9/11/11

AUG 2011

Dear Stakeholder

Attached please find three Permit Modification Requests (PMRs) which are planned to be submitted to the New Mexico Environment Department (NMED) in September, 2011. The PMRs to be discussed include:

- Update Ventilation Language
- Addition of a Shielded Container
- Revise the WIPP Groundwater Detection Monitoring Program

The Permittees anticipate a pre-submittal meeting on these three PMRs as indicated below:

Meeting Date: August 30, 2011

Time: 1-4 pm

Location: Albuquerque Sheraton Uptown

2600 Louisiana Blvd., NE

Albuquerque, NM

For those that cannot attend in person there will be a call-in telephone number available which is:

1-800-779-6975

Passcode: 62235

If you have any questions please contact Mr. Bobby St. John at 575-234-7348

110821

DRAFT 08-11-11

Class 2 Permit Modification Request

Addition of a Shielded Container

Waste Isolation Pilot Plant
Carlsbad, New Mexico

WIPP Permit Number NM4890139088-TSDF

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Acronyms and Abbreviations

AK	Acceptable Knowledge
CFR	Code of Federal Regulations
CH	Contact Handled
DAC	Drum Age Criteria
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
ft	feet
gal	gallon
HWDU	Hazardous Waste Disposal Unit
L	Liter
lbs	pounds
m^3	Cubic Meters
mrem/h	Millirems Per Hour
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
PMR	Permit Modification Request
RCRA	Resource Conservation and Recovery Act
RH	Remote Handled
SLB	Standard Large Box
TDOP	Ten Drum Overpack
TRU	transuranic
TSDF	Treatment, Storage and Disposal Facility
WHB	Waste Handling Building
WIPP	Waste Isolation Pilot Plant
WTS	Washington TRU Solutions LLC
WWIS	WIPP Waste Information System

Overview of the Permit Modification Request

This document contains one Class 2 Permit Modification Request (**PMR**) for the Waste Isolation Pilot Plant (**WIPP**) Hazardous Waste Facility Permit (**Permit**) Number NM4890139088-TSDF.

This PMR is being submitted by the U.S. Department of Energy (**DOE**) Carlsbad Field Office and Washington TRU Solutions LLC (**WTS**), collectively referred to as the Permittees, in accordance with the WIPP Permit, Part 1, Condition 1.3.1. (20.4.1.900 New Mexico Administrative Code (**NMAC**) incorporating Title 40 Code of Federal Regulations (**CFR**) §270.42(b)). The modification provides for the following changes:

- addition of a new gamma shielded container for managing remote-handled (**RH**) transuranic (**TRU**) mixed waste processed as contact handled (**CH**) TRU mixed waste,
- description of how the volume of RH TRU mixed waste which disposed in gamma shielded containers will be tracked upon arrival through emplacement, and,
- related changes to waste handling descriptions.

The gamma shielded container will be used to package RH TRU mixed waste that is approved for shipment to the WIPP facility for disposal.

These changes do not reduce the ability of the Permittees to provide continued protection to human health and the environment.

The requested modification to the WIPP Permit and related supporting documents are provided in this PMR. The proposed modification to the text of the WIPP Permit has been identified using red text and a double underline and a ~~strikeout~~ font for deleted information. All direct quotations are indicated by italicized text. The following information specifically addresses how compliance has been achieved with the WIPP Permit Part 1, Condition 1.3.1. for submission of this Class 2 PMR.

1. 20.4.1.900 NMAC (incorporating 40 CFR §270.42(b)(1)(i)) requires the applicant to describe the exact change to be made to the permit conditions and supporting documents referenced by the Permit.

The Permittees are proposing to package a portion of the RH TRU mixed waste inventory in gamma shielded containers for emplacement at the WIPP facility. The use of the shielded containers will enable the DOE to simplify the packaging and management of RH TRU mixed waste.

Shielded containers will be transported to the WIPP facility in the HalfPACT transportation package. The shielded containers comply with the U.S. Department of Transportation (**DOT**) Type 7A standards.

The RH TRU mixed waste that will be packaged in shielded containers is the same kind as that included in the current inventory for disposal at the WIPP facility. Candidate RH TRU mixed waste streams for shipment and disposal in gamma shielded containers will be selected based

on the requirement to keep the radiation surface dose rate at the external surface of the shielded container below 200 millirems per hour (**mrem/h**) in accordance with Permit Part 1, Condition 1.5.1. RH TRU mixed waste emplaced at the WIPP facility in shielded containers will remain designated as RH TRU mixed waste in the WIPP Waste Information System (**WWIS**). The emplaced volume will be counted against the RH repository limit of 7,080 cubic meters (**m^3**) and RH TRU mixed waste volume limits specified in the Permit. The shielded container allows the WIPP facility to manage the shipment in a manner consistent with management of a CH TRU mixed waste shipment.

The shielded container is designed to hold an inner 30-gallon container. The cylindrical sidewall of the shielded container has approximately a 1-inch-thick lead shield sandwiched between a double-walled carbon steel shell as shown in Figure 1. The external wall is approximately 1/8-inch thick, and the internal wall has a thickness of approximately 3/16-inch. The lid and the bottom of the shielded container are made of carbon steel and are approximately 3 inches thick. The empty weight of the shielded container is approximately 1,726 pounds. The shielded container and the inner 30-gallon container will be vented.

The shielded containers will be assembled in a 3-pack configuration on a triangular pallet surrounded by radial and axial dunnage components. They will be transported as a single 3-pack configuration within the existing HalfPACT packaging. The 3-pack configuration will remain intact throughout transportation and emplacement (Figure 2).

Upon arrival at the WIPP facility, the shielded containers will be processed as CH TRU mixed waste. After receipt at the WIPP facility, the 3-pack assembly will be removed from the HalfPACT transportation container using existing lifting fixtures and equipment in the CH Bay portion of the Waste Handling Building. The 3-pack assembly will remain intact. The radial and axial dunnage will be removed. The 3-pack will be processed, tracked and downloaded to the underground repository and emplaced along with CH TRU mixed waste containers. The 3-pack assembly will be placed singly on the floor with no waste placed on top in the interstitial spaces around CH waste (see Figure 3). Emplacement of the 3-pack assembly of shielded containers will be performed using existing waste handling equipment and fixtures.

The handling and emplacement of shielded containers will have minimal impact on waste handling operations. The Permittees will track waste components, packaging, transportation and emplacement information using the same method as other waste that is transported and emplaced at the WIPP facility. The shielded container waste will be reported as RH TRU mixed waste as the volume of waste in the inner waste container.

The Permittees have evaluated the Drum Age Criteria (**DAC**) for the shielded container packaging configuration (Drum Age Criteria Values for the Shielded Container, June 2009). The evaluation indicates that no new DAC values are necessary because existing 55-gallon DAC values bound the shielded container.

The Permittees are proposing the following changes in this PMR:

1. Add a new container (Part 3, Condition 3.3.1., Part 4, Table 4.1.1., Condition 4.3.1., Attachment A1, Section A1-1b(1), Section A1-1c(1), Section A1-1d(2), Section A1-1d(3), Table A1-2, Figure A1-37,

Attachment A2, Section A2-1, Section A2-2a(1), Section A2-2b, Table A2-1, Attachment A4, Section A4-3, Attachment C1, Section C1-1a, Section C1-1a(1), Table C1-8 footnote, Attachment D, Section D-1d, Section D-1e(1), Attachment E, Section E-1b(1), Attachment H1, Introduction.

2. Revise Part 4, Table 4.1.1 to remove the container equivalent column since RH TRU mixed waste will be disposed of in both canisters and shielded containers.

3. Add figure of shielded container (Attachment A1).

4. Add "Shielded Containers" to Attachment C1, Sections C1-1a and C1-1a (1) and revise Table C1-8 indicating that the 55-gallon drum DAC bounds the shielded container.

Appendix A provides a detailed list of changes by Permit section. Proposed text changes are included in Appendix B of this PMR.

2. 20.4.1.900 NMAC (incorporating 40 CFR §270.42(b)(1)(ii)), requires the applicant to identify that the modification is a Class 2 modification.

This PMR proposes to add a new container to the Permit. The Permittees request that these changes be reviewed as a Class 2 as specified in 20.4.1.900 NMAC (incorporating 40 CFR, §270.42(a)(3)) to allow for public comment on this requested change.

3. 20.4.1.900 NMAC (incorporating 40 CFR §270.42(b)(1)(iii)), requires the applicant to explain why the modification is needed.

This PMR is necessary to add a shielded container as an acceptable waste container at the WIPP facility.

The Permittees are proposing to package a portion of the RH TRU mixed waste inventory in shielded containers for emplacement at the WIPP facility. The use of the shielded containers will enable DOE to simplify the packaging and management of RH TRU mixed waste. The shielded containers will be transported to the WIPP facility in the HalfPACT transportation container. The shielded containers will be managed and emplaced in the rooms of the repository as CH TRU mixed waste. The containers comply with DOT Type 7A standards and they will have a surface dose rate of less than 200 mrem/h.

The RH TRU mixed waste that will be packaged in shielded containers is included in the current inventory for the WIPP facility. No change in the permitted aboveground hazardous waste storage or underground disposal unit capacity is required. Candidate RH TRU mixed waste streams for shipment and disposal in shielded containers will be selected based on the requirement to keep the radiation surface dose rate at the external surface of the shielded containers below 200 mrem/h. The volume of waste emplaced in shielded containers will remain designated as RH TRU mixed waste in the WWIS and will be counted against the RH TRU mixed waste repository limit of 7,080 m^3.

The Table of Changes in this PMR describes each change that has been made and why that change is necessary.

4. 20.4.1.900 NMAC (incorporating 40 CFR §270.42 (b)(1)(iv)) requires the applicant to provide the applicable information required by 40 CFR §270.13 through §270.21, §270.62 and §270.63.

The attached regulatory crosswalk describes those portions of the WIPP Permit that are affected by this PMR. Where applicable, regulatory citations in this modification reference Title 20, Chapter 4, Part 1, NMAC, revised March 2009, incorporating the CFR, Title 40 (40 CFR Parts 264 and 270). 40 CFR §270.16 through §270.22, §270.62, §270.63 and §270.66 are not applicable at WIPP. Consequently, they are not listed in the regulatory crosswalk table. 40 CFR §270.23 is applicable to the WIPP Hazardous Waste Disposal Units (**HWDUs**). This modification does not impact the conditions associated with the HWDUs.

5. 20.4.1.900 NMAC (incorporating 40 CFR §270.11(d)(1) and 40 CFR §270.30(k)) require that any person signing under paragraph a and b must certify the document in accordance with 20.4.1.900 NMAC.

The transmittal letter for this PMR contains the signed certification statement in accordance with Permit Part 1, Condition 1.9. of the WIPP Permit.

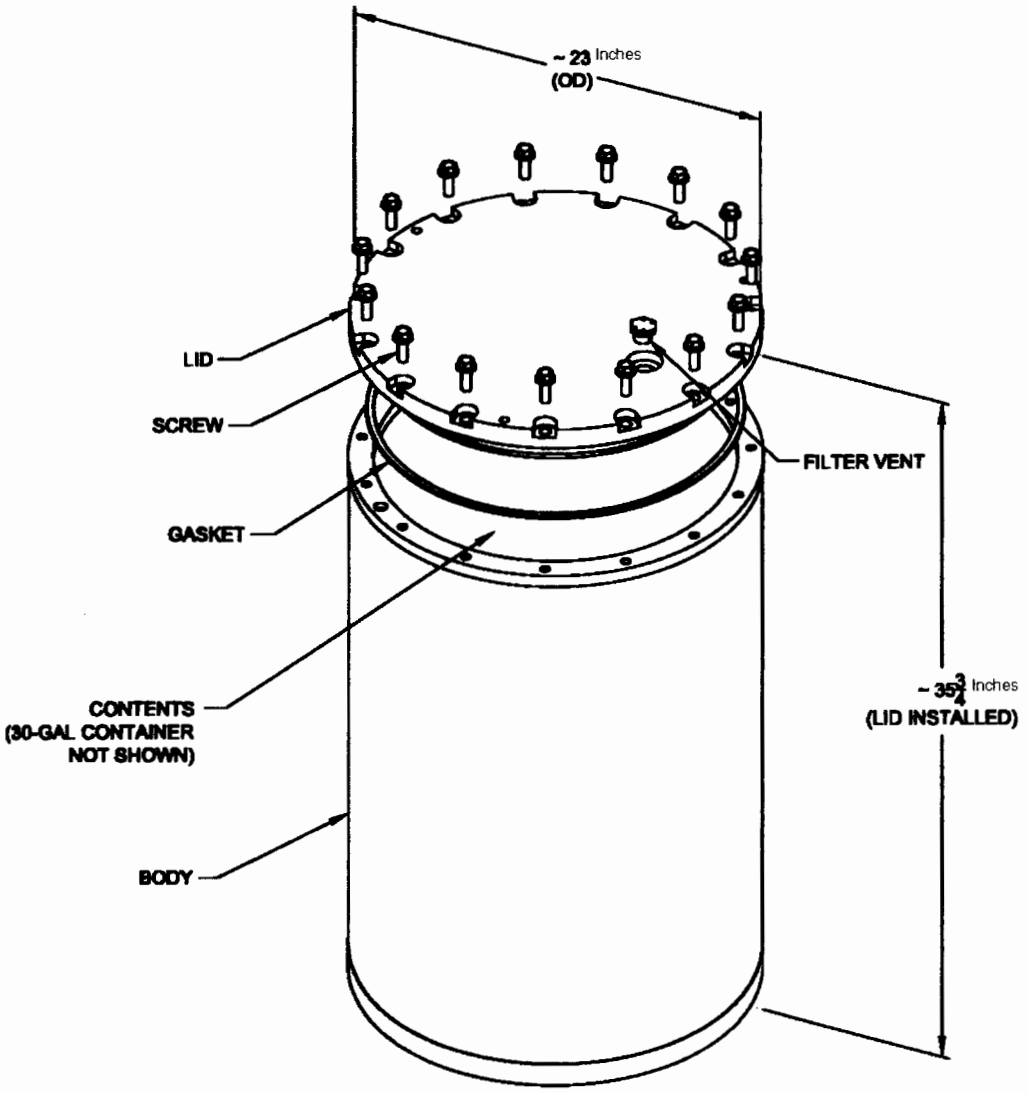

Figure 1
Shielded Container

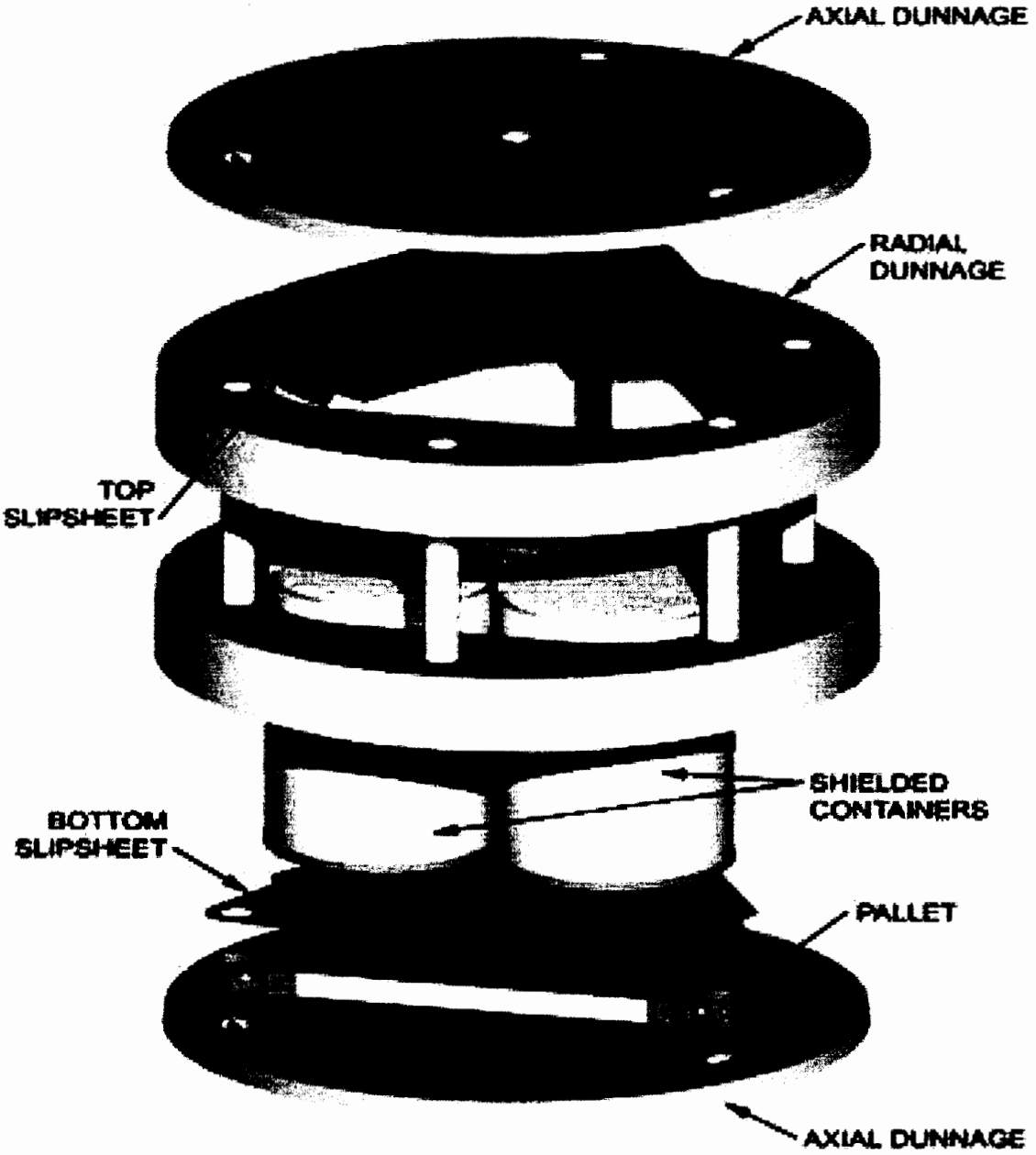

Figure 2
3-Pack Assembly of Shielded Containers with Axial and Radial Dunnage

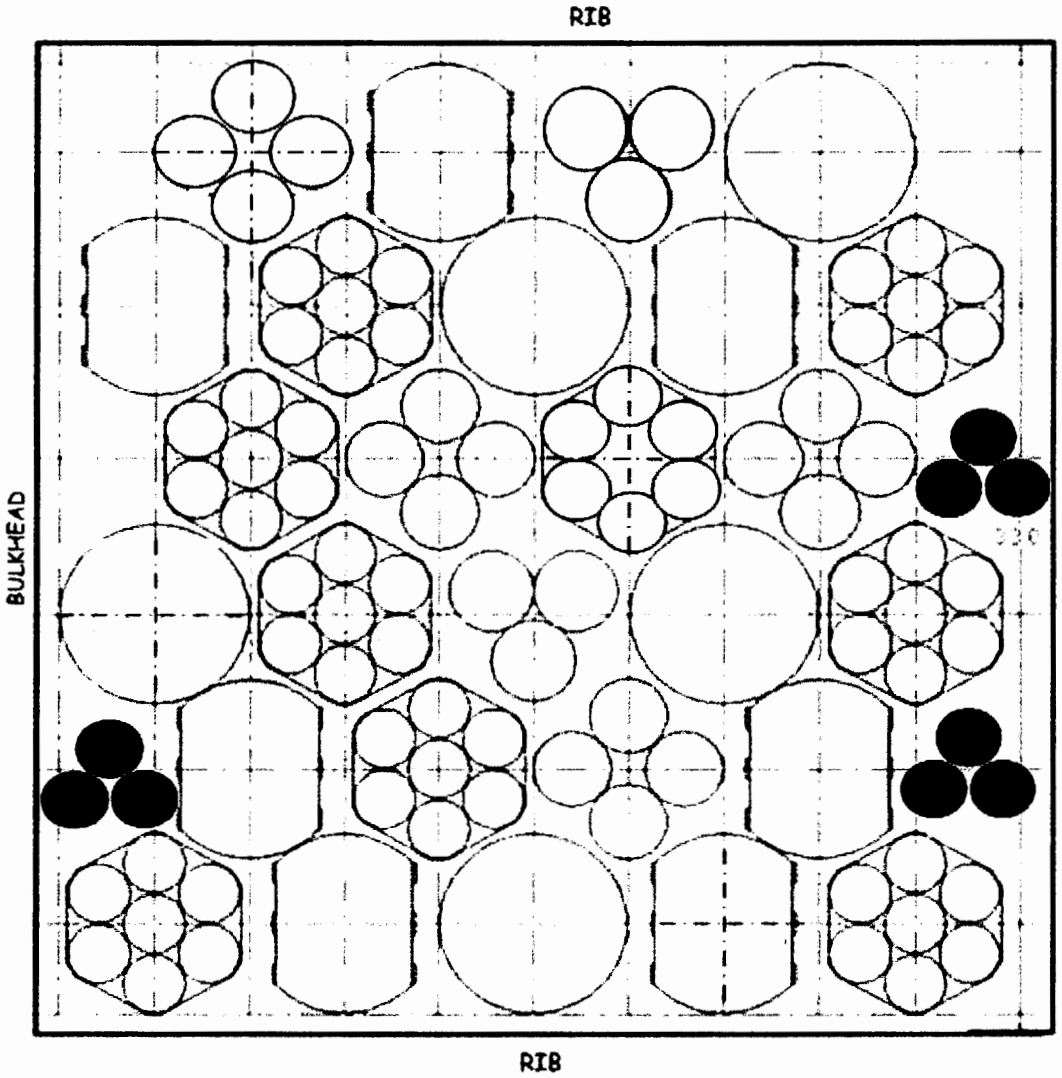

Figure 3
Shielded Containers – Randomly Placed in the Interstitial Spaces in Waste Rows

Regulatory Crosswalk

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit Application	Yes	No
§270.13		Contents of Part A permit application	Attachment B, Part A		✓
§270.14(b)(1)		General facility description	Attachment A		✓
§270.14(b)(2)	§264.13(a)	Chemical and physical analyses	Attachment C		✓
§270.14(b)(3)	§264.13(b)	Development and implementation of waste analysis plan	Attachment C		✓
	§264.13(c)	Off-site waste analysis requirements	Attachment C		✓
§270.14(b)(4)	§264.14(a-c)	Security procedures and equipment	Part 2.6		✓
§270.14(b)(5)	§264.15(a-d)	General inspection requirements	Attachment E		✓
	§264.174	Container inspections	Attachment E	✓	
§270.23(a)(2)	§264.602	Miscellaneous units inspections	Attachment E		✓
§270.14(b)(6)		Request for waiver from preparedness and prevention requirements of Part 264 Subpart C	NA		
§270.14(b)(7)	264 Subpart D	Contingency plan requirements	Attachment D		✓
	§264.51	Contingency plan design and implementation	Attachment D		✓
	§264.52 (a) & (c-f)	Contingency plan content	Attachment D	✓	
	§264.53	Contingency plan copies	Attachment D		✓
	§264.54	Contingency plan amendment	Attachment D		✓
	§264.55	Emergency coordinator	Attachment D		✓
	§264.56	Emergency procedures	Attachment D		✓
§270.14(b)(8)		Description of procedures, structures or equipment for:	Part 2.10		✓
§270.14(b)(8) (i)		Prevention of hazards in unloading operations (e.g., ramps and special forklifts)	Part 2.10		✓
§270.14(b)(8) (ii)		Runoff or flood prevention (e.g., berms, trenches, and dikes)	Part 2.10		✓
§270.14(b)(8) (iii)		Prevention of contamination of water supplies	Part 2.10		✓
§270.14(b)(8) (iv)		Mitigation of effects of equipment failure and power outages	Part 2.10		✓
§270.14(b)(8) (v)		Prevention of undue exposure of personnel (e.g., personal protective equipment)	Part 2.10		✓
§270.14(b)(8) (vi) §270.23(a)(2)	§264.601	Prevention of releases to the atmosphere	Part Part 4 Attachment A2 Attachment N		✓
	264 Subpart C	Preparedness and Prevention	Part 2.10		✓
	§264.31	Design and operation of facility	Part 2.10		✓
	§264.32	Required equipment	Part 2.10 Attachment D		✓
	§264.33	Testing and maintenance of equipment	Attachment E		✓
	§264.34	Access to communication/alarm system	Part 2.10		✓
	§264.35	Required aisle space	Part 2.10		✓
	§264.37	Arrangements with local authorities	Attachment D		✓
§270.14(b)(9)	§264.17(a-c)	Prevention of accidental ignition or reaction of ignitable, reactive, or incompatible wastes	Part 2.10		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit Application	Yes	No
§270.14(b) (10)		Traffic pattern, volume, and controls, for example: Identification of turn lanes Identification of traffic/stacking lanes, if appropriate Description of access road surface Description of access road load-bearing capacity Identification of traffic controls	Attachment A4	✓	
§270.14(b) (11)(i) and (ii)	§264.18(a)	Seismic standard applicability and requirements	Part B, Rev. 6 Chapter B		✓
§270.14(b) (11)(iii-v)	§264.18(b)	100-year floodplain standard	Part B, Rev. 6 Chapter B		✓
	§264.18(c)	Other location standards	Part B, Rev. 6 Chapter B		✓
§270.14(b) (12)	§264.16(a-e)	Personnel training program	Part 2 Attachment F		✓
§270.14(b) (13)	264 Subpart G	Closure and post-closure plans	Attachment G & H		✓
§270.14(b)(13)	§264.111	Closure performance standard	Attachment G		✓
§270.14(b)(13)	§264.112(a), (b)	Written content of closure plan	Attachment G		✓
§270.14(b)(13)	§264.112(c)	Amendment of closure plan	Attachment G		✓
§270.14(b)(13)	§264.112(d)	Notification of partial and final closure	Attachment G		✓
§270.14(b)(13)	§264.112(e)	Removal of wastes and decontamination/dismantling of equipment	Attachment G		✓
§270.14(b)(13)	§264.113	Time allowed for closure	Attachment G		✓
§270.14(b)(13)	§264.114	Disposal/decontamination	Attachment G		✓
§270.14(b)(13)	§264.115	Certification of closure	Attachment G		✓
§270.14(b)(13)	§264.116	Survey plat	Attachment G		✓
§270.14(b)(13)	§264.117	Post-closure care and use of property	Attachment H		✓
§270.14(b)(13)	§264.118	Post-closure plan; amendment of plan	Attachment H		✓
§270.14(b)(13)	§264.178	Closure/ containers	Attachment G		✓
§270.14(b)(13)	§264.601	Environmental performance standards-Miscellaneous units	Attachment G		✓
§270.14(b)(13)	§264.603	Post-closure care	Attachment G		✓
§270.14(b)(14)	§264.119	Post-closure notices	Attachment H		✓
§270.14(b)(15)	§264.142	Closure cost estimate	NA		✓
	§264.143	Financial assurance	NA		✓
§270.14(b)(16)	§264.144	Post-closure cost estimate	NA		✓
	§264.145	Post-closure care financial assurance	NA		✓
§270.14(b)(17)	§264.147	Liability insurance	NA		✓
§270.14(b)(18)	§264.149-150	Proof of financial coverage	NA		✓
§270.14(b)(19)(i), (vi), (vii), and (x)		Topographic map requirements Map scale and date Map orientation Legal boundaries Buildings Treatment, storage, and disposal operations	Attachment B Part A		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit Application	Yes	No
		Run-on/run-off control systems Fire control facilities			
§270.14(b)(19)(ii)	§264.18(b)	100-year floodplain	Attachment B Part A		✓
§270.14(b)(19)(iii)		Surface waters	Attachment B Part A		✓
§270.14(b)(19)(iv)		Surrounding Land use	Attachment B Part A		✓
§270.14(b)(19)(v)		Wind rose	Attachment B Part A		✓
§270.14(b)(19)(viii)	§264.14(b)	Access controls	Attachment B Part A		✓
§270.14(b)(19)(ix)		Injection and withdrawal wells	Attachment B Part A		✓
§270.14(b)(19)(xi)		Drainage on flood control barriers	Attachment B Part A		✓
§270.14(b)(19)(xii)		Location of operational units	Attachment B Part A		✓
§270.14(b)(20)		Other federal laws Wild and Scenic Rivers Act National Historic Preservation Act Endangered Species Act Coastal Zone Management Act Fish and Wildlife Coordination Act Executive Orders	Attachment B Part A		✓
§270.15	§264 Subpart I	Containers	Attachment A1	✓	
	§264.171	Condition of containers	Attachment A1		✓
	§264.172	Compatibility of waste with containers	Attachment A1		✓
	§264.173	Management of containers	Attachment A1	✓	
	§264.174	Inspections	Attachment E Attachment A1		✓
§270.15(a)	§264.175	Containment systems	Attachment A1		✓
§270.15(c)	§264.176	Special requirements for ignitable or reactive waste	Part 2		✓
§270..15(d)	§264.177	Special requirements for incompatible wastes	Part 2		✓
	§264.178	Closure	Attachment G		✓
§270.15(e)	§264.179	Air emission standards	Part 4 Attachment N	✓	
§270.23	264 Subpart X	Miscellaneous units	Attachment A2	✓	
§270.23(a)	§264.601	Detailed unit description	Attachment A2		✓
§270.23(b)	§264.601	Hydrologic, geologic, and meteorologic assessments	Part 5 Attachment L		✓
§270.23(c)	§264.601	Potential exposure pathways	Part 4 Attachment A2 Attachment N		✓
§270.23(d)		Demonstration of treatment	NA		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit Application	Yes	No
		effectiveness			
	§264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	Part 2 Part 4 Part 5 Attachment A2 Attachment N		✓
	§264.603	Post-closure care	Attachment H Attachment H1	✓	
	264 Subpart E	Manifest system, record keeping, and reporting	Part 2 Attachment C		✓

Appendix A
Table of Changes

Table of Changes

Affected Permit Section	Explanation of Change	Page Number
Part 3, Condition 3.3.1.	Add 3.3.1.8. to add shielded container as an acceptable container at the WIPP facility.	B-2
Part 4, Table 4.1.1.	Remove "container equivalent" column since the RH TRU mixed waste may now be disposed at the WIPP facility in containers other than canisters.	B-3
Part 4, Condition 4.3.1.	Add 4.3.1.8 to add a shielded container as an acceptable container at the WIPP facility.	B-4
Attachment A1, Section A1-1b(1)	Add shielded container to the Container Description section of the Permit. Add Figure A1-37.	B-5
Attachment A1, Section A1-1c(1)	Add shielded container to CH Bay Operations description.	B-5
Attachment A1, Section A1-1d(2)	Revise the contents of what may be received in a HalfPACT relative to container management practices.	B-5
Attachment A1, Section A1-1d(3)	Revise what containers RH TRU mixed waste may be shipped in.	B-6
Attachment A1, Table A1-2	Revise Table A1-2 to add shielded containers.	B-7
Attachment A1, Figure A1-37	Add figure A1-37 Typical Shielded Container.	B-8
Attachment A2, Section A2-1	Add container to the Description of the Geologic Repository. Add "disposed in the panel".	B-9
Attachment A2, Section A2-2a(1)	Add shielded container to Geologic Repository Design and Process Description.	B-9
Attachment A2, Section A2-2b	Add shielded container to Geologic Repository Design and Process Description.	B-9
Attachment A2, Table A2-1	Revise Table A2-1 to add shielded containers.	B-10
Attachment A4, Section A4-3	Add shielded container to Waste Handling Building Traffic description.	B-11
Attachment C1, Section C1-1a	Clarify that the shielded containers are bounded by the 55-gallon drum DAC.	B-12
Attachment C1, Section C1-1a(1)	Clarify that the shielded containers are bounded by the 55-gallon drum DAC.	B-12
Attachment C1, Table C1-8	Clarify that the shielded containers are bounded by the 55-gallon drum DAC.	B-14
Attachment D, Section D-1d	Add shielded container to the Description of Containers section of the Contingency Plan.	B-16
Attachment D, Section D-1e(1)	Add shielded container to the Description of Containers section of the Contingency Plan.	B-16
Attachment E, Section E-1b(1)	Add shielded container to CH Bay Operations description.	B-17
Attachment H1, Introduction	Add shielded container to the description of CH Containers.	B-18

Proposed Revised Permit Text

Proposed Revised Permit Text:

3.3.1. Acceptable Storage Containers

The Permittees shall use containers that comply with the requirements for U.S. Department of Transportation shipping container regulations (49 CFR §173 - Shippers - General Requirements for Shipment and Packaging, and 49 CFR §178 - Specifications for Packaging) for storage of TRU mixed waste at WIPP. The Permittees are prohibited from storing TRU mixed waste in any container not specified in Permit Attachment A1, Section A1-1b, as set forth below:

3.3.1.8. Shielded Container

Each 30-gallon inner container has a gross internal volume of 4.0 ft^3 (0.11 m^3). This container will be used to emplace RH TRU mixed waste, but the shielding will allow it to be managed as CH TRU mixed waste. For the purpose of this Permit, shielded containers are managed and handled as CH TRU mixed waste containers, but will remain counted towards the volume of RH TRU mixed waste containers.

Table 4.1.1

Table 4.1.1 - Underground HWDUs				
Description[1]	**Waste Type**	**Maximum Capacity**[2]	**~~Container Equivalent~~**	**Final Waste Volume**
Panel 1	CH TRU	636,000ft^3 (18,000 m^3)		370,800 ft^3 (10,500 m^3)
Panel 2	CH TRU	636,000 ft^3 (18,000 m^3)		635,600 ft^3 (17,998 m^3)
Panel 3	CH TRU	662,150 ft^3 (18,750 m^3)		603,600 ft^3 (17,092 m^3)
Panel 4	CH TRU	662,150 ft^3 (18,750 m^3)		503,500 ft^3 (14,258 m^3)
	RH TRU	12,570 ft^3 (356 m^3)	~~400 RH TRU Canisters~~	6,200 ft^3 (176 m^3)
Panel 5	CH TRU	662,150 ft^3 (18,750 m^3)		
	RH TRU	15,720 ft^3 (445 m^3)	~~500 RH TRU Canisters~~	
Panel 6	CH TRU	662,150 ft^3 (18,750 m^3)		
	RH TRU	18,860 ft^3 (534 m^3)	~~600 RH TRU Canisters~~	
Panel 7	CH TRU	662,150 ft^3 (18,750 m^3)		
	RH TRU	22,950 ft^3 (650 m^3)	~~730 RH TRU Canisters~~	
Panel 8	CH TRU	662,150 ft^3 (18,750 m^3)		
	RH TRU	22,950 ft^3 (650 m^3)	~~730 RH TRU Canisters~~	
Total	**CH TRU**	**5,244,900 ft^3 (148,500 m^3)**		
	RH TRU	**93,050 ft^3 (2,635 m^3)**	**~~2960 RH TRU Canisters~~**	

[1] The area of each panel is approximately 124,150 ft^2 (11,533 m^2).
[2] "Maximum Capacity" is the maximum volume of TRU mixed waste that may be emplaced in each panel. The maximum repository capacity of "6.2 million cubic feet of transuranic waste" is specified in the WIPP Land Withdrawal Act (Pub. L. 102-579, as amended).

4.3. DISPOSAL CONTAINERS

4.3.1 Acceptable Disposal Containers

The Permittees shall use containers that comply with the requirements for U.S. Department of Transportation shipping container regulations (49 CFR §173 - Shippers - General Requirements for Shipment and Packaging, and 49 CFR §178 - Specifications for Packaging) for disposal of TRU mixed waste at WIPP. The Permittees are prohibited from disposing TRU mixed waste in any container not specified in Permit Attachment A1 (Container Storage), Section A1-1b, as set forth below:

4.3.1.8. Shielded container

Shielded containers are configured as a 3-pack.

A1-1b(1) CH TRU Mixed Waste Containers

Contact handled (**CH**) TRU mixed waste containers will be either 55-gal (208-L) drums singly or arranged into 7-packs, 85-gal (322-L) drums singly or arranged into 4-packs, 100-gal (379 L) drums singly or arranged into 3-packs, shielded containers arranged as 3-packs, ten-drum overpacks (**TDOP**), standard large box 2s (**SLB2**), or SWBs. A summary description of each CH TRU mixed waste container type is provided below.

Shielded Container

The shielded container meets the requirements for DOT specification 7A (Figure A1-37).

Shielded containers having a 30-gallon inner container which has a gross internal volume of 4.0 ft^3 (0.11 m^3). One or more filter vents will be installed in the shielded container lid to prevent the escape of radioactive particulates and to prevent internal pressurization. This container will be used to emplace RH TRU mixed waste, but the shielding will allow it to be managed as CH TRU mixed waste.

A1-1c(1) Waste Handling Building Container Storage Unit (WHB Unit)

CH TRU Mixed Waste

- TRUPACT-II and HalfPACT Management

  Once unloaded from the Contact-Handled Packaging, CH TRU mixed waste containers (7-packs, 3-packs, 4-packs, 3-packs of shielded containers, SWBs, or TDOPs or any combination thereof) are placed in one of two positions on the facility pallet or on a containment pallet. The waste containers are stacked, on the facility pallets (one- or two-high, depending on weight considerations). Waste on containment pallets will be stacked one-high. The use of facility or containment pallets will elevate the waste at least 6 in. (15 cm) from the floor surface. Pallets of waste will then be relocated to the CH Bay Storage Area of the WHB Unit for normal storage.

A1-1d(2) CH TRU Mixed Waste Handling

The TRUPACT-II may hold up to two 7-packs, two 4-packs, two 3-packs, two SWBs, or one TDOP. A HalfPACT may hold seven 55-gal (208-L) drums, one SWB, one 3-pack of shielded containers, or four 85-gallon drums. The TRUPACT-III holds a single SLB2. An overhead bridge crane or Facility Transfer Vehicle will be used to remove the contents of the Contact-Handled Package and place them on a facility pallet. The containers will be visually inspected for physical damage (severe rusting, apparent structural defects, signs of pressurization, etc.) and leakage to ensure they are in good condition prior to storage. Waste containers will also be checked for external surface contamination. If a primary waste container is not in good condition, the Permittees will overpack the container, repair/patch the container in accordance with 49 CFR §173 and §178 (e.g., 49 CFR §173.28), or return the container to the generator.

A1-1d(3) RH TRU Mixed Waste Handling

The RH TRU mixed waste that is not in a shielded container will be received in the RH-TRU 72-B cask or CNS 10-160B cask loaded on a trailer, as illustrated in process flow diagrams in Figures A1-26 and A1-27, respectively. RH TRU mixed waste received in shielded containers will be handled as CH TRU mixed waste. These are shown schematically in Figures A1-28 and A1-29. Upon arrival at the gate, external radiological surveys, security checks, shipping documentation reviews are performed and the Uniform Hazardous Waste Manifest is signed. The generator's copy of the Uniform Hazardous Waste Manifest is returned to the generator. Should the results of the contamination survey exceed acceptable levels, the shipping cask and transport trailer remain outside the WHB in the Parking Area Unit, and the appropriate radiological boundaries (i.e., ropes, placards) are erected around the shipping cask and transport trailer. A determination will be made whether to return the cask to the originating site or to decontaminate the cask.

Table A1-2
Waste Handling Equipment Capacities

CAPACITIES FOR EQUIPMENT	
CH Bay overhead bridge crane	12,000 lbs.
Surface forklifts	26,000 lbs. (CH Bay forklift) 70,000 lbs. (TRUPACT-III Handler forklift)
Facility Pallet	25,000 lbs.
Adjustable center-of-gravity lift fixture	10,000 lbs.
Facility Transfer Vehicle	30,000 lbs.
Yard Transfer Vehicle	60,000 lbs.
MAXIMUM GROSS WEIGHTS OF CONTAINERS	
Seven-pack of 55-gallon drums	7,000 lbs.
Four-pack of 85-gallon drums	4,500 lbs.
Three-pack of 100-gallon drums	3,000 lbs.
Ten-drum overpack	6,700 lbs.
Standard waste box	4,000 lbs.
Standard large box 2	10,500 lbs.
Shielded container	2,260 lbs.
MAXIMUM NET EMPTY WEIGHTS OF EQUIPMENT	
TRUPACT-II	13,140 lbs.
HalfPACT	10,500 lbs.
TRUPACT-III	43,600 lbs.
Adjustable center of gravity lift fixture	2,500 lbs.
Facility pallet	4,120 lbs.

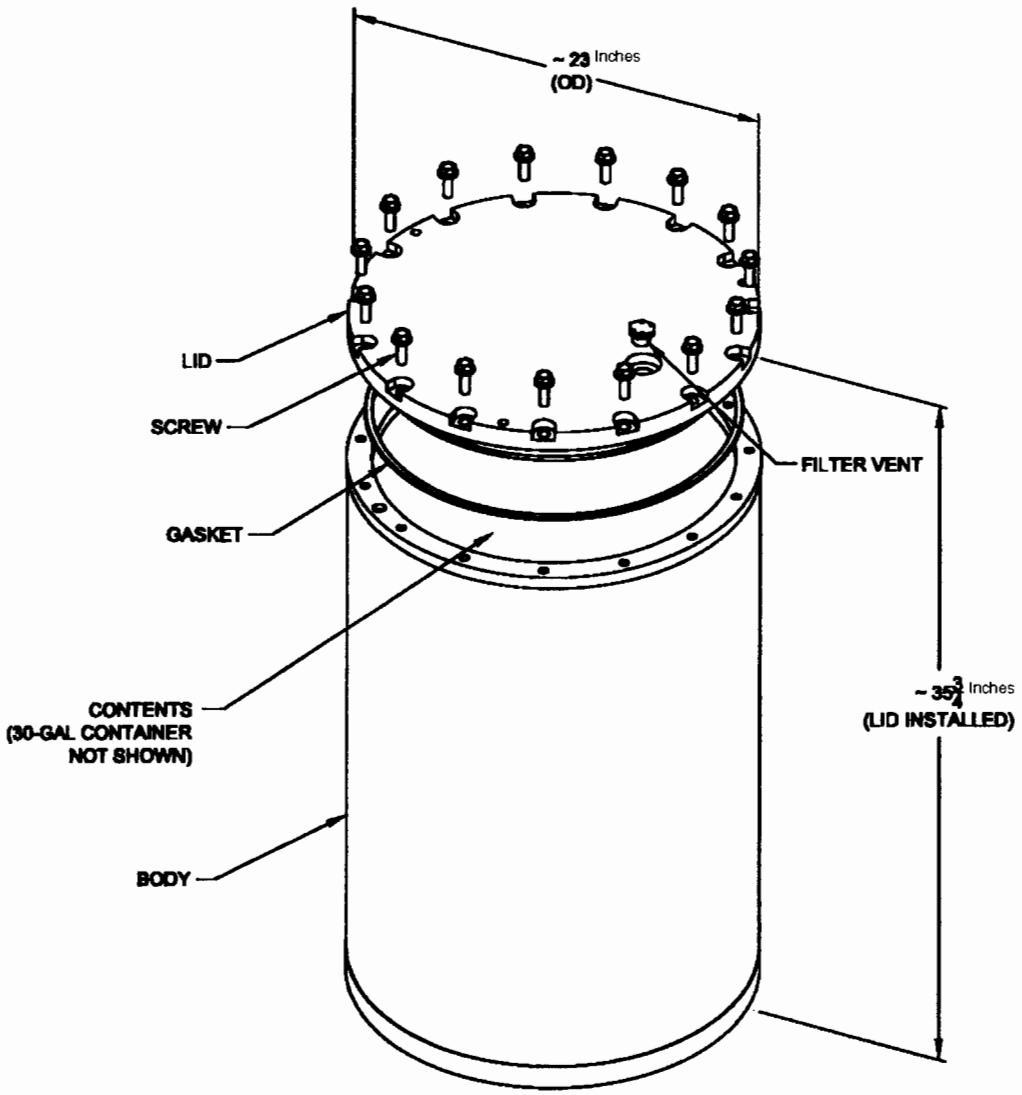

Figure A1-37
Typical Shielded Container

A2-1 Description of the Geologic Repository

Panels 4 through 8 provide room for up to 93,050 ft^3 (2,635 m^3) of RH TRU mixed waste. RH TRU mixed waste containers may be disposed of in up to 730 boreholes per panel, subject to the limitations in Permit Part 4, Section 4.1.1.2.ii. These boreholes shall be drilled on nominal eight-foot centers, horizontally, about mid-height in the ribs of a disposal room. The thermal loading from RH TRU mixed waste disposed in the panel shall not exceed 10 kilowatts per acre when averaged over the area of a panel, as shown in Permit Attachment A3, plus 100 feet of each of a Panel's adjoining barrier pillars.

A2-2a(1) CH TRU Mixed Waste Handling Equipment

Facility Pallets

The facility pallet is a fabricated steel unit designed to support 7-packs, 3-packs, or 4-packs of drums, standard waste boxes (**SWBs**), ten-drum overpacks (**TDOPs**), or a standard large box 2 (**SLB2**), and has a rated load of 25,000 pounds (lbs.) (11,430 kilograms (kg)). The facility pallet will accommodate up to four 7-packs, four 3-packs, two 3-packs of shielded containers, or four 4-packs of drums, four SWBs (in two stacks of two units), two TDOPs, ~~or~~ one SLB2. Loads are secured to the facility pallet during transport to the emplacement area. Facility pallets are shown in Figure A2-3. Fork pockets in the side of the pallet allow the facility pallet to be lifted and transferred by forklift to prevent direct contact between TRU mixed waste containers and forklift tines. This arrangement reduces the potential for puncture accidents. WIPP facility operational documents define the operational load of the facility pallet to ensure that the rated load of a facility pallet is not exceeded.

A2-2b Geologic Repository Process Description

CH TRU Mixed Waste Emplacement

CH TRU mixed waste containers will arrive by tractor-trailer at the WIPP facility in sealed shipping containers (e.g., TRUPACT-IIs or HalfPACTs), at which time they will undergo security and radiological checks and shipping documentation reviews. The trailers carrying the shipping containers will be stored temporarily at the Parking Area Container Storage Unit (Parking Area Unit). A forklift will remove the Contact Handled Packages from the transport trailers and a forklift or Yard Transfer Vehicle will transport them into the Waste Handling Building Container Storage Unit for unloading of the waste containers. Each TRUPACT-II may hold up to two 7-packs, two 4-packs, two 3-packs, two SWBs, or one TDOP. Each HalfPACT may hold up to seven 55-gal (208 L) drums, one SWB, one 3-pack of shielded containers, or four 85-gal (322 L) drums. Each TRUPACT-III will hold one SLB2. An overhead bridge crane or Facility Transfer Vehicle with transfer table will be used to remove the waste containers from the Contact Handled Packaging and place them on a facility or containment pallet. Each facility pallet has two recessed pockets to accommodate two sets of 7-packs, two sets of 3-packs, two sets of 4-packs, two SWBs stacked two-high, two TDOPs, or one SLB2. Each stack of waste containers will be secured prior to transport underground (see Figure A2-3). A forklift or the facility transfer vehicle will transport the loaded facility pallet to the conveyance loading room adjacent to the Waste Shaft. The facility transfer vehicle will be driven onto the waste shaft conveyance deck, where the loaded facility pallet will be transferred to the waste shaft conveyance, and the facility transfer vehicle will be backed off. Containers of CH TRU mixed waste (55-gal (208 L) drums, SWBs, 85-gal (322 L) drums, 100-gal (379 L) drums, and TDOPs) can be handled individually, if needed, using the forklift and lifting attachments (i.e., drum handlers, parrot beaks).

Table A2-1
CH TRU Mixed Waste Handling Equipment Capacities

Capacities for Equipment	
Facility Pallet	25,000 lbs.
Facility Transfer Vehicle	26,000 lbs.
Underground transporter	28,000 lbs.
Underground forklift	12,000 lbs.
Maximum Gross Weights of Containers	
Seven-pack of 55-gallon drums	7,000 lbs.
Four-pack of 85-gallon drums	4,500 lbs.
Three-pack of 100-gallon drums	3,000 lbs.
Ten-drum overpack	6,700 lbs.
Standard waste box	4,000 lbs.
Standard large box 2	10,500 lbs.
Shielded container	2,260 lbs.
Maximum Net Empty Weights of Equipment	
TRUPACT-II	13,140 lbs.
HalfPACT	10,500 lbs.
TRUPACT-III	43,600 lbs.
Facility pallet	4,120 lbs.

A4-3 Waste Handling Building Traffic

The TRUPACT-II may hold up to two 55-gallon drum seven-packs, two 85-gallon drum four-packs, two 100-gallon drum three-packs, two standard waste boxes (SWB), or one ten-drum overpack (**TDOP**). A HalfPACT may hold seven 55-gallon drums, one SWB, one 3-pack of shielded containers, or four 85-gallon drums. The TRUPACT-III holds a single SLB2. A six-ton overhead bridge crane or Facility Transfer Vehicle with a transfer table will be used to remove the contents of the Contact Handled Package. Waste containers will be surveyed for radioactive contamination and decontaminated or returned to the Contact Handled Package as necessary.

Each facility pallet will accommodate four 55-gallon drum seven-packs, four SWBs, four 85-gallon drum four-packs, four 100-gallon drum three-packs, two 3-packs of shielded containers, two TDOPs, or an SLB2. Waste containers will be secured to the facility pallet prior to transfer. A forklift or facility transfer vehicle will transport the loaded facility pallet the air lock at the Waste Shaft (Figures A4-3, A4-3a, and A4-3b). The facility transfer vehicle will be driven onto the waste shaft conveyance deck, where the loaded facility pallet will be transferred to the waste shaft conveyance and downloaded for emplacement.

C1-1a Method Requirements

For those waste streams without an acceptable knowledge (**AK**) Sufficiency Determination approved by the U.S. Department of Energy (**DOE**), containers shall be randomly selected from waste streams designated as summary category S5000 (Debris waste) and shall be categorized under one of the sampling scenarios shown in Table C1-5 and depicted in Figure C1-1. If the container is categorized under Scenario 1, the applicable drum age criteria (**DAC**) from Table C1-6 must be met prior to headspace gas sampling. If the container is categorized under Scenario 2, the applicable Scenario 1 DAC from Table C1-6 must be met prior to venting the container and then the applicable Scenario 2 DAC from Table C1-7 must be met after venting the container. The DAC for Scenario 2 containers that contain filters or rigid liner vent holes other than those listed in Table C1-7 shall be determined using footnotes "a" and "b" in Table C1-7. Containers that have not met the Scenario 1 DAC at the time of venting must be categorized under Scenario 3. Containers categorized under Scenario 3 must be placed into one of the Packaging Configuration Groups listed in Table C1-8. If a specific packaging configuration cannot be determined based on the data collected during packaging and/or repackaging (Attachment C, Section C-3d(1)), a conservative default Packaging Configuration Group of 3 for 55-gallon drums and shielded containers, 6 for Standard Waste Boxes (**SWBs**) ten-drum overpacks (**TDOPs**), and standard larged box 2s (**SLB2s**), and 8 for 85-gallon and 100-gallon drums must be assigned, provided the drums do not contain pipe component packaging. If a container is designated as Packaging Configuration Group 4 (i.e., a pipe component), the headspace gas sample must be taken from the pipe component headspace. Drums, TDOPs, SLB2s, or SWBs that contain compacted 55-gallon drums containing a rigid liner may not be disposed of under any packaging configuration unless headspace gas sampling was performed before compaction in accordance with this waste analysis plan (**WAP**). The DAC for Scenario 3 containers that contain rigid liner vent holes that are undocumented during packaging, repackaging, and/or venting (Section C1-1a[4][ii]) shall be determined using the default conditions in footnote "b" in Table C1-9.The DAC for Scenario 3 containers that contain filters that are either undocumented or are other than those listed in Table C1-9 shall be determined using footnote 'a' in Table C1-9. Each of the Scenario 3 containers shall be sampled for headspace gas after waiting the DAC in Table C1-9 based on its packaging configuration (note: Packaging Configuration Groups 4, 5, 6, 7, and 8 are not summary category group dependent, and 85-gallon drum, 100-gallon drum, SWB, TDOP, and SLB2 requirements apply when the 85-gallon drum, 100-gallon drum, SWB, TDOP, or SLB2 is used for the direct loading of waste).

C1-1a(1) General Requirements

For all retrievably stored waste containers, the rigid liner vent hole diameter must be assumed to be 0.3 inches unless a different size is documented during drum venting or repackaging. For all retrievably stored waste containers, the filter hydrogen diffusivity must be assumed to be the most restrictive unless container-specific information clearly identifies a filter model and/or diffusivity characteristic that is less restrictive. For all retrievably stored waste containers that have not been repackaged, acceptable knowledge shall not be used to justify any packaging configuration less conservative than the default (i.e., Packaging Configuration Group 3 for 55-gallon drums and shielded containers, 6 for SWBs TDOPs, and SLB2s, and 8 for 85-gallon and 100-gallon drums). For information reporting purposes listed above, sites may report the default packaging configuration for retrievably stored waste without further verification.

Drum age criteria apply only to 55-gallon drums, 85-gallon drums, 100-gallon drums, SWBs, TDOPs, ~~and~~ SLB2s and shielded containers. Drum age criteria for all other container types must be established through permit modification prior to performing headspace gas sampling.

Table C1-8
Scenario 3 Packaging Configuration Groups

Packaging Configuration Group	Covered S5000 Packaging Configuration Groups
Packaging Configuration Group 1, 55-gal drums [a]	• No layers of confinement, filtered inner lid [b] • No inner bags, no liner bags (bounding case)
Packaging Configuration Group 2, 55-gal drums [a]	• 1 inner bag • 1 filtered inner bag • 1 liner bag • 1 filtered liner bag • 1 inner bag, 1 liner bag • 1 filtered inner bag, 1 filtered liner bag • 2 inner bags • 2 filtered inner bags • 2 inner bags, 1 liner bag • 2 filtered inner bags, 1 filtered liner bag • 3 inner bags • 3 filtered inner bags • 3 filtered inner bags, 1 filtered liner bag • 3 inner bags, 1 liner bag (bounding case)
Packaging Configuration Group 3, 55-gal drums and shielded containers [a]	• 2 liner bags • 2 filtered liner bags • 1 inner bag, 2 liner bags • 1 filtered inner bag, 2 filtered liner bags • 2 inner bags, 2 liner bags • 2 filtered inner bags, 2 filtered liner bags • 3 filtered inner bags, 2 filtered liner bags • 4 inner bags • 3 inner bags, 2 liner bags • 4 inner bags, 2 liner bags (bounding case)
Packaging Configuration Group 4, pipe components	• No layers of confinement inside a pipe component • 1 filtered inner bag, 1 filtered metal can inside a pipe component • 2 inner bags inside a pipe component • 2 filtered inner bags inside a pipe component • 2 filtered inner bags, 1 filtered metal can inside a pipe component • 2 inner bags, 1 filtered metal can inside a pipe component (bounding case)
Packaging Configuration Group 5, Standard Waste Box, Ten-Drum Overpack, or Standard Large Box 2 [a]	• No layers of confinement • 1 SWB liner bag (bounding case)
Packaging Configuration Group 6, Standard Waste Box, Ten-Drum Overpack, or Standard Large Box 2 [a]	• any combination of inner and/or liner bags that is less than or equal to 6 • 5 inner bags, 1 SWB liner bag (bounding case)
Packaging Configuration Group 7, 85-gal. drums and 100-gal. drums [a]	• No inner bags, no liner bags, no rigid liner, filtered inner lid (bounding case) [b] • No inner bags, no liner bags, no rigid liner

Packaging Configuration Group	Covered S5000 Packaging Configuration Groups
Packaging Configuration Group 8, 85-gal. drums and 100-gal. drums [a]	• 4 inner bags and 2 liner bags, no rigid liner, filtered inner lid (bounding case) [b]

[a] If a specific Packaging Configuration Groups cannot be determined based on the data collected during packaging and/or repackaging, a conservative default Packaging Configuration Group of 3 for 55-gallon drums and shielded containers, 6 for SWBs, TDOPs, and SLB2s, and 8 for 85-gallon and 100-gallon drums must be assigned provided the drums do not contain pipe component packaging. If pipe components are present as packaging in the drums, the pipe components must be sampled following the requirements for Packaging Configuration Group 4.

[b] A "filtered inner lid" is the inner lid on a double lid drum that contains a filter.

Definitions:

Liner Bags: One or more optional plastic bags that are used to control radiological contamination. Liner bags for drums have a thickness of approximately 11 mils. Liner bags are typically similar in size to the container. SWB liner bags have a thickness of approximately 14 mils. TDOPs and SLB2s use SWB liner bags.

Inner Bags: One or more optional plastic bags that are used to control radiological contamination. Inner bags have a thickness of approximately 5 mils and are typically smaller than liner bags.

D-1d Description of Containers

CH TRU mixed waste containers will be either 55-gallon (gal) (208-liter (L)) drums singly or arranged into seven (7)-packs, 85-gal (322-L) drums (used as singly or arranged into four (4)-packs, 100-gal (379 L) drums singly or arranged into three (3)-packs, shielded containers arranged as 3-packs, ten-drum overpacks (**TDOP**), 66.3 ft^3 (1.88 m^3) SWBs, or standard large box 2s (**SLB2**).

D-1e(1) CH Bay Operations

Once unloaded from the Contact-Handled Package, CH TRU mixed waste containers (7-packs of 55-gal drums, 3-packs of 100-gal drums, 4-packs of 85-gal drums, 3-packs of shielded containers, SWBs, TDOPs, ~~or~~ one SLB2) are placed on the facility pallet. The waste containers are stacked on the facility pallets (one- or two-high, depending on weight considerations). The use of facility pallets will elevate the waste at least 6 inches (in.) (15 centimeters [cm]) from the floor surface. Pallets of waste will then be stored in the CH bay. This storage area will be clearly marked to indicate the lateral limits of the storage area. This storage area will have a maximum capacity of thirteen facility pallets of waste during normal operations. These pallets will typically be in the CH Bay storage area for a period of up to five days.

E-1b(1) Container Inspection

Containers are used to manage TRU mixed waste at the WIPP facility. These containers are described in Permit Part 3. Off-site CH TRU mixed waste will arrive in 55-gallon drums arranged as seven (7)-packs, in Ten Drum Overpacks (**TDOP**), in 85-gallon drums arranged as four (4) packs, in 100-gallon drums arranged as three (3) packs, in standard waste boxes (**SWB**), ~~or~~ in standard large box 2s (**SLB2s**) or shielded containers as three (3) packs. The waste containers will be visually inspected to ensure that the waste containers are in good condition and that there are no signs that a release has occurred. This visual inspection shall not include the center drums of 7-packs and waste containers positioned such that visual observation is precluded due to the arrangement of waste assemblies on the facility pallets. If CH TRU mixed waste handling operations should stop for any reason with containers located on the TRUPACT-II Unloading Dock (**TRUDOCK** storage area of the WHB Unit) or in room 108 while still in the Contact-Handled Packages, primary waste container inspections could not be accomplished until the containers of waste are removed from the shipping containers.

ATTACHMENT H1

ACTIVE INSTITUTIONAL CONTROLS DURING POST-CLOSURE

Introduction

Upon receipt of the necessary certifications and permits from the EPA and the New Mexico Environment Department, the Permittees will begin disposal of contact-handled (**CH**) and remote-handled (**RH**) TRU and TRU mixed waste in the WIPP. This waste emplacement and disposal phase will continue until the regulated capacity of the repository of 6,200,000 cubic feet (175,588 cubic meters) of TRU and TRU mixed waste has been reached, and as long as the Permittees comply with the requirements of the Permit. For the purposes of this Permit Attachment, this time period is assumed to be 25 years. The waste will be shipped from DOE facilities across the country in specially designed transportation containers certified by the Nuclear Regulatory Commission. The transportation routes from these facilities to the WIPP have been predetermined. The CH TRU mixed waste will be packaged in 55-gallon (208-liter), 85-gallon (322-liter), 100-gallon (379-liter) steel drums, standard waste boxes (**SWBs**), ten drum overpacks (**TDOPs**), ~~and/or~~ standard large box 2s (**SLB2s**), or shielded containers. An SWB is a steel container having a free volume of 66.3 cubic feet (1.88 cubic meters). Figure H1-2 shows the general arrangement of a seven-pack of drums and an SWB as received in a Contact-Handled Package. RH TRU mixed waste inside a Remote-Handled Package is contained in one or more of the allowable containers described in Permit Attachment A1.

Class 2 Permit Modification Request

Update Ventilation Language

Waste Isolation Pilot Plant
Carlsbad, New Mexico

WIPP Permit Number - NM4890139088-TSDF

August 2011

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Acronyms/Abbreviations/Units

CFR	Code of Federal Regulations
CH	contact-handled
HWDU	Hazardous Waste Disposal Unit
MSHA	Mine Safety and Health Administration
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
Permit	Hazardous Waste Facility Permit
PMR	Permit Modification Request
RH	remote-handled
scfm	standard cubic feet per minute
TRU	transuranic
VOC	volatile organic compound
WIPP	Waste Isolation Pilot Plant

Overview of the Permit Modification Request

This document contains one Class 2 Permit Modification Request (**PMR**) for the Waste Isolation Pilot Plant (**WIPP**) Hazardous Waste Facility Permit (**Permit**) Number NM4890139088-TSDF.

This PMR is being submitted by the U.S. Department of Energy Carlsbad Field Office and Washington TRU Solutions LLC, collectively referred to as the Permittees, in accordance with the WIPP Permit, Part 1, Condition 1.3.1 (20.4.1.900 New Mexico Administrative Code (**NMAC**) incorporating Title 40 Code of Federal Regulations (**CFR**) 270.42(b)). The modification provides for the following changes:

- Revise language to indicate when 35,000 standard cubic feet per minute (scfm) is required for worker entry into active rooms and when reporting is required.

The requested modification to the WIPP Permit and related supporting documents are provided in this PMR. The proposed modification to the text of the WIPP Permit has been identified using red text and a double underline and a ~~strikeout~~ font for deleted information. All direct quotations are indicated by italicized text. The following information specifically addresses how compliance has been achieved with the WIPP Permit requirement, Permit Part 1, Condition 1.3.1. for submission of this Class 2 PMR.

1. 20.4.1.900 NMAC (incorporating 40 CFR 270.42(b)(1)(i)) requires the applicant to describe the exact change to be made to the permit conditions and supporting documents referenced by the Permit.

The Permittees are proposing the following changes in this PMR:

1. Add definition for a "filled room."

2. Add clarifying language in Attachment A2, Section A2-2a(3), Attachment O, Section O-1, Section O-2, Section O-3, Section O-3b(2), Section O-3c(1) and Section O-5a to indicate that 35,000 scfm is required for worker entry into any active room that is adjacent to a filled room.

3. Modify the notification requirements when the ventilation requirements are not met.

The Table of Changes (Appendix A) and proposed text changes in redline strikeout (Appendix B) of this PMR describe each change that is being proposed. Appendix A provides a detailed list of changes by Permit section.

2. 20.4.1.900 NMAC (incorporating 40 CFR 270.42(b)(1)(ii)), requires the applicant to identify that the modification is a Class 2 modification.

On May 20, 2011, the Permittees submitted a similar modification to the New Mexico Environment Department (**NMED**) requesting a determination of class. On June 15, 2011 the NMED responded that they believed that this request was a Class 2 modification as it was "*most similar*" to Item A.4.b of Appendix I in 40 CFR 270.42 which states: "*Changes in the frequency of or procedures for monitoring, reporting, sampling or maintenance activities by the*

permittee: other changes." Therefore this modification request is being submitted as a Class 2 under Item A.4.b.

3. 20.4.1.900 NMAC (incorporating 40 CFR 270.42(b)(1)(iii)), requires the applicant to explain why the modification is needed.

The basis for this PMR is to improve the protection of operating personnel by reducing the time the workers must be present in the exhaust air of panels to adjust ventilation regulators. Permit Attachment A4, Section A4-4 states that "[t]he exhaust drift in the waste disposal area will normally not be used for personnel access." This restriction minimizes the chance for exposure to emissions from the waste. This PMR proposes to use the active remote-handled (**RH**) transuranic (**TRU**) mixed waste disposal room to gain access to the ventilation louvers without requiring workers to travel the longer distances down the exhaust drift even if the ventilation flow rate in the RH TRU mixed waste disposal room is less than 35,000 scfm. Currently workers are required to routinely occupy the ventilation exhaust areas to adjust ventilation. This PMR proposes to ameliorate this circumstance by applying the restriction regarding access to rooms that is adjacent to a filled contact-handled (**CH**) TRU waste disposal room. This proposed change is consistent with the exposure modeling and the administrative history of the Permit as discussed below. This change will allow workers to enter the RH TRU mixed waste inlet air side in order to access the ventilation regulators even if there is less than 35,000 scfm of air present. This change does not waive any ventilation requirements imposed by the Mine Safety and Health Administration (**MSHA**).

There are times when it is necessary to enter an active disposal room in order to establish normal ventilation. One such event occurred in July 2011 when as the result of a power failure, normal ventilation was stopped. In such cases, the ventilation mode shifts to "Filtration Mode" whereby one 60,000 cubic feet per minute fan is operated and air from the underground is diverted through the HEPA filters as a precaution. In such cases, the process for restoring normal ventilation is to inspect the waste face to make sure there are no breached containers. Normally, this can be performed from the entry to the active room (i.e., from the intake drift at the room entrance). However, in the recent event, the waste face was not visible from this location, therefore, it was necessary to send workers into the room for the required inspection. Under the current Permit language, such an entry is not a noncompliance of the Permit because waste handling activity is not underway; however a notification per Attachment O was necessary. In order to assure such reentry activity can be performed after the Permit is modified, language is placed in Attachment O, Section O-3c(2) that specifically exempts entry for establishing normal ventilation (i.e., 35,000 scfm) from the requirement that ventilation already be at 35,000 scfm prior to entering. The language requires that such entry be noted in the log book so that clear documentation of such events is kept in the Operating Record for the facility.

Related to this, some clarification of the reporting requirement is proposed. Currently, there is a 7-day notification requirement whenever the Ventilation Requirements are not met. This is triggered after a monthly review of the ventilation records. It is not clear what purpose the notification requirement serves, since no action is triggered. The Permittees are proposing in place of the 7-day notification, which is usually reserved to situations which pose risk to human health or the environment, instances where the ventilation requirements are not achieved, be reported annually in the Mine Ventilation Rate Monitoring Annual Report. This is consistent with reporting "other noncompliance" annually as required by Permit Part 1, Condition 1.7.14. To this extent, the Permittees are proposing changes to the text in Permit Part 4, Condition 4.6.4.3 and Permit Attachment O, Sections O-3b(2) and O-5a.

Source of the 35,000 scfm Ventilation Requirement in the Permit:

When the Permittees prepared their Permit Application in 1996, the NMED requested that several exposure scenarios be examined to evaluate the potential releases of volatile organic compounds (**VOCs**) and the effects on underground workers (WIPP RCRA Part B Permit Application, DOE/WIPP 91-005, Revision 6 Appendix D9, Attachment 1). These scenarios involved a roof fall in an open room (i.e., one being actively filled with CH TRU mixed waste) and a closed room (i.e., a CH TRU mixed waste room that was filled with drums of waste and had ventilation barriers in place). Two other scenarios evaluated "normal operations" to determine risk to workers actively placing waste in CH TRU mixed waste rooms when no roof fall occurs. In all cases, the potentially exposed individual was an underground waste handler working in the active CH TRU mixed waste room. The four scenarios are shown in Figures 1 to 4 which are taken from the NMED's written testimony submitted during the original Permit hearings in 1999 (NMED Direct Testimony Regarding Regulatory Process and Imposed Conditions" (HRM 98-04(P))). In all four cases, the NMED determined that the combination of the environmental performance standards (established through room-based limits) and the minimum ventilation of 35,000 scfm were sufficient to protect these workers. Hence, the Permit was issued with the condition that 35,000 scfm be maintained whenever workers are present in an active room (Permit Attachment O, multiple locations).

Applicability to RH TRU Mixed Waste Rooms:

At the time the Permit was issued in 1999, RH TRU waste was prohibited and RH TRU waste emplacements were not included in the NMED's analysis. Rooms that are being filled with RH TRU waste represent one additional scenario as shown in Figure 5. As can be seen in Figure 5, the worker is unaffected by normal operations or a roof fall in the adjacent CH TRU mixed waste room and by any roof fall scenario in the adjacent closed room by virtue of the fact that the ventilation flow through the active CH TRU mixed waste room bypasses the active RH TRU mixed waste room. Volatile Organic Compound emissions from RH TRU waste itself are negligible due to the low volume of RH TRU waste being emplaced, and emplacement of RH in boreholes with shield plugs. This is supported by the room-based measurements made at the exhaust of the active RH TRU mixed waste room shown in Figure 6. This figure shows the measurements in Room 7 exhaust for Panels 5 and 6. These are the only cases where the Permittees measure emissions that are due to RH TRU mixed waste only. The values (through May 17, 2011) range from zero to 4.5 parts per billion (volume). The highest value is seven orders of magnitude below any room-based action level and is an indication that RH TRU mixed waste is contributing very little to overall concentration of carbon tetrachloride in the panels.

Appropriateness of the Proposed Changes:

The changes proposed in the PMR are based on the NMED record that indicates the concern for maintaining adequate ventilation is to protect workers from exposure to harmful concentrations of VOCs in the active CH TRU mixed waste room adjacent to a filled CH TRU mixed waste room during normal operations and in the event of a roof fall. These harmful concentrations are unlikely to occur in the RH TRU mixed waste rooms during normal operations or as the result of the roof fall. Therefore, the change specifically limits the condition to maintain 35,000 scfm to any active room that is adjacent to a filled disposal room when workers are present. A "filled room" is also defined so there is no confusion regarding this terminology. The change normally would apply to the room in a panel that is receiving CH TRU mixed waste and not to an RH TRU mixed waste disposal room. However, there may be circumstances when a room is filled with CH TRU mixed waste and there is remaining RH TRU

mixed waste to be emplaced in the next room. In such cases, the requirement for 35,000 scfm would apply to the RH TRU mixed waste room (i.e., the room adjacent to a filled disposal room).

Figure 7 shows the current and proposed worker pathways to adjust the ventilation regulators. Clearly, the pathway allowed by this proposed modification is significantly shorter and thereby reduces the time that a worker must be downstream of the emplaced waste.

4. 20.4.1.900 NMAC (incorporating 40 CFR 270.42 (b)(1)(iv)), requires the applicant to provide the applicable information required by 40 CFR 270.13 through 270.21, 270.62 and 270.63.

Regulatory citations in this modification reference 20.4.1.900 NMAC (incorporating 40 CFR §§270.13-15) revised March, 2009. Title 40 CFR §§270.16 through 270.22, 270.62, 270.63 and 270.66 are not applicable at WIPP. Consequently, they are not included. Title 40 CFR §270.23 is applicable to the WIPP Hazardous Waste Disposal Units (**HWDUs**). This modification does not impact the conditions associated with the HWDUs.

5. 20.4.1.900 NMAC (incorporating 40 CFR 270.11(d)(1) and 40 CFR 270.30(k)), requires that any person signing under paragraph a and b must certify the document in accordance with 20.4.1.900 NMAC.

The transmittal letter for this PMR contains the signed certification statement in accordance with Part 1, Condition 1.9 of the Permit.

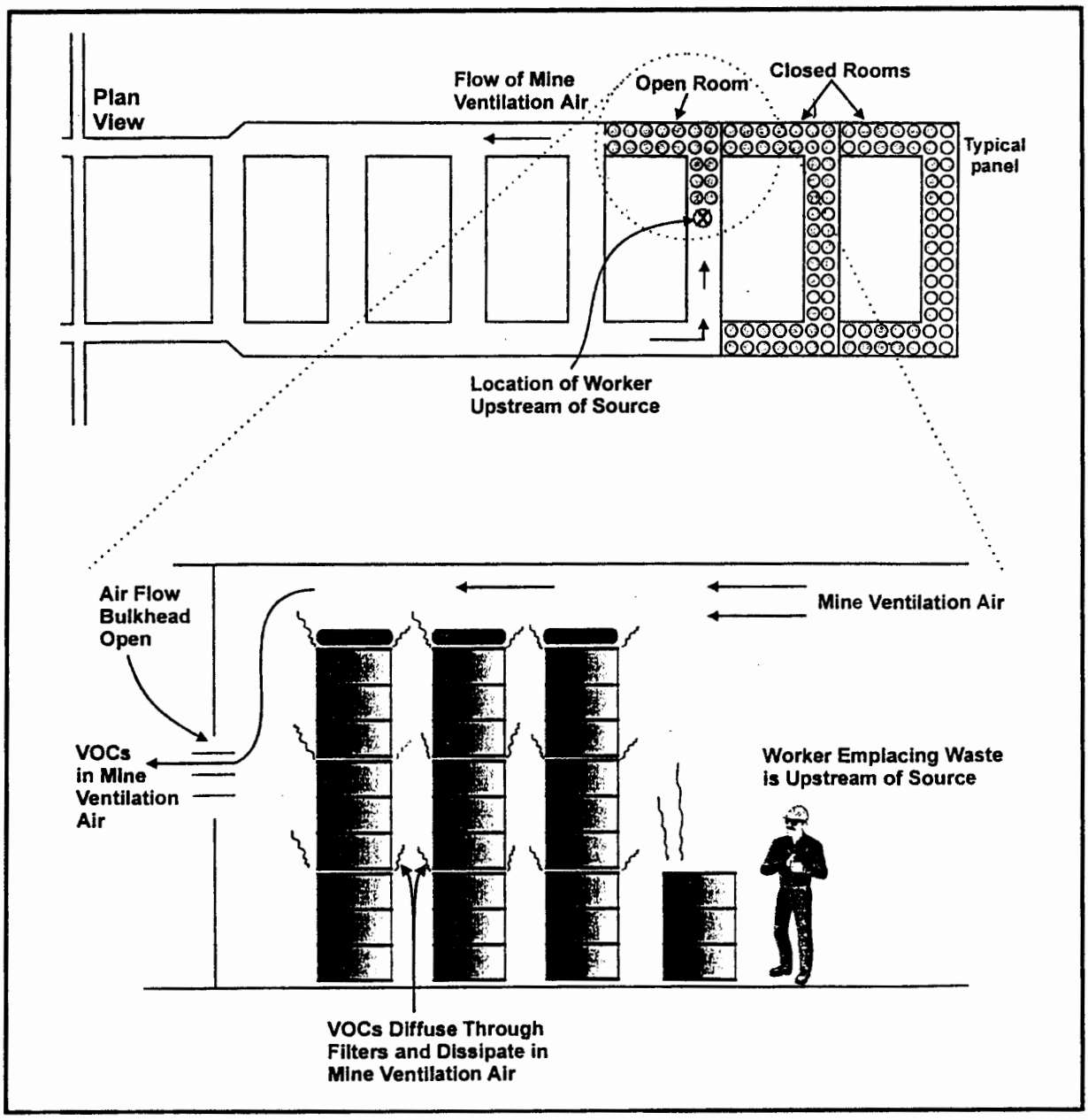


Figure 1
VOC Emissions from an Open Room, Open Panel Under Normal Operation

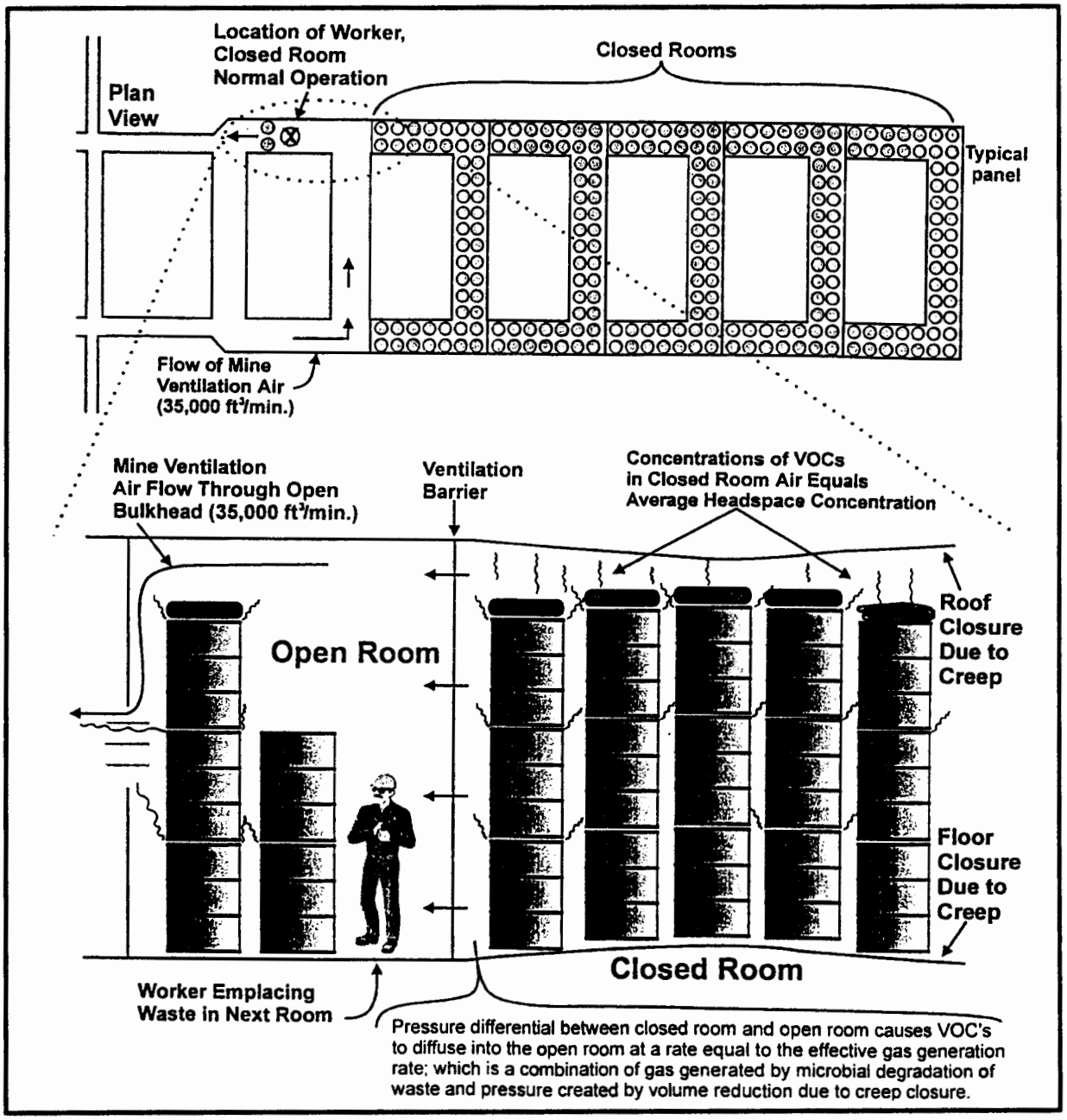


Figure 2
VOC Emissions from a Closed Room, Open Panel under Normal Operation

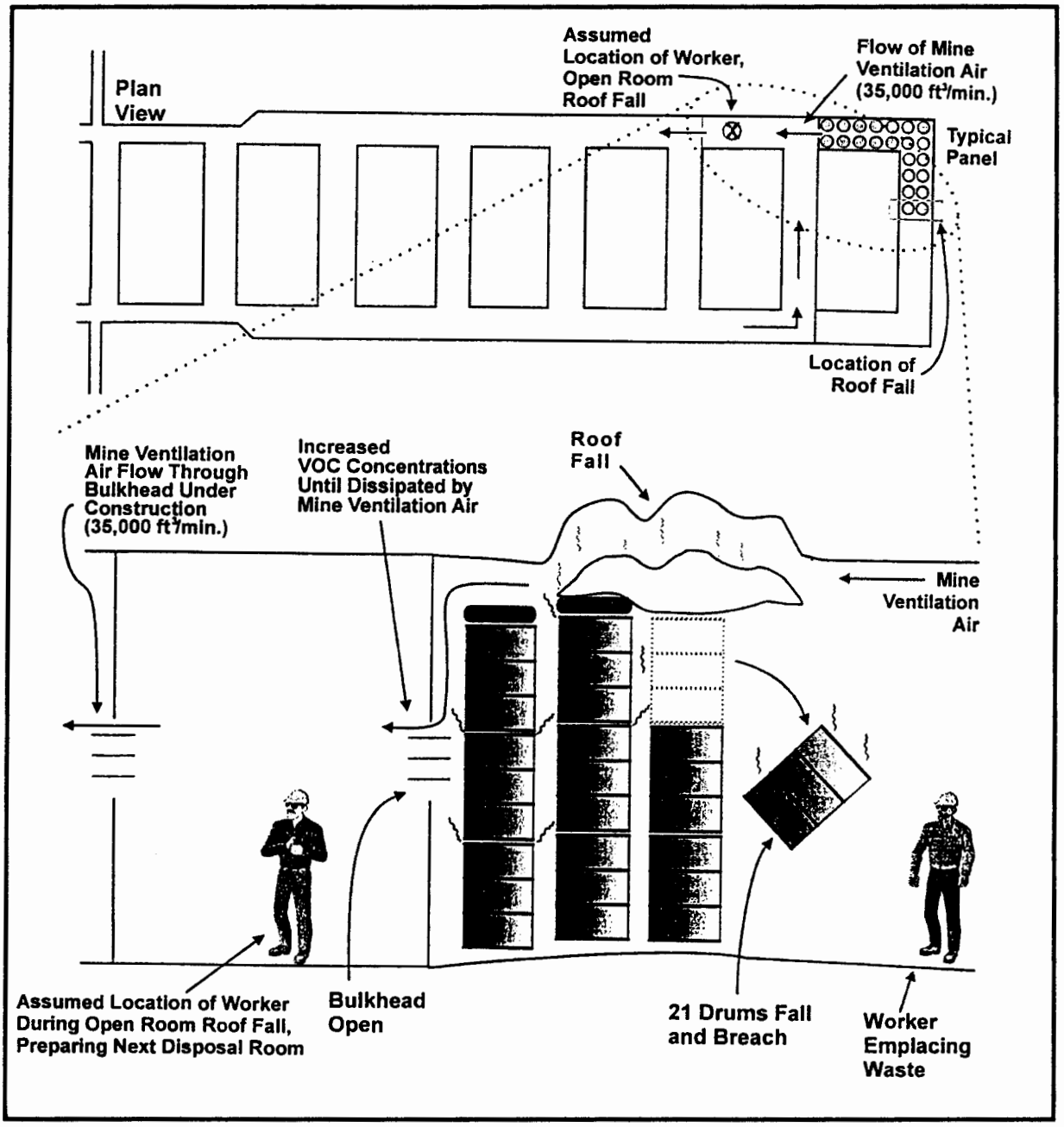


Figure 3
Roof Fall in an Open Room

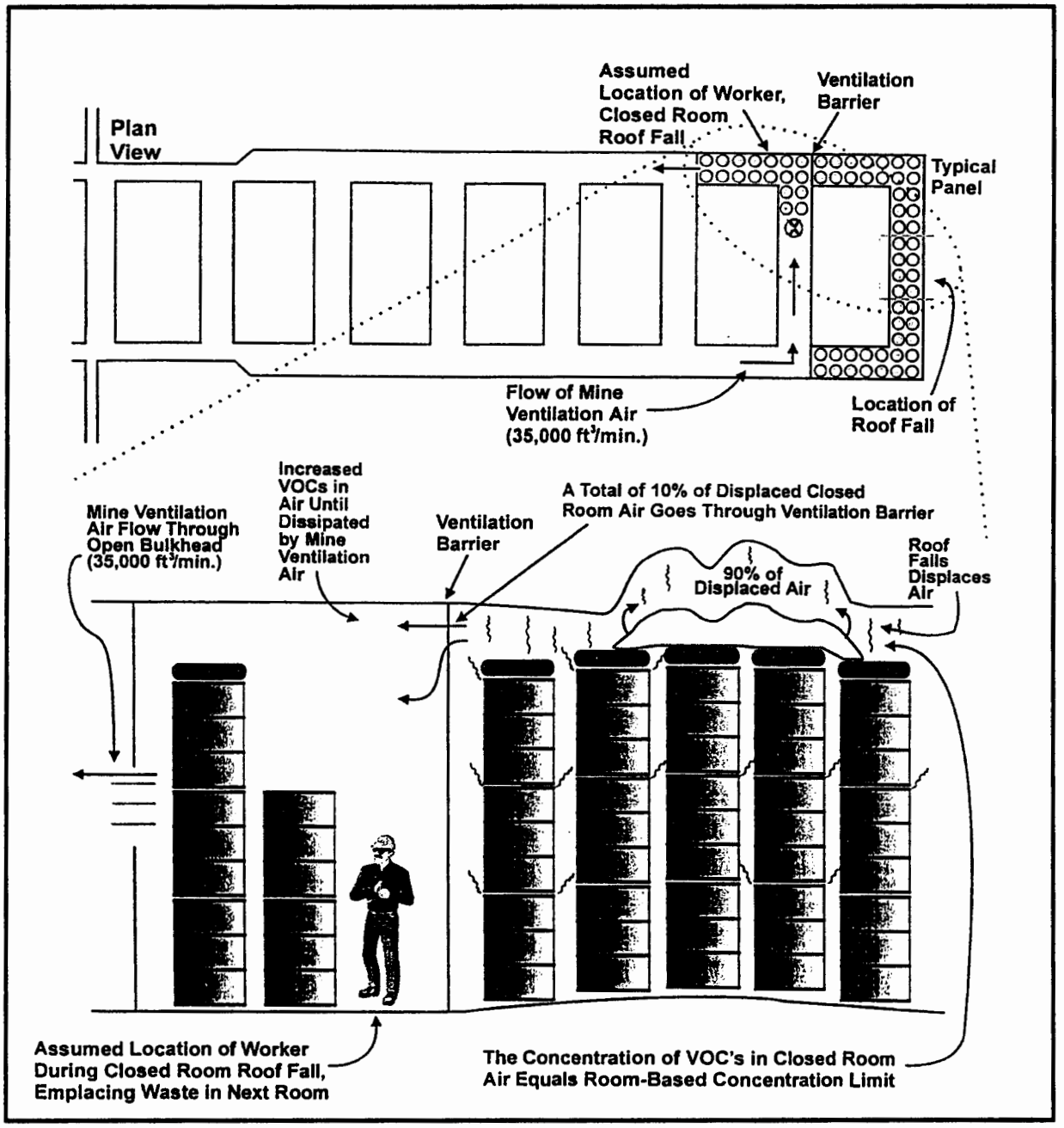


Figure 4
Roof Fall in Closed Room

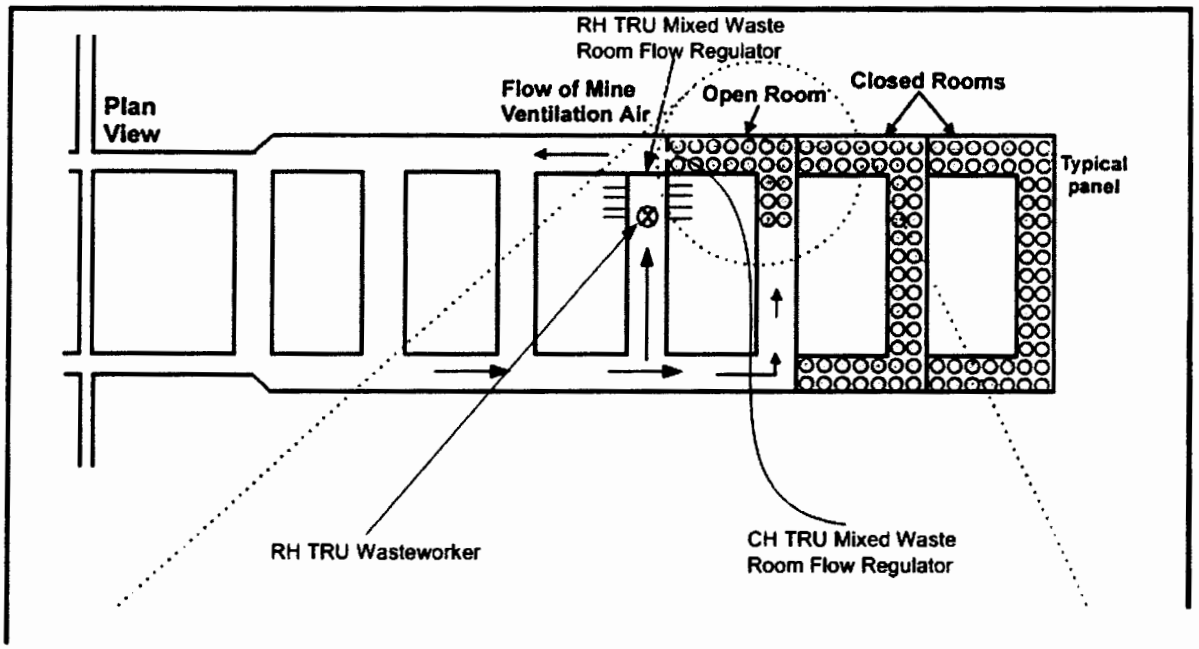
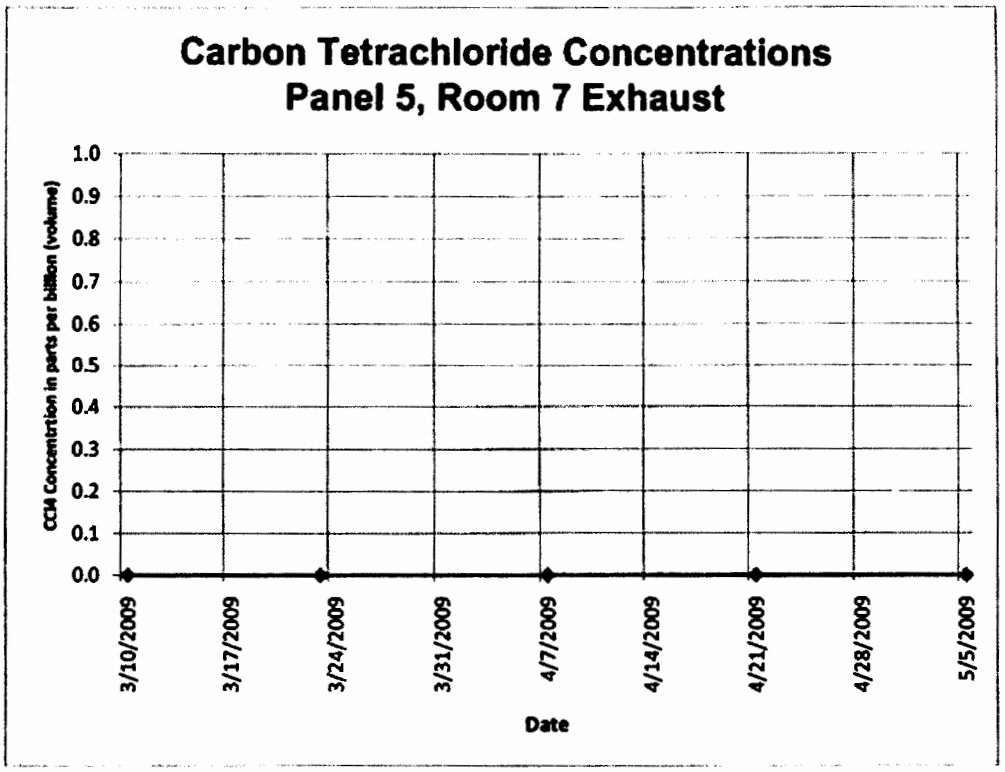


Figure 5
Location of Worker Emplacing RH-TRU Mixed Waste



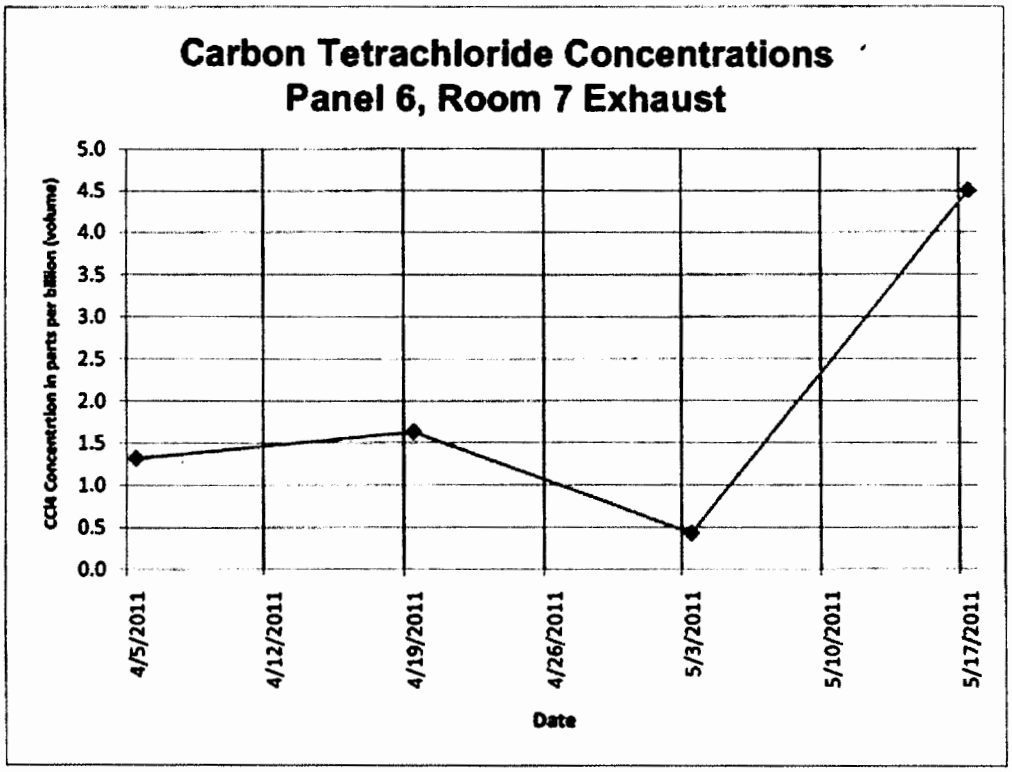


Figure 6
VOC (Carbon Tetrachloride)
Emissions due to RHTRU Waste only

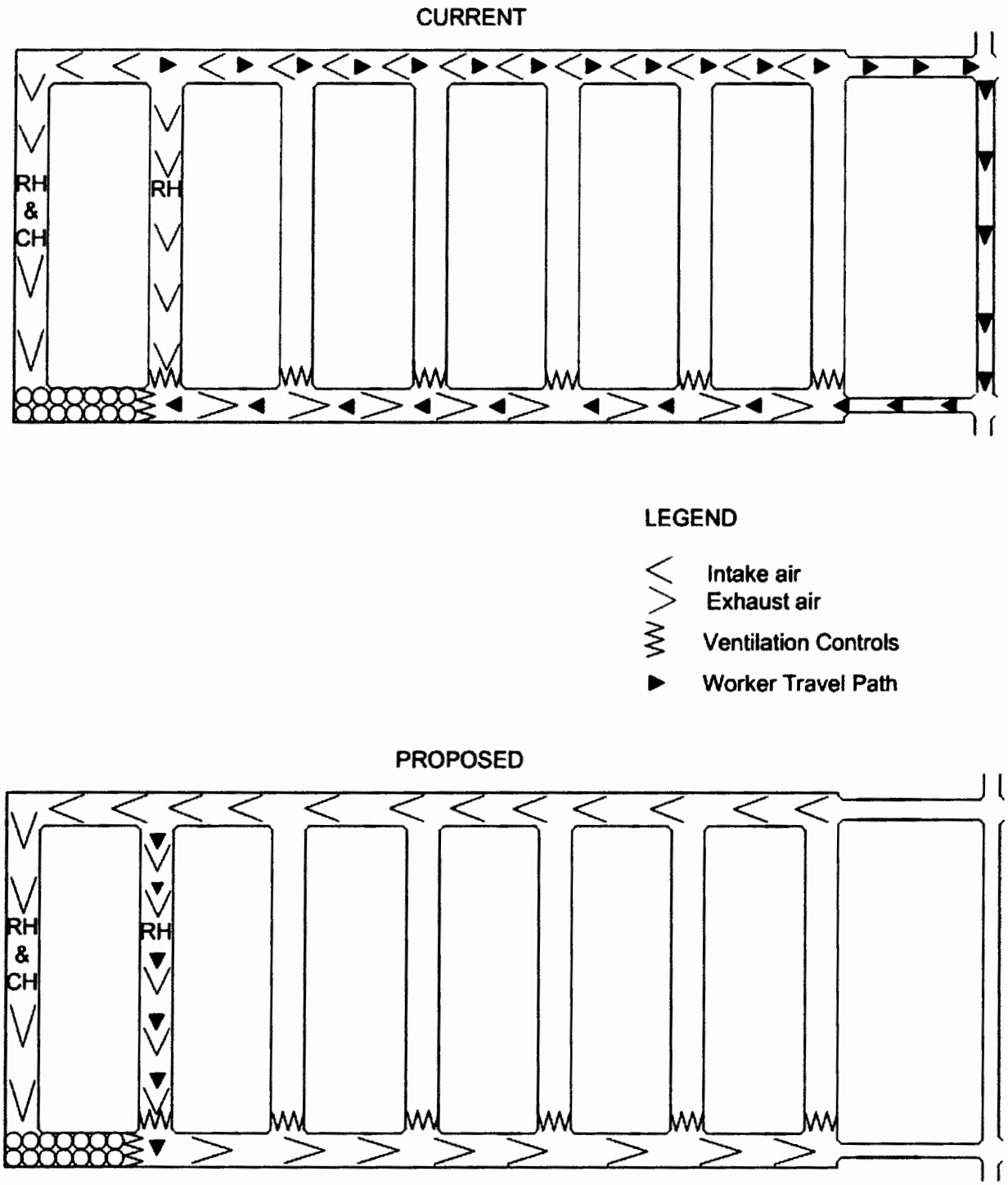


Figure 7
Current and Proposed Routes

Regulatory Crosswalk

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
§270.13		Contents of Part A permit application	Attachment B Part A		✓
§270.14(b)(1)		General facility description	Attachment A		✓
§270.14(b)(2)	§264.13(a)	Chemical and physical analyses	Part 2.3.1 Attachment C		✓
§270.14(b)(3)	§264.13(b)	Development and implementation of waste analysis plan	Part 2.3.1.1 Attachment C		✓
	§264.13(c)	Off-site waste analysis requirements	Part 2.2.1 Attachment C		✓
§270.14(b)(5)	§264.15(a-d)	General inspection requirements	Part 2.7 Attachment E-1a		✓
	§264.174	Container inspections	Attachment E-1b(1)		✓
§270.23(a)(2)	§264.602	Miscellaneous units inspections	Attachment E-1b Attachment E-1b(1)		✓
§270.14(b)(6)		Request for waiver from preparedness and prevention requirements of Part 264 Subpart C	NA		✓
§270.14(b)(7)	264 Subpart D	Contingency plan requirements	Part 2.12 Attachment D		✓
	§264.51	Contingency plan design and implementation	Part 2.12.1 Attachment D		✓
	§264.52 (a) & (c-f)	Contingency plan content	Attachment D		✓
	§264.53	Contingency plan copies	Part 2.12.2 Attachment D		✓
	§264.54	Contingency plan amendment	Part 2.12.3 Attachment D		✓
	§264.55	Emergency coordinator	Part 2.12.4 Attachment D-4a(1)		✓
	§264.56	Emergency procedures	Attachment D-4		✓
§270.14(b)(8)		Description of procedures, structures or equipment for:	Attachment A Part 2.11		✓
§270.14(b)(8)(i)		Prevention of hazards in unloading operations (e.g., ramps and special forklifts)	Part 2.11		✓
§270.14(b)(8)(ii)		Runoff or flood prevention (e.g., berms, trenches, and dikes)	Attachment A1-1c(1) Part 2.11		✓
§270.14(b)(8)(iii)		Prevention of contamination of water supplies	Part 2.11		✓
§270.14(b)(8)(iv)		Mitigation of effects of equipment failure and power outages	Part 2.11		✓
§270.14(b)(8)(v)		Prevention of undue exposure of personnel (e.g., personal protective equipment)	Part 2.11		✓
§270.14(b)(8)(vi) §270.23(a)(2)	§264.601	Prevention of releases to the atmosphere	Part 2.11 Part 4.4 Attachment D-4e Attachment G-1a		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
	264 Subpart C	Preparedness and Prevention	Part 2.10		✓
	§264.31	Design and operation of facility	Part 2.1		✓
	§264.32	Required equipment	Part 2.10.1 Attachment D		✓
	§264.33	Testing and maintenance of equipment	Part 2.10.2 Attachment E-1a		✓
	§264.34	Access to communication/alarm system	Attachment E-1a Part 2.10.3		✓
	§264.35	Required aisle space	Part 2.10.4		✓
	§264.37	Arrangements with local authorities	Attachment D-4a(3)		✓
§270.14(b)(9)	§264.17(a-c)	Prevention of accidental ignition or reaction of ignitable, reactive, or incompatible wastes	Part 2.9		✓
§270.14(b)(10)		Traffic pattern, volume, and controls, for example: Identification of turn lanes Identification of traffic/stacking lanes, if appropriate Description of access road surface Description of access road load-bearing capacity Identification of traffic controls	Attachment A4		✓
§270.14(b) (11)(i) and (ii)	§264.18(a)	Seismic standard applicability and requirements	Attachment G2-2.2 Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(11)(iii-v)	§264.18(b)	100-year floodplain standard	Attachment A1-1c(1) Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b) (12)	§264.16(a-e)	Personnel training program	Part 2.8 Attachment F		✓
§270.14(b)(13)	264 Subpart G	Closure and post-closure plans	Part 6 & 7 Attachment G & H		✓
§270.14(b)(13)	§264.111	Closure performance standard	Attachment G-1a		✓
§270.14(b)(13)	§264.112(a), (b)	Written content of closure plan	Attachment G-1		✓
§270.14(b)(13)	§264.112(c)	Amendment of closure plan	Part 6.3 Attachment G-1d(4)		✓
§270.14(b)(13)	§264.112(d)	Notification of partial and final closure	Attachment G-2a		✓
§270.14(b)(13)	§264.112(e)	Removal of wastes and decontamination/dismantling of equipment	Attachment G-1e(2)		✓
§270.14(b)(13)	§264.113	Time allowed for closure	Part 6.5 Attachment G-1d		✓
§270.14(b)(13)	§264.114	Disposal/decontamination	Part 6.6 Attachment G-1e(2)		✓
§270.14(b)(13)	§264.115	Certification of closure	Part 6.7 Attachment G-2a		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
§270.14(b)(13)	§264.116	Survey plat	Part 6.8 Attachment G-2b		✓
§270.14(b)(13)	§264.117	Post-closure care and use of property	Part 7.3 Attachment H-1a		✓
§270.14(b)(13)	§264.118	Post-closure plan; amendment of plan	Part 7.5 Attachment H-1a (1)		✓
§270.14(b)(13)	§264.178	Closure/containers	Part 6.9 Attachment A1-1h Attachment G-1		✓
§270.14(b)(13)	§264.601	Environmental performance standards-miscellaneous units	Attachment A-4 Attachment D-1 Attachment G-1a		✓
§270.14(b)(13)	§264.603	Post-closure care	Part 7.3 Attachment G-1a(3)		✓
§270.14(b)(14)	§264.119	Post-closure notices	Part 7.4 Attachment H-2		✓
§270.14(b)(15)	§264.142	Closure cost estimate	NA		✓
	§264.143	Financial assurance	NA		✓
§270.14(b)(16)	§264.144	Post-closure cost estimate	NA		✓
	§264.145	Post-closure care financial assurance	NA		✓
§270.14(b)(17)	§264.147	Liability insurance	NA		✓
§270.14(b)(18)	§264.149-150	Proof of financial coverage	NA		✓
§270.14(b)(19)(i), (vi), (vii), and (x)		Topographic map requirements Map scale and date Map orientation Legal boundaries Buildings Treatment, storage, and disposal operations Run-on/run-off control systems Fire control facilities	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(ii)	§264.18(b)	100-year floodplain	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(iii)		Surface waters	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(iv)		Surrounding land use	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
§270.14(b)(19)(v)		Wind rose	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(viii)	§264.14(b)	Access controls	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(ix)		Injection and withdrawal wells	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(xi)		Drainage on flood control barriers	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(xii)		Location of operational units	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(20)		Other federal laws Wild and Scenic Rivers Act National Historic Preservation Act Endangered Species Act Coastal Zone Management Act Fish and Wildlife Coordination Act Executive Orders	Attachment B Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.15	§264 Subpart I	Containers	Part 3 Part 4.3 Attachment A1		✓
	§264.171	Condition of containers	Part 3.3 Attachment A1		✓
	§264.172	Compatibility of waste with containers	Part 3.4 Attachment A1		✓
	§264.173	Management of containers	Part 3.5 Attachment A1		✓
	§264.174	Inspections	Part 3.7 Attachment E-1 Attachment A1-1e		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
§270.15(a)	§264.175	Containment systems	Part 3.6 Attachment A1		✓
§270.15(c)	§264.176	Special requirements for ignitable or reactive waste	Attachment A1-1g Permit Part 2.1		✓
§270.15(d)	§264.177	Special requirements for incompatible wastes	Attachment A1-1g Permit Part 2.3.3.4		✓
	§264.178	Closure	Part 6 Attachment G		✓
§270.15(e)	§264.179	Air emission standards	Part 4.4.2 Attachment N		✓
§270.23	264 Subpart X	Miscellaneous units	Part 1.3.1 Attachment A2-1 Attachment G1.3.1		✓
§270.23(a)	§264.601	Detailed unit description	Part 4 Part 5 Attachment A2 Attachment L		✓
§270.23(b)	§264.601	Hydrologic, geologic, and meteorologic assessments	Part 4 Part 5 Attachment A2 Attachment L		✓
§270.23(c)	§264.601	Potential exposure pathways	Part 4 Part 5 Attachment A2 Attachment N Attachment L	✓	
§270.23(d)		Demonstration of treatment effectiveness	Part 4 Attachment A2 Attachment N		✓
	§264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	Part 4 Part 5 Attachment A2 Attachment E-1 Attachment N Attachment L		✓
	§264.603	Post-closure care	Attachment H Attachment H1		✓
	264 Subpart E	Manifest system, record keeping, and reporting	Permit Part 1 Permit Part 2.13 & 2.14 Permit Part 4 Attachment C		✓
§270.30(j)(2)	§264.73(b)	Ground-water records	Part 1		✓
	264 Subpart F	Releases from solid waste management units	Part 5 & 7 Attachment G2 & L		✓
	§264.90	Applicability	Part 5 Attachment L		✓
	§264.91	Required programs	Attachment L		✓
	§264.92	Ground-water protection standard	Attachment L		✓
	§264.93	Hazardous constituents	Attachment L		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
	§264.94	Concentration limits	Part 5 Attachment L		✓
	§264.95	Point of compliance	Part 5 Attachment L		✓
	§264.96	Compliance period	Attachment L		✓
	§264.97	General ground-water monitoring requirements	Part 5 Attachment L		✓
	§264.98	Detection monitoring program	Part 5 Attachment L		✓
	§264.99	Compliance monitoring program	Part 5 Attachment L		✓
	§264.100	Corrective action program	Part 5 Attachment L		✓
	§264.101	Corrective action for solid waste management units	Part 8 Attachment L		✓
	264 Appendix IX	Ground-water Monitoring List	Part 5 Attachment L		✓

Appendix A
Table of Changes

Table of Changes

Affected Permit Section	Explanation of Change	Page Number
• Part 1, Condition 1.5.19.	• Added definition for Filled Room	B-2
• Part 4, Condition 4.5.3.2.	• Deleted "active" • Deleted "the" • Added "an active" • Added "adjacent to a filled room"	B-2 B-2 B-2 B-2
• Part 4, Condition 4.6.4.3.	• Deleted "Notification" • Added "Evaluation" • Deleted "Whenever the evaluation of the mine ventilation monitoring program data identifies that the ventilation rates specified in Permit Section 4.5.3.2 have not been achieved, the" • Added "The" • Deleted "writing within seven calendar days" • Added "the annual report specified in Permit Section 4.6.4.2 whenever the evaluation of the mine ventilation monitoring program data identifies that the ventilation rates specified in Permit Section 4.5.3.2 have not been achieved"	B-2 B-2 B-2 B-2 B-2 B-2
• Attachment A2, Section A2-2a(3)	• Added "that is adjacent to a filled room" • Deleted "The" • Added "Filled" • Deleted "that are filled with waste" • Deleted "the" • Added "adjacent"	B-3 B-3
• Attachment O, Section O-1	• Added "that is adjacent to a filled room"	B-3
• Attachment O, Section O-2	• Added "that are adjacent to a filled room"	B-4
• Attachment O, Section O-3	• Added "that are adjacent to a filled room"	B-4
• Attachment O, Section O-3b(2)	• Deleted "The Permittees will notify NMED within seven calendar days if either the minimum running annual average mine ventilation exhaust rate of 260,000 scfm or a minimum active room ventilation rate of 35,000 scfm when workers are present in the room are not achieved."	B-4
• Attachment O, Section O-3c(1)	• Added "the Minimum Airflow for an" • Added "that is Adjacent to a Filled Room" • Deleted "Minimum Airflow" • Added "in an active room that is adjacent to a filled room" • Added "that" • Deleted "(s)"	B-4 B-4 B-4 B-4 B-4 B-4
• Attachment O, Section O-3c(2)	• Added "Entry to restricted access active disposal rooms for the purpose of establishing normal ventilation (e.g., after a power failure) will also be documented on the log sheet."	B-4
• Attachment O, Section O-5a	• Deleted "Whenever the evaluation of the mine ventilation monitoring program data identifies that the ventilation rates specified in O-3b(2) have not been achieved, the" • Added "The" • Deleted "notify"	B-5 B-5 B-5

Affected Permit Section	Explanation of Change	Page Number
	• Added "report to" • Deleted "writing within seven calendar days" • Added "the annual report specified in Permit Section 4.6.3.2 whenever the evaluation of the mine ventilation monitoring program data identifies that the ventilation rates specified in O-3b(2) have not been achieved" • Deleted "active room" • Added "for an active room that is adjacent to a filled room"	B-5 B-5 B-5 B-5 B-5

Appendix B
Proposed Revised Permit Text

Proposed Revised Permit Text:

1.5.19. Filled Room

"Filled Room" means a room in an Underground Hazardous Waste Disposal Unit as described in Permit Part 4 that will no longer receive CH TRU mixed waste for emplacement.

4.5.3.2. Ventilation

The Permittees shall maintain a minimum running annual average mine ventilation exhaust rate of 260,000 standard ft^3/min and a minimum ~~active~~ room ventilation rate of 35,000 standard ft^3/min when workers are present in ~~the~~ an active room adjacent to a filled room, as specified in Permit Attachment A2, Section A2-2a(3), "Subsurface Structures (Underground Ventilation System Description)" and as required by 20.4.1.500 NMAC (incorporating 40 CFR 264.601(c)).

4.6.4.3. ~~Notification~~ Evaluation Requirements

The Permittees shall calculate the running annual average mine ventilation exhaust rate on a monthly basis. In addition, the Permittees shall evaluate compliance with the minimum active room ventilation rate specified in Permit Section 4.5.3.2 on a monthly basis. ~~Whenever the evaluation of the mine ventilation monitoring program data identifies that the ventilation rates specified in Permit Section 4.5.3.2 have not been achieved, the~~ The Permittees shall notify the Secretary in ~~writing within seven calendar days~~ the annual report specified in Permit Section 4.6.4.2 whenever the evaluation of the mine ventilation monitoring program data identifies that the ventilation rates specified in Permit Section 4.5.3.2 have not been achieved.

A2-2a(3) Subsurface Structures

Underground Ventilation System Description

At any given time during waste emplacement activities, there may be significant activities in multiple rooms in a panel. For example, one room may be receiving CH TRU mixed waste containers, another room may be receiving RH TRU mixed waste canisters, and the drilling of RH TRU mixed waste emplacement boreholes may be occurring in another room. The remaining rooms in a panel will either be completely filled with waste; be idle, awaiting waste handling operations; or being prepared for waste receipt. A minimum ventilation rate of 35,000 ft^3 (990 m^3) per

minute will be maintained in each room that is adjacent to a filled room where waste disposal is taking place when workers are present in the room. This quantity of air is required to support the numbers and types of diesel equipment that are expected to be in operation in the area, to support the underground personnel working in that area, and to exceed a minimum air velocity of 60 ft (18 m) per minute. The remainder of the air is needed in order to account for air leakage through inactive rooms.

Air will be routed into a panel from the intake side. Air is routed through the individual rooms within a panel using underground bulkheads and air regulators. Bulkheads are constructed by erecting framing of rectangular steel tubing and screwing galvanized sheet metal to the framing. Bulkhead members use telescoping extensions that are attached to framing and the salt which adjust to creep. Rubber or sheet metal attached to the bulkhead on one side and the salt on the other completes the seal of the ventilation. Where controlled airflow is required, a louver-style damper on a slide-gate (sliding panel) regulator is installed on the bulkhead. Personnel access is available through most bulkheads, and vehicular access is possible through selected bulkheads. Vehicle roll-up doors in the panel areas are not equipped with warning bells or strobe lights since these doors are to be used for limited periodic maintenance activities in the return air path. Flow is also controlled using brattice cloth barricades. These consist of chain link fence that is bolted to the salt and covered with brattice cloth; and are used in instances where the only flow control requirement is to block the air. A brattice cloth air barricade is shown in Figure A2-11. Ventilation will be maintained only in all active rooms within a panel until waste emplacement activities are completed and the panel-closure system is installed. The air will be routed simultaneously through all the active rooms within the panel. ~~The~~ Filled rooms ~~that are filled with waste~~ will be isolated from the ventilation system, while ~~the~~ adjacent rooms that are actively being filled will receive a minimum of 35,000 SCFM of air when workers are present to assure worker safety. After all rooms within a panel are filled, the panel will be closed using a closure system described Permit Attachment G and Permit Attachment G1.

O-1 Definitions

Restricted Access: If the required ventilation rate in an active disposal room that is adjacent to a filled room cannot be achieved or cannot be supported due to operational needs, access is restricted by the use of barriers, signs and postings, or individuals stationed at the entrance to the active disposal room when ventilation rates are below 35,000 scfm.

O-2 Objective

The objective of this plan is to describe how the ventilation requirements in the Permit will be met. This plan achieves this objective and documents the process by which the Permittees demonstrate compliance with the ventilation requirements by:

- Maintaining an annual running average of 260,000 scfm through the underground repository

- Maintaining a minimum of 35,000 scfm of air through the active disposal rooms that are adjacent to a filled room when workers are present in the rooms

O-3 Design and Procedures

This section describes the four basic processes that make up the mine ventilation rate monitoring plan:

- Test and Balance, a periodic re-verification of the satisfactory performance of the entire underground ventilation system and associated components
- Monitoring and calculation of the Running Annual Average of the Total Mine Airflow to verify achievement of the 260,000 scfm minimum requirement
- Monitoring of active disposal room(s) that are adjacent to a filled room to ensure a minimum flow of 35,000 scfm whenever workers are present in the room

O-3b(2) Calculation of the Running Annual Average of Total Mine Airflow

The use of an average value of 730 hours per month in the monthly average calculation is reasonable, given that all the numbers involved are very large and that the final use of the monthly average flow is in an annual calculation. ~~The Permittees will notify NMED within seven calendar days if either the minimum running annual average mine ventilation exhaust rate of 260,000 scfm or a minimum active room ventilation rate of 35,000 scfm when workers are present in the room are not achieved.~~

O-3c(1) Verification of the Minimum Airflow for an Active Disposal Room that is Adjacent to a Filled Room ~~Minimum Airflow~~

Whenever workers are present in an active room that is adjacent to a filled room, the Permittees shall verify the minimum airflow through that active disposal room~~(s)~~ of 35,000 scfm at the start of each shift, any time there is an operational mode change, or if there is a change in the ventilation system configuration.

O-3c(2) Measurement and Calculation of the Active Waste Disposal Room Airflow

The operator shall compare the recorded acfm value with the minimum acfm value provided at the top of the log sheet. The airflow shall be re-checked and recorded whenever there is an operational mode change or a change in ventilation system configuration. Once the ventilation rate has been recorded and verified to be at least the required minimum, personnel access to the room is unrestricted in accordance with normal underground operating procedures. If the required ventilation rate cannot be achieved, or cannot be supported due to operational needs, access to the room shall be restricted. Those periods when active disposal room access is restricted shall be documented on the log sheet for that active disposal room. Entry to restricted access active disposal rooms for the purpose of establishing normal ventilation (e.g., after a power failure) will also be documented on the log sheet.

O-5a Reporting

The Permittees shall submit an annual report to NMED presenting the results of the data and analysis of the Mine Ventilation Rate Monitoring Plan. In the years that the Test and Balance is

performed, the Permittees will provide a summary of the results in the annual report. The Permittees shall calculate the running annual average mine ventilation rate on a monthly basis and evaluate compliance with the minimum active room ventilation rate specified in O-3b(2) on a monthly basis. ~~Whenever the evaluation of the mine ventilation monitoring program data identifies that the ventilation rates specified in O-3b(2) have not been achieved, the~~ The Permittees will ~~notify~~ report to the Secretary in ~~writing within seven calendar days~~the annual report specified in Permit Section 4.6.3.2 whenever the evaluation of the mine ventilation monitoring program data identifies that the ventilation rates specified in O-3b(2) have not been achieved.

The Permittees shall calculate the running annual average mine ventilation rate on a monthly basis and evaluate compliance with the minimum ~~active room~~ ventilation rate for an active room that is adjacent to a filled room specified in O-3b(2) on a monthly basis. Whenever the evaluation of the mine ventilation monitoring program data identifies that the ventilation rates specified in O-3b(2) have not been achieved, the Permittees will notify the Secretary in writing within seven calendar days.

Class 2 Permit Modification Request

Revise the WIPP Groundwater Detection Monitoring Program Plan

Waste Isolation Pilot Plant
Carlsbad, New Mexico

WIPP Permit Number - NM4890139088-TSDF

August 2011

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Acronyms and Abbreviations

ASER	Annual Site Environmental Report
CBFO	Carlsbad Field Office
CFR	Code of Federal Regulations
DMP	Detection Monitoring Program
DOE	U.S. Department of Energy
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
HWDU	Hazardous Waste Disposal Unit
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
Permit	Hazardous Waste Facility Permit
PMR	Permit Modification Request
QAO	quality assurance objective
RCRA	Resource Conservation and Recovery Act
SOP	standard operating procedure
TOX	total organic halogen
TRU	transuranic
V and V	verification and validation
WIPP	Waste Isolation Pilot Plant
WLMP	Water Level Monitoring Program
WTS	Washington TRU Solutions LLC

Overview of the Permit Modification Request

This document contains one Class 2 permit modification request (**PMR**) to the Hazardous Waste Facility Permit (**Permit**) for the Waste Isolation Pilot Plant (**WIPP**) facility, Permit Number NM4890139088-TSDF.

This PMR is being submitted by the U.S. Department of Energy (**DOE**), Carlsbad Field Office (**CBFO**) and Washington TRU Solutions LLC (**WTS**), collectively referred to as the Permittees, in accordance with the Permit Part 1, Condition 1.3.1 (20.4.1.900 New Mexico Administrative Code (**NMAC**) incorporating Title 40 Code of Federal Regulations (**CFR**) §270.42(d)). The following information specifically addresses how compliance has been achieved with the Permit Part 1, Condition 1.3.1. for submission of this Class 2 PMR.

1. 20.4.1.900 NMAC (incorporating 40 CFR §270.42(b)(1)(i)), requires the applicant to describe the exact change to be made to the permit conditions and supporting documents referenced by the Permit.

This PMR proposes to make changes to the groundwater monitoring program as described in Permit Part 5 and Attachment L. The Table of Changes and redline/strikeout in Attachments A and B of this modification, respectively, and the discussion below describe the exact changes to be made to the Permit Conditions and supporting documents. These changes are being made in accordance with the Groundwater Permit Modification Work Plan approved by the NMED on August 5, 2011.

The PMR includes, but is not limited to, the items in the Groundwater Permit Modifcation Work Plan described below:

- Revise sources of confusion and ambiguities.

  *The Permit contains confusing references to the components of the groundwater monitoring plan and to the various elements of the program. The modification request proposes clarification by describing the program as the Groundwater Monitoring Program consisting of two components: the Detection Monitoring Program (**DMP**) and the Water Level Monitoring Program (**WLMP**). The DMP consists of six wells that are sampled, analyzed, and reported annually. The WLMP consists of over 40 wells that are measured monthly and reported semi-annually.*

- Specifically identify which wells are used for density measurements.

  A new table, Attachment L, Table L-4, was added to identify the Culebra wells used for obtaining density measurements.

  - Specify frequency for density measurements and assessment.

    Attachment L, Section L-4c(1) was revised to specify the frequency for density measurements as annually.

  - Specify how density measurements are performed.

    Attachment L, Section L-4c(1), last paragraph, now describes the means of how measurements are performed.

- Include a specific list of wells that must be monitored for water levels.

  - Exclude non-Culebra wells from those required for water level measurements.

    A new table, Attachment L, Table L-4, lists the Culebra wells for water level monitoring. Non-Culebra wells have been excluded.

- Remove all references to the non-Culebra sampling well identified as WQSP-6A.

  This change was made when the Permit was renewed in 2010. Therefore, no change is being proposed.

- Clarify the need for, and use of, written procedures for both field work and non-field work, including the procedure for developing a potentiometric surface map annually.

  The sections listed below were revised to clarify the need for, and use of, written procedures (referred to as standard operating procedures or SOPs) for both field work and non-field work:

  > *Attachment L, Sections L-1, L-4c(1), L-4c(1)(i), L-4c(1)(ii), L-4c(2)(ii), L-4c(2)(iii), L-4c(2)(iv), L-4c(2)(v), L-4d(1), L-4d(2), L-7a, L-7a(4),L-7c, L-7d, L-7e, L-7f, L-7i, L-7h, and Table L-3.*

  In addition, the SOP descriptions were removed from the text, updated, and included as the new Table L-3. The procedure for developing a potentiometric surface map was added to Attachment L, Section L-5c.

- Clarify the data quality objectives section and explain the data quality objectives and quality assurance objectives and the difference between the quality assurance objectives for field work and laboratory analysis.

  *The data quality objectives (**DQOs**) and quality assurance objectives (**QAOs**) are clearly identified, revised, and separated into Attachment L, Sections L-7a(1), Data Quality Objectives, and new Section L-7a(2), Quality Assurance Objectives. These changes clearly define the DQOs for each Groundwater Monitoring Program component and clarify the associated QAOs.*

- Remove specificity regarding departments and organizations and replace those terms with "the Permittees."

  Attachment L, Section L-7, Project Organization and Responsibilities, has been deleted. References to departments, organizations, and titles referenced in Attachment L are replaced with "Permittees."

  The sections that were revised are listed below:

  > *Attachment L, Sections L-4c(2)(i), L-4c(2)(ii), L-4c(2)(iii), L-4c(2)(v), L-4c(3), L-5(a), L-5(b), and L-5(c).*

  *Updated the organization that performs data verification and validation (**V and V**) in Attachment L, Section L-4c(3).*

- Add background values from the "Waste Isolation Pilot Plant Resource Conservation and Recovery Act Background Groundwater Quality Baseline Report" and Addendum 1, IT Corporation, July 2000, to be used for making statistical determinations of contamination.

  This change was made when the Permit was renewed in 2010. Therefore, no change is being proposed.

- Separate parameters from constituents so that general chemistry parameters (e.g., pH, calcium) are separated from the hazardous constituents.

  This change was made when the Permit was renewed in 2010.

- Clarify serial sampling requirements including the following:

  - Remove several field parameters that are not indicators of stabilization, such as chloride, divalent cations, alkalinity, total iron, and Eh.

    This change was made in Attachment L, Section L-4c(2)(ii).

  - Remove the bubbler line requirements.

    This change was made in Attachment L, Section L-4c(2)(i).

  - Restrict serial sampling for stabilization to no more than three well bore volumes.

    This change was made in Attachment L, Section L-4c(2)(i) and L-4c(2)(ii).

- Change the frequency of performing groundwater sampling and analysis to an annual basis rather than semi-annually.

  - Change the frequency of reporting to annually rather than semi-annually.

    The modification includes clarification regarding when sampling data will be submitted. The Permittees are proposing annual sampling instead of semi-annual sampling based on 15 years of data that show little or no change in constituent concentrations. The Permittees are proposing a specific date that the report will be due to the NMED.

    A November submittal will be in the form of an "Annual Culebra Groundwater Report" which includes the Annual Culebra Groundwater sampling results.

    See Part 5, Conditions 5.5, 5.5.1, 5.10.2.1, 5.10.2.2, 5.10.2.3, Attachment L, Sections L-4a, L-4c(3), L-4e(4), L-5b, L-5c, Table L-2.

- Change the frequency of reporting water level values to twice per year rather than monthly.

  The details of the proposed changes with regard to WLMP reporting are as follows:

- *Effective on the first reporting date after approval of the PMR, the Permittees will provide a groundwater level report to the NMED semi-annually according to the following schedule:*

  1. *In May for groundwater level measurements taken between August 1 and January 31.*

  2. *In November for groundwater level measurements taken between February 1 and July 31. The Permittees will combine the November water level data with the November "Annual Culebra Groundwater Report."*

  3. *Each semi-annual report will include a hydrograph for each Culebra monitoring well. The hydrograph will show both uncorrected (as measured) and corrected (to equivalent freshwater) heads.*

  4. *Each semi-annual report will include a hydrograph for each Culebra monitoring well beginning with the 2005 sampling year and displaying at least five years of continuous measurement.*

  5. *In the November "Annual Culebra Groundwater Report," the Permittees will provide a Culebra Potentiometric Surface Map, corrected to equivalent freshwater heads.*

  See Part 5, Conditions 5.10.2.2, 5.10.2.3, Attachment L, Sections L-4a, L-4c(1), L-4c(1)(ii), L-5.

- Include enhanced interpretation in the form of annotated hydrographs.

  Attachment L, Section L-4c(1)(ii) was revised to stipulate that the semi-annual groundwater reports will include annotated hydrographs and trend analysis.

- Include flow rate and direction determination in the annual detection monitoring report.

  The Permittees have clarified that flow rate and direction determinations will be included in the "Annual Culebra Groundwater Report" required by Attachment L, Section L-5c. Only the downgradient wells could trigger actions leading to compliance monitoring. Based on transport modeling, the only wells that would likely intercept a contaminant plume are downgradient wells WQSP 4 to 6 from the WIPP shaft area. These wells are located between the shafts and the facility boundary such that detection would occur long before any contamination would reach the boundary. The Culebra water surface mapping method, employed by the Permittees to demonstrate flow rate and direction, will provide a periodic demonstration that the flow paths continue to be in the direction of these downgradient wells.

- Remove the "Annual Site Environmental Report" (ASER) as a means of reporting flow rate and direction.

  The PMR proposes to remove the ASER as a Permit deliverable and report the relevant groundwater flow rate and direction in the "Annual Culebra Groundwater Report."

The PMR proposes to remove requirements to report radionuclide analytical results annually to the NMED. These are not measured under the Permit and were previously provided as part of the ASER.

See Part 5, Condition 5.10.2.3, Attachment L, Sections L-4c(3), L-4e(4), L-5b, L-5c.

- **Revise the statistical process for data analysis to be consistent with 20.4.1.500 NMAC (incorporating 40 CFR 264.97(h)).**

  The PMR clarifies how temporal and spatial analyses and statistical evaluations are performed.

  See Attachment L, Sections L-4e, L-4e(1), L-4e(2), L-4e(3).

- **Update figures, tables, and text with current information.**

  The PMR proposes to remove obsolete content throughout Part 5 and Attachment L. This includes conditions in the Permit that only applied to the initial baseline sampling and are no longer required. This language is proposed for deletion and past-tense statements are either completed or are made current.

- **Describe the methodology for generation of the Culebra Potentiometric Surface Map whereby the Permittees determine the groundwater flow rate and direction annually in accordance with 20.4.1.500 NMAC (incorporating 40 CFR 264.98(e)).**

  In Attachment L, Section L-5c, Bullet #7 clarifies the methodology for groundwater surface elevations including how the potentiometric map is determined and drawn. The Permittees have proposed a procedure for generating the potentiometric map that is required by the Permit. This procedure is designed to reflect the most recent hydrological information regarding the Culebra and uses the most recent water level measurements and water densities. The Permittees propose that the potentiometric map be generated using the following steps:

  - *Examine hydrographs to identify the month having the largest number of Culebra water levels available with the fewest wells affected by pumping or other anthropogenic events.*
  - *Convert water levels from the subject month to equivalent freshwater heads using fluid densities appropriate to the date.*
  - *Fit the trend surface through freshwater heads.*
  - *Extrapolate the trend surface to the boundaries of the model domain used for the current Performance Assessment Baseline Calculations (PABCs) and define initial fixed-head boundary conditions based on the trend surface.*
  - *Using the ensemble-average Culebra transmissivity field used for the current PABC, optimize the model boundary heads to improve the fit of the model to the freshwater heads at the wells using optimization software interactively with MODFLOW.*
  - *Run MODFLOW with optimal boundary conditions fit.*

- *Contour MODFLOW head results on WIPP site.*
- *Compute the particle path and travel time from the Waste Handling Shaft to the LWA Boundary.*
- *Data analysis that will accompany the potentiometric surface map will include:*
  - *Measured versus modeled scatter plot diagram*
  - *Frequency of modeled head residuals*
  - *Modeled residual freshwater head at each well*
  - *Explanations for modeled misfit residuals greater than 16.4 feet (5 meters).*

Other Proposed Changes

The Groundwater Permit Modification Work Plan states, "The PMR will include, but will not necessarily be limited to the modifications..." Therefore, the Permittees propose these changes that are not specifically listed in the Groundwater Permit Modification Work Plan.

- Clarify the contents of the Operating Record versus what will be retained on file at the facility but not in the Operating Record.

  The Permittees are clarifying which records are required to be in the Operating Record (20.4.1.501 NMAC, incorporating 40 CFR 264.73) versus those that will be kept on file at the facility.

- The Permittees are deleting the reference to Teflon and replacing it with "inert material."

  See Attachment L, Sections in L-4c(2).

- The Permittees have added a clarification that the analytical laboratory may request sample containers, volumes, and holding times that are different than those listed in Table L-6.

  See Attachment L, Section L-4c(2)(iii)

- The Permittees have combined the Request for Analysis and Chain of Custody example forms into one form.

  See Attachment L, Section L-4c(2)(v) and Figure L-13.

- The Permittees are deleting the requirement for non-dedicated sample collection lines and referring the cleaning of other non-dedicated components to SOPs.

  See Attachment L, Section L-4c(2)(iii).

- The Permittees are proposing the removal of total organic halogen (TOX) as a parameter.

See Part 5, Condition 5.4, Table 5.4.a, and Attachment L, Section L-4c(2)(iii).

- The Permittees are proposing to change the baseline value for methylene chloride to five micrograms per liter (µg/L).

  See Part 5, Table 5.6.

- The following editorial changes are proposed throughout Part 5 and Attachment L:

  The Permittees are proposing to standardize the term "ground-water" and "ground water" to the term "groundwater."

  The Permittees are proposing to eliminate "branching from the main sample line..." in Attachment L, Section L-4c(2)(iii) because it is redundant to text in Attachment L, Section L-4c(2)(i).

2. 20.4.1.900 NMAC (incorporating 40 CFR §270.42(b)(1)(ii)), requires the applicant to identify that the modification is a Class 2 modification.

This is a Class 2 modification for the reasons listed below:

- "Changes in ground-water sampling or analysis procedures or monitoring schedule, with prior approval of the director...[1]1" pursuant to 20.4.1.900 NMAC (incorporating 40 CFR §270.42, Appendix I, C. Ground-water protection, Item 2). The NMED provided prior approval of the classification with the approval of the Groundwater Permit Modification Work Plan.

- "Changes in the indicator parameters, hazardous constituents, or concentration limits (including ACLs): b. as specified in the detection monitoring program...2" pursuant to 20.4.1.900 NMAC (incorporating 40 CFR §270.42, Appendix I, C. Ground-water protection, Item 5.b).

3. 20.4.1.900 NMAC (incorporating 40 CFR §270.42(b)(1)(iii)), requires the applicants to explain why the modification is needed.

This PMR is needed to comply with the Groundwater Permit Modification Work Plan, approved by the NMED on August 5, 2011. The following discussion provides a brief explanation of why the changes are required by the Groundwater Permit Modification Work Plan. The exact change that is being made is described in Item 1 above and the attached redline/strikeout text in Attachment B. The following discussion is formatted to follow the Groundwater Permit Modification Work Plan.

- Revise sources of confusion and ambiguities.

  The first item in the Groundwater Permit Modification Work Plan deals with ambiguities and confusion in the Permit with regard to the implementation of groundwater monitoring at the WIPP facility. The Permittees identified several specific examples of these sources and listed them in the Groundwater Permit Modification Work Plan.

The first item in the Groundwater Permit Modification Work Plan deals with ambiguities and confusion in the Permit with regard to the implementation of groundwater detection monitoring requirements at the WIPP facility. Eliminating the sources of confusion and ambiguity is required to facilitate compliance with Permit and with Item 10.a. of the NMED stipulated Final Order NO. HWB-09-47. The Permittees identified specific examples of these sources and listed them in the Groundwater Permit Modification Work Plan. Ambiguities and confusing text dealt with areas such as groundwater well designation, water level measurement, procedures, data quality objectives, quality assurance objectives, and organizational responsibilities. However, before dealing with these specific sources, it is necessary to clarify the WIPP groundwater DMP and its program components to eliminate confusion with regard to what program components are used for compliance with various requirements.

Clarifying the program as the Groundwater Monitoring Program consisting of two components, the DMP and the WLMP, which eliminates confusion with regard to what program components are used to satisfy various requirements. Language in the Permit refers to the overall program and all wells as being the DMP. However, in other places, the DMP wells are limited to only the wells that are sampled and analyzed. In order to correct this, the Permittees are proposing language that defines the overall program as the Groundwater Monitoring Program with two components, the DMP and the WLMP. Each component has its own set of measurement wells and measurement activities and associated DQOs. The DMP consists of six wells that are sampled and analyzed annually to determine if contamination has been released from the disposal units. The WLMP consists of over 40 wells that are measured monthly and reported semi-annually to determine if assumptions regarding groundwater flow and direction remain valid.

- **Specifically identify which wells are used for density measurements.**

  A new table, Attachment L, Table L-4, was added to identify the Culebra wells used for obtaining density measurements.

  Density measurements are only relevant to Culebra water level determinations. Previously, the number of wells used was defined generally as those available for measurement. These wells included some that are too distant to have a meaningful impact on the facility water level determination and some that were completed in horizons other than the Culebra and had no impact on the water level mapping. The Permittees have optimized (McKenna 2004) the number and location of wells for making water level determinations and are proposing to establish these wells as a list in the Permit that can only be changed via a permit modification. The list eliminates non-Culebra wells from the measurement schedule since these measurements are not used to determine compliance with groundwater monitoring requirements of the Permit.

  In addition, language has been clarified to ensure that the water levels are measured monthly, that densities are measured annually, that acceptable methods are used for making measurements, and that new density data are used in correcting measured water levels to freshwater heads. This language ensures that semi-annual and annual data submittals are of acceptable quality and are presented in a consistent manner that makes comparison of results over time possible. The measurement methodology and the procedure for drawing the maps (discussed subsequently) also ensure consistency between the data reported to the NMED for Permit compliance and data reported to the Environmental Protection Agency (EPA).

This change is required to clarify specifically what wells are used to obtain density measurements.

- Specify frequency for density measurements and assessment.

  Attachment L, Section L-4c(1) was revised to specify the frequency for density measurements as annually.

  The language in the Permit does not reflect the original intent of the Groundwater Monitoring Program to evaluate density annually. The language has been clarified to require measurement and evaluation annually.

- Specify how density measurements are performed.

  Attachment L, Section L-4c(1), last paragraph, now describes the means of how measurements are performed.

  This clarification is required to provide instructions on how density measurements can be consistently performed. Measurement will be made using a hydrometer for DMWs, mobile pressure transducer for redundant wells, and fixed transducers in other wells. Calculations are presented in Attachment L, Section L-4c(1).

- Include a specific list of wells that must be monitored for water levels.

  - Exclude non-Culebra wells from those required for water level measurements.

    A new table, Attachment L, Table L-4 lists all Culebra wells for water level monitoring, excluding non-Culebra wells.

    Some confusion exists in the Permit regarding which wells are to be sampled or measured. The Permittees have clarified this by providing a list of Culebra wells for both the DMP and the WLMP (new Attachment L, Table L-4). Non-Culebra wells have been excluded because they provide no data for detection monitoring.

- Clarify the need for, and use of, written procedures for both field work and non-field work, including the procedure for developing a potentiometric surface map annually.

  The sections listed below were revised to clarify the need for, and use of, written procedures for both field work and non-field work:

  Attachment L, Sections L-1, L-4c(1), L-4c(1)(i), L-4c(1)(ii), L-4c(2)(ii), L-4c(2)(iii), L-4c(2)(iv), L-4c(2)(v), L-4d(1), L-4d(2), L-7a, L-7a(4),L-7c, L-7d, L-7e, L-7f, L-7i, L-7h, and Table L-3.

  In addition, the procedure descriptions were removed from the text, updated, and included as new Table L-3. The procedure for developing a potentiometric surface map was added to Attachment L, Section L-5c.

  Another source of confusion in the Permit has to do with procedures needed to conduct the Groundwater Monitoring Plan. The Permit lists specific procedures needed for field activities but is silent with regard to non-field procedures used to analyze and map

groundwater data. Language regarding procedures is ambiguous. In order to eliminate this ambiguity, the Permittees are proposing a list of field and non-field procedures and a description of the process (procedure) for producing the annual potentiometric surface map.

*This approach accomplishes three objectives. First, it satisfies the Resource Conservation and Recovery Act (**RCRA**) regulations that specify that certain groundwater activities be performed in accordance with procedures and that personnel be trained to those procedures and use them during monitoring activities. This table lists the minimum RCRA requirements that are to be included in procedures. Second, it removes the details of the procedures from the Permit, thereby giving the Permittees the flexibility to change procedures to accommodate administrative changes or changes in sampling or analytical methods without having to seek a permit modification. Preparing, using, and controlling SOPs is mandated at the WIPP facility by the DOE quality assurance requirements. Standard operating procedures may change frequently as the DOE requirements change. By listing specific SOPs by number and title in the Permit, the Permittees find themselves in a position where implementing changes, even administrative ones, may be delayed because of the need to modify the Permit first. In order to overcome this, the Permittees are proposing to list the specific items that must be included in facility SOPs, and committing to have the current version of the SOP on file for the NMED to examine at any time. In this way, the Permit controls the essential content of the SOP while the Permittees control the administration for the SOP. Third, it enhances the enforceability of the program by removing any question regarding which SOPs are in place and are being followed by the Permittees with regard to the Groundwater Monitoring Program.*

- Clarify the data quality objectives section and explain data quality objectives and quality assurance objectives and the difference between quality assurance objectives for field work and for laboratory analysis.

  The DQOs and QAOs are clearly identified, revised, and separated into Attachment L, Sections L-7a(1), Data Quality Objectives, and new Section L-7a(2), Quality Assurance Objectives. These changes clearly define the DQOs for each Groundwater Monitoring Program component and clarifies the QAOs.

  The Permit confuses DQOs and QAOs and fails to distinguish between QAOs applicable to field measurements and those applicable to laboratory analysis. In addition, the clarification of the Groundwater Monitoring Program, consisting of two separate components, leads to the need to state a DQO for each component. While the program has been operating under a consistent set of QAOs, specifying them in the Permit ensures consistency for future Groundwater Monitoring Program activities. Furthermore, clearly stated QAOs and DQOs aligns the program with EPA Guidance which encourages this.

- Remove specificity regarding departments and organizations and replace those terms with "the Permittees."

  Deleted entire section of former Permit, Attachment L, Section L-7, Project Organization and Responsibilities. Deleted all references to departments, organizations, and titles referenced in former Attachment L, Section L-7 throughout Attachment L and replaced with Permittees.

The sections that were revised are listed below:

Attachment L, Sections L-4c(2)(i), L-4c(2)(ii), L-4c(2)(iii), L-4c(2)(v), L-4c(3),L-5(a),L-5(b),L-5(c), L-7a(3).

Changed organizational titles to the more generic "Permittees" where applicable in Attachment L.

When the Groundwater Program was initially placed in the Permit, it was based on an internal WIPP facility implementation plan which included specific organization and position names. As a result, there are numerous places in the Permit where unnecessary detail regarding position titles and organizations is provided. While this is important at the facility level as part of an implementation plan, it is not needed in the Permit, and creates an administrative burden to the extent that if the organizational names or functions change at the facility, a Permit modification is necessary. Therefore, in an effort to focus the Permit on the requirements and to leave the details for implementation to the Permittees internal programs and processes, changes such as this are being proposed.

Updated the organization that performs data V and V.

This change is necessary because previously the Permittees contracted data V & V to a subcontractor, the text reflected this activity. The Permittees now perform V & V in house and much of the language that applies to managing subcontractors does not apply. Instead, an SOP for V&V is listed in Attachment L, Table L-3 to ensure the proper V&V.

- Clarify serial sampling requirements including the following:

  - Remove several field parameters that are not indicators of stabilization, such as chloride, divalent cations, alkalinity, total iron, and Eh.

    See Attachment L, Section L-4c(2)(ii).

    Another area addressed by the Groundwater Permit Modification Work Plan regards serial sampling. The Permit requires the measurement of chloride divalent cations, alkalinity, total iron, Eh, pH, specific conductance, temperature, and specific gravity as parameters that may be used to determine field stabilization of Culebra groundwater prior to final sampling. After over 15 years of sampling experience, the Permittees have determined that certain changes are appropriate to facilitate sampling and to remove unneeded sampling activity. Specifically, the Permittees are proposing to change how field stabilization is determined prior to taking a final sample for analysis. Based on field experience with the DMP, the Permittees have identified that pH, specific conductance, temperature, and specific gravity are the most diagnostic indicators of groundwater condition and are easily measured in the field. Other parameters are significantly more difficult to measure and, in the case of iron, have little meaning with regard to the current well configuration (iron was important when the Permittees were using iron cased wells).

  - Remove the bubbler line requirements.

    See Attachment L, Section L-4c(2)(i).

The bubbler line requirements are redundant to the water level probe. Bubbler technology is now obsolete.

- Restrict serial sampling for stabilization to no more than three well bore volumes.

  See Attachment L, Sections L-4c(2)(i) and L-4c(2ii).

  The Permittees are proposing to restrict the volume of water to be pumped from a well prior to sampling, to no more than three well bore volumes or when field parameters meet the stablility requirements in the Permit, whichever occurs first in order to be consistent with the EPA RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (EPA/530/SW-86/055, September 1986) and to avoid unnecessary pumping of groundwater.

- Change the frequency of performing groundwater sampling and analysis to an annual basis rather than semi-annually.

  As part of the Groundwater Permit Modification Work Plan, the Permittees have evaluated the frequency for groundwater sampling and reporting. The cumulative results, which can be found in the most recent data report, indicates that there has been no significant change in the nature of the Culebra water and no indication of contamination leading to the conclusion that annual sampling will be adequate. Reporting is proposed to be reduced to annually as well.

  - Change the frequency of reporting to annually rather than semi-annually.

    These changes are being made because the data shows limited variability in sampling events and no indication of contamination resulting from TRU waste management. Furthermore, many of the parameters are non-detects. Therefore, semi-annual reporting is not necessary.

- Change the frequency of reporting water level values to twice per year rather than monthly.

  Water level data shows minimal variability therefore, monthly reporting is not necessary and semi-annual reporting is adequate.

  - Include enhanced interpretation in the form of annotated hydrographs.

    Attachment L, Section L-4c(1)(ii) was revised to stipulate that the semi-annual groundwater reports will include annotated hydrographs and trend analysis.

    The NMED has reported that the current format, while compliant with the Permit, is not as useful as a semi-annual report with hydrographs.

- Include flow rate and direction determination in the annual detection monitoring report.

  Because the Permittees are proposing to remove the ASER as described below as the vehicle for reporting flow rate and direction, the "Annual Culebra Groundwater Report" will now include this information. In addition, the Permittees are only reporting on downgradient wells because they are the only ones that can trigger actions leading to

compliance monitoring. Based on transport modeling, the wells that would likely intercept a contaminant plume are WQSP 4 to 6. These wells are located between the shafts and the facility boundary such that detection would occur before any contamination would reach the boundary. The conceptual models now employed by the Permittees to demonstrate flow rate and direction will provide a periodic demonstration that the flow paths continue to be in the direction of these downgradient wells.

The other wells are upgradient from the release point and could not be contaminated by releases from the repository, therefore using them to trigger compliance monitoring is not appropriate.

- Remove the ASER as a means of reporting flow rate and direction.

  Removed the ASER and replaced with the "Annual Culebra Groundwater Report."

  The requirement to submit the ASER is deleted since the ASER was previously the vehicle for submitting the water level sampling contour map. Now separate water level reports are proposed for submittal.

  Removed requirements to report radionuclide analytical results annually to the NMED as a consequence of deleting the requirement to submit the ASER. The requirement to report radionuclide data is also deleted.

  This information is not collected under the Permit and was available because it was contained in the ASER. With the deletion of the ASER as a deliverable, these data are proposed for deletion from the Permit.

- Revise the statistical process for data analysis to be consistent with 20.4.1.500 NMAC (incorporating 40 CFR 264.97(h)).

  Clarified how temporal and spatial analysis and statistical evaluations are performed.

  See Attachment L, Sections L-4e, L-4e(1), L-4e(2), L-4e(3).

  Another area addressed by the Groundwater Permit Modification Work Plan has to do with the removal of obsolete requirements from the Permit. Much of the statistical analysis portion of the permit is aimed at establishing the baseline statistics for ongoing comparisons to determine if a release has occurred. This information is no longer needed since the baseline has been established and has been incorporated into the Permit. The Permit was written with the assumption that there would be detectable constituents and that they can be represented as distributions making statistical analysis possible. In reality, no organic constituents have been detected so that the values are set at the minimum detection level for the analysis. This limits use of predictive statistics for comparisons. To compensate, the Permittees do comparisons to the baseline value to determine if the analytical result is "over or under" the baseline. Using this approach, most of the statistical discussion is not needed. Furthermore, by specifying that for constituents with distributions (such as metals), a statistical method will be used; the Permit accomplishes the goal of forcing a statistical analysis without the extensive detail in the text.

- Update figures, tables and text with current information.

Removed obsolete content throughout Part 5 and Attachment L including conditions in the Permit that only applied to the initial baseline sampling and are no longer required. This language is proposed for deletion and past-tense statements are either completed or are made current.

In addition, figures and tables are being revised to reflect current information and proposed Permit text.

- Describe the methodology for generation of the Culebra Potentiometric Surface Map whereby the Permittees determine the groundwater flow rate and direction annually in accordance with 20.4.1.500 NMAC (incorporating 40 CFR 264.98(e)).

  This methodology is being proposed to ensure development of consistent potentiometric surface maps.

Other Proposed Changes

The Groundwater Permit Modification Work Plan recognizes that the Permittees may need to make other changes to the Groundwater Monitoring Plan in addition to those specifically identified in the Groundwater Permit Modification Work Plan. These "Other Changes" include the following:

- The Permittees are moving records which are not required to be maintained in the Operating Record (20.4.1.501 NMAC, incorporating 40 CFR 264.73) to facility files.

  This change is needed to ensