking Area Unit</u>	February 2032	September 2032
Sample Analysis	June 2032	January 2033
Prepare and Submit Container Management Unit <u>WHB Unit and Parking Area Unit</u> Closure Certification	February 2033	May 2033
Dispose of Closure-Derived Waste	November 2030	January 2032
Closure of Open Underground HWDU panel	February 2032 [*]	September 2032
Install Borehole Seals	October 2032	September 2033
Install Repository Seals	June 2033	September 2037
Recontour and Revegetate	October 2037	May 2038
Prepare and Submit Final (Contingency) Closure Certification	October 2037	May 2038
Post-closure Monitoring	July 2038	N/A

4
5
6
7
8

N/A—Not Applicable

Refer to Figures I-3 and I-4 for precise activity titles.

^{*} This assumes the final waste is placed in this unit in January 2032 and notification of closure for this HWDU is submitted to the NMED in December 2031.

1
 2
 3

**TABLE I-3
 GOVERNING REGULATIONS FOR BOREHOLE ABANDONMENT**

Federal or State Land	Type of Well or Borehole	Governing Regulation	Summary of Requirements
Both	Groundwater Surveillance	State and Federal regulation in effect at time of abandonment	Monitor wells no longer in use shall be plugged in such a manner as to preclude migration of surface runoff or groundwater along the length of the well. Where possible, this shall be accomplished by removing the well casing and pumping expanding cement from the bottom to the top of the well. If the casing cannot be removed, the casing shall be ripped or perforated along its entire length if possible, and grouted. Filling with bentonite pellets from the bottom to the top is an acceptable alternative to pressure grouting.
Federal	Oil and Gas Wells	43 CFR Part 3160, §§ 3162.3-4	The operator shall promptly plug and abandon, in accordance with a plan first approved in writing or prescribed by the authorized officer.
Federal	Potash	43 CFR Part 3590, § 3593.1	(b) Surface boreholes for development or holes for prospecting shall be abandoned to the satisfaction of the authorizing officer by cementing and/or casing or by other methods approved in advance by the authorized officer. The holes shall also be abandoned in a manner to protect the surface and not endanger any present or future underground operation, any deposit of oil, gas, or other mineral substances, or any aquifer.
State	Oil and Gas Well Outside the Oil-Potash Area	State of New Mexico, Oil Conservation Division, Rule 202 (eff. 3-1-91)	<p>B. Plugging</p> <p>(1) Prior to abandonment, the well shall be plugged in a manner to permanently confine all oil, gas, and water in the separate strata where they were originally found. This can be accomplished by using mud-laden fluid, cement, and plugs singly or in combination as approved by the Division on the notice of intention to plug.</p> <p>(2) The exact location of plugged and abandoned wells shall be marked by the operator with a steel marker not less than four inches (4") in diameter, set in cement, and extending at least four feet (4') above mean ground level. The metal of the marker shall be permanently engraved, welded, or stamped with the operator name, lease name, and well number and location, including unit letter, section, township, and range.</p>
State	Oil and Gas Wells Inside the Oil-Potash Area	State of New Mexico, Oil Conservation Division, Order No. R-111-P (eff. 4-21-88)	<p>F. Plugging and Abandonment of Wells</p> <p>(1) All existing and future wells that are drilled within the potash area, shall be plugged in accordance with the general rules established by the Division. A solid cement plug shall be provided through the salt section and any water-bearing horizon to prevent liquids or gases from entering the hole above or below the salt selection.</p> <p>It shall have suitable proportions—but no greater than three (3) percent of calcium chloride by weight—of cement considered to be the desired mixture when possible.</p>

1

FIGURES

1

(This page intentionally blank)

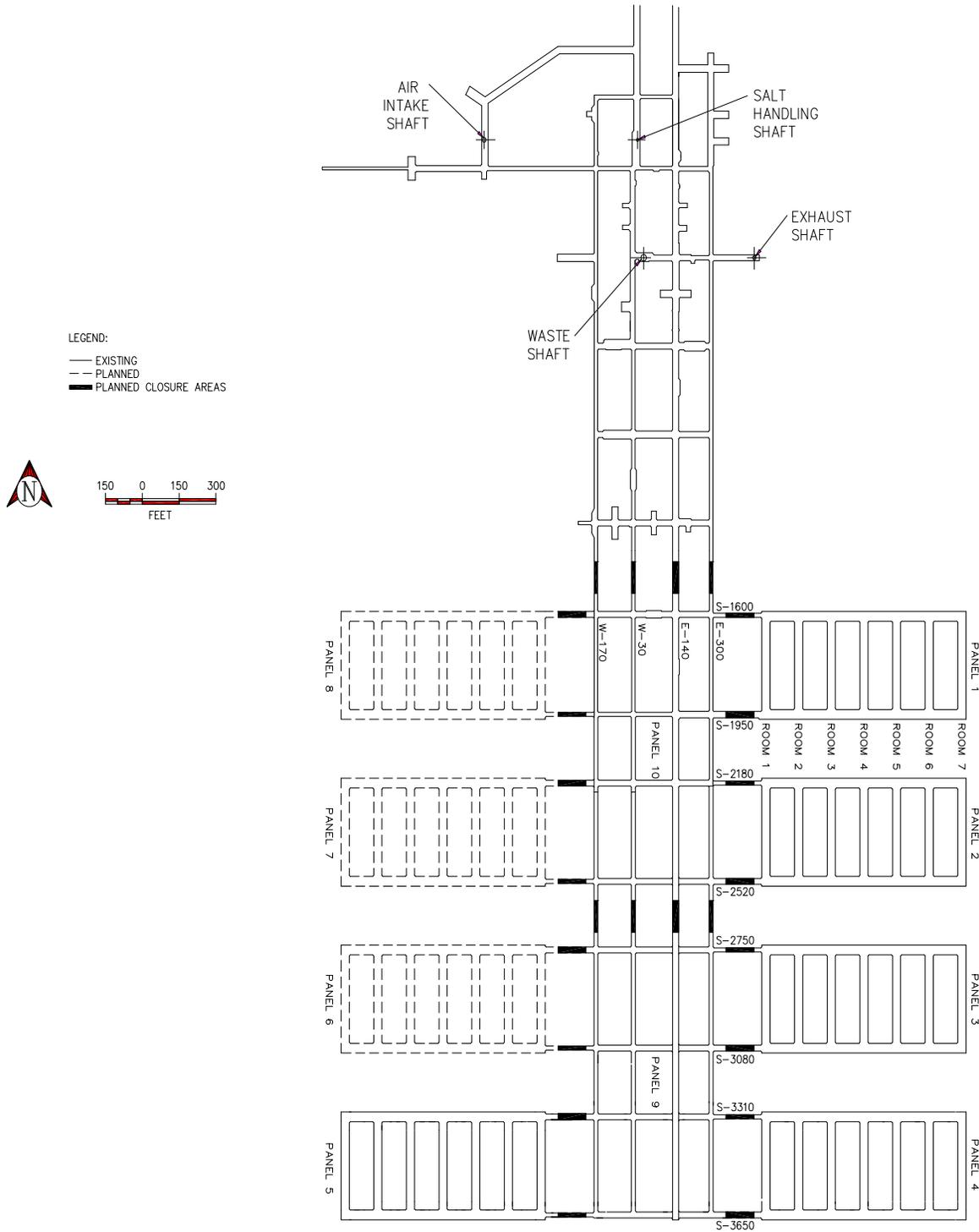


Figure I-1
 Location of Underground HWDUs and Anticipated Closure Locations

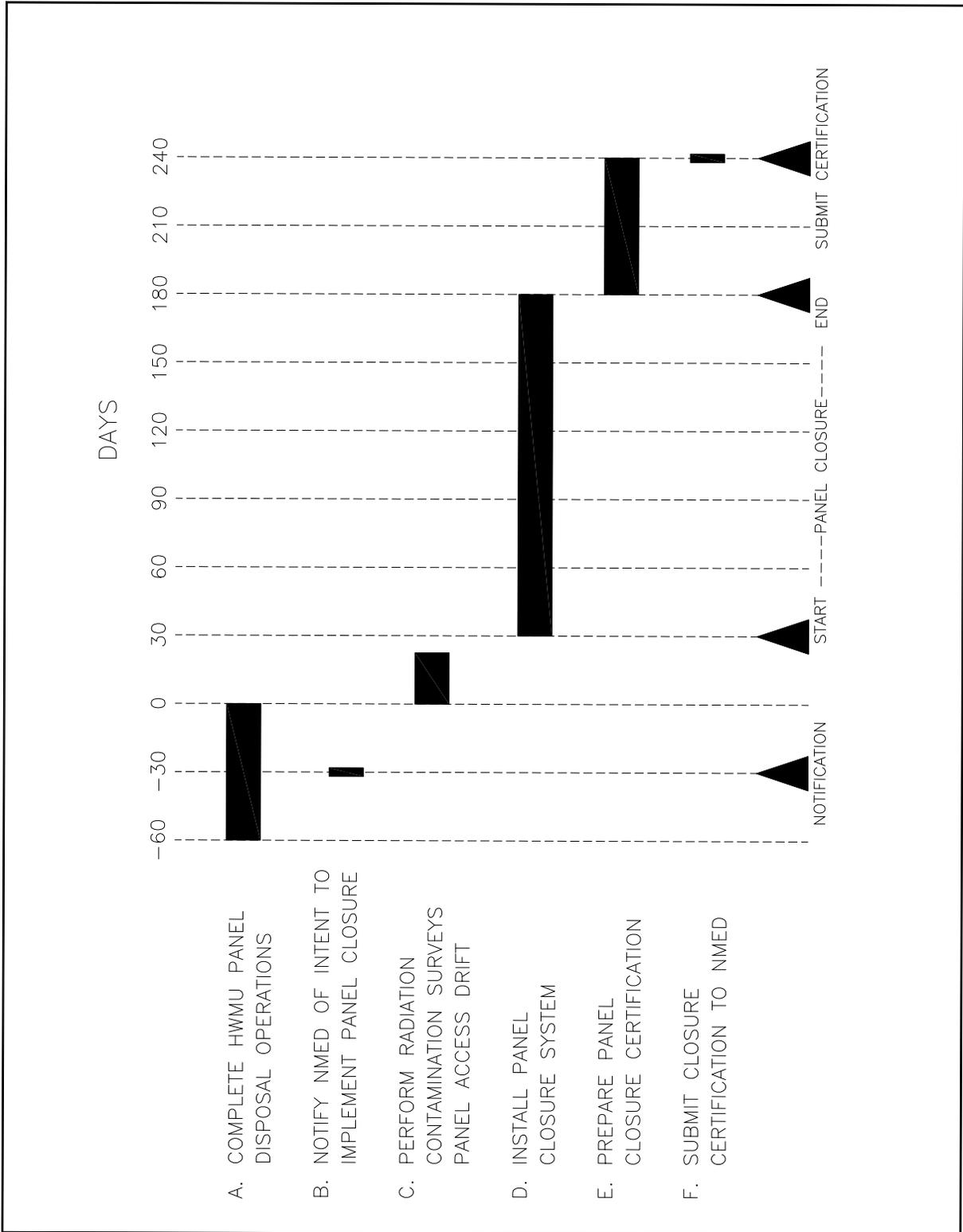


Figure I-2
 WIPP Panel Closure Schedule

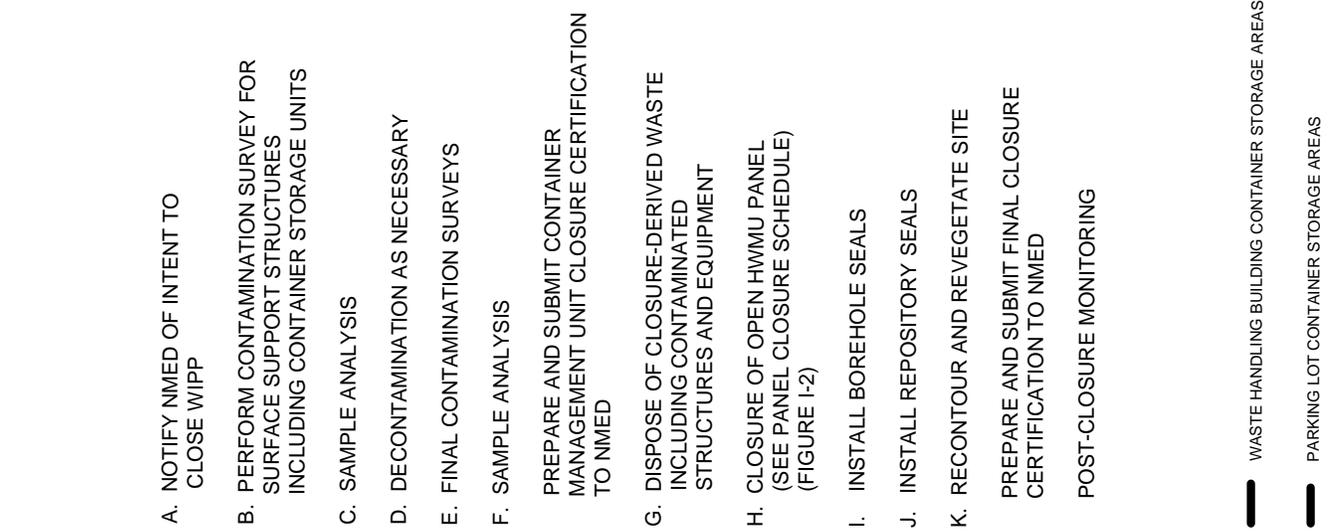


Figure I-3
 WIPP Facility Final Closure Schedule
 RENEWAL APPLICATION CHAPTER I
 Page I-33 of 36

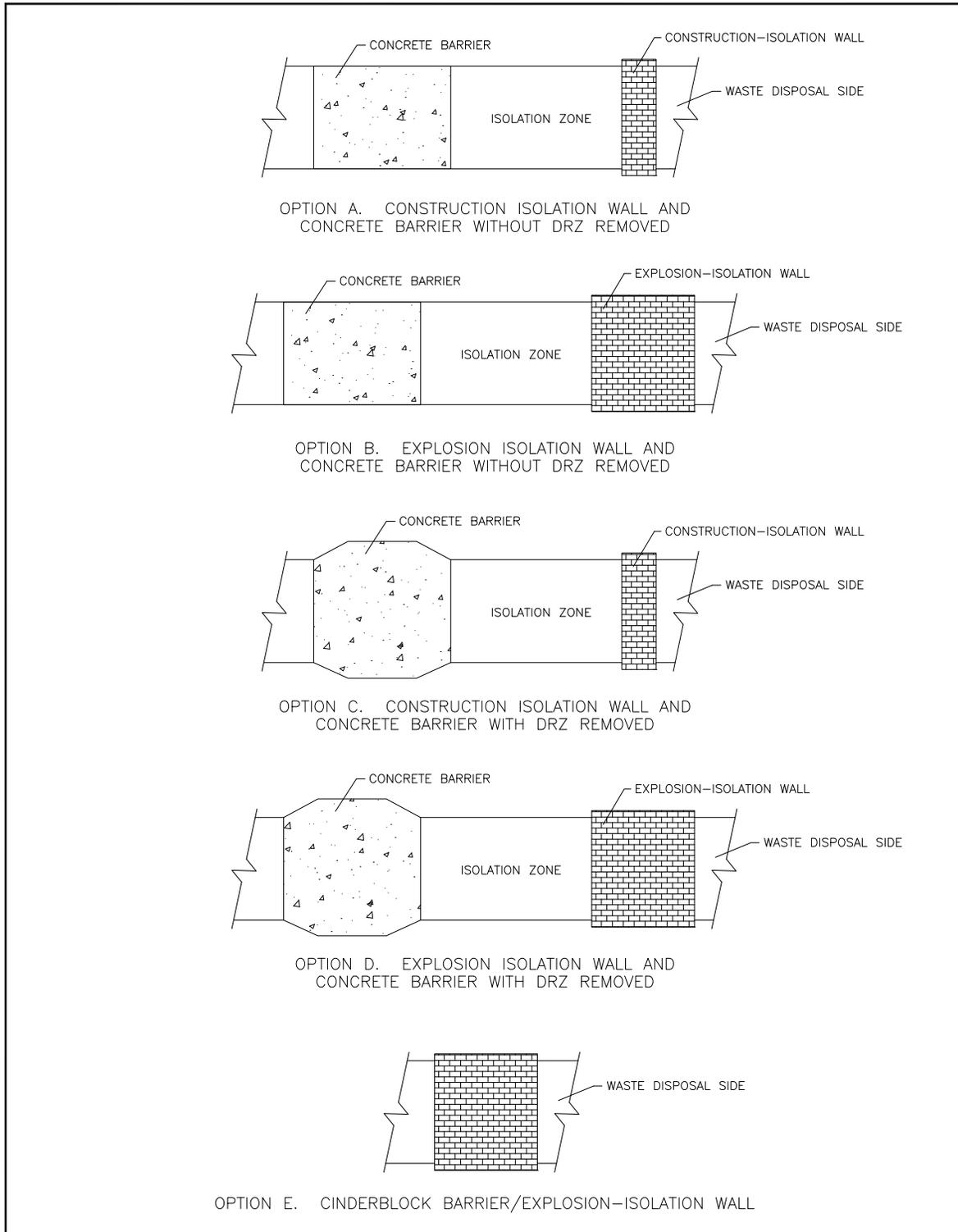


Figure I-4
Design of a Panel Closure System

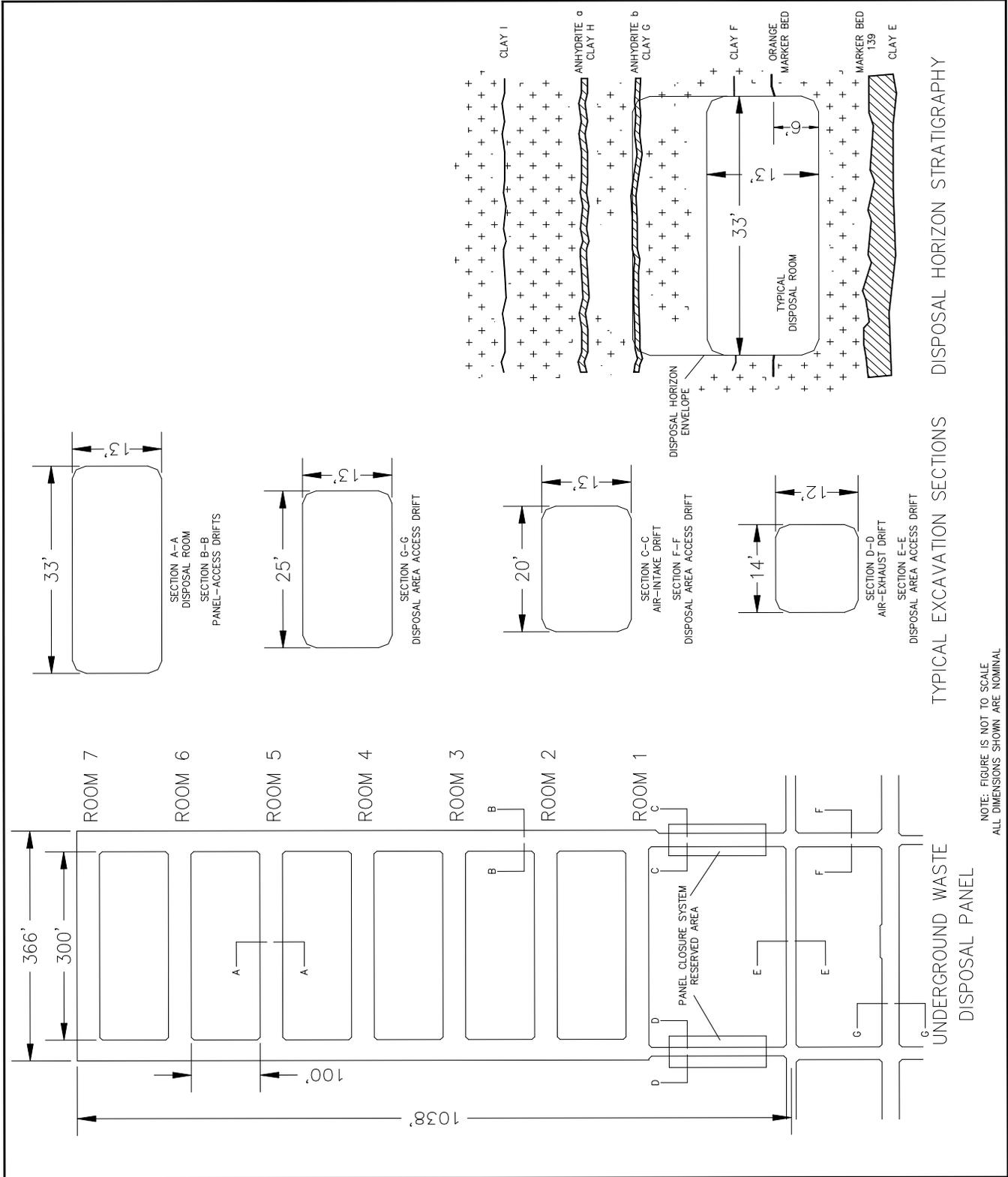


Figure I-5
 Typical Disposal Panel
 RENEWAL APPLICATION CHAPTER I
 Page I-35 of 36

Y cug'Kqrc'kqp'Rkqv'Rrcpv'
 J c|ctf qwu'Y cug'Hcekrk' 'Rgto k'
 F tch'Tgpgy cri'Cr r'kecvkqp"
 O c{'422;

WIPP-19

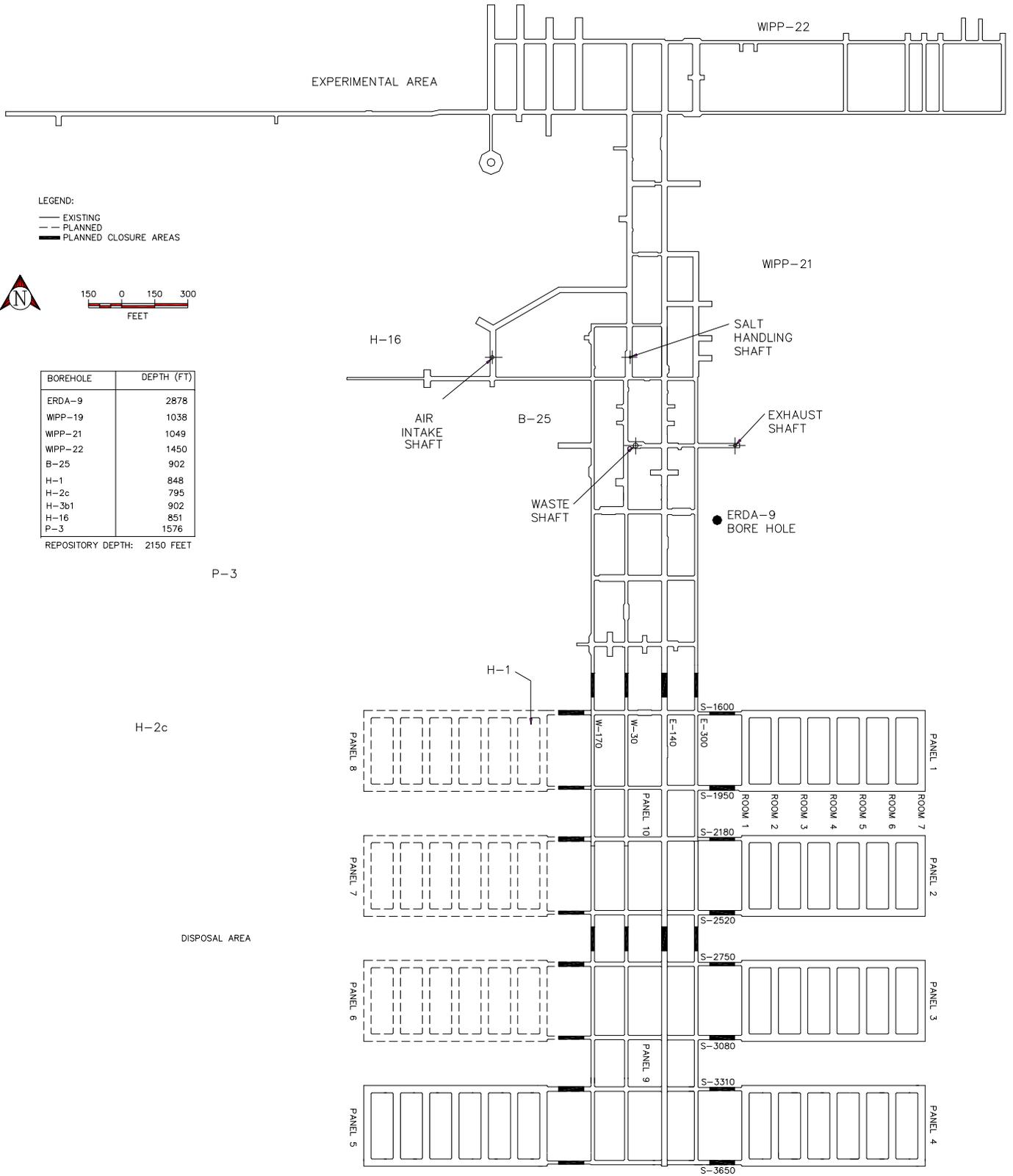


Figure I-6
 Approximate Location of Boreholes in Relation to the WIPP Underground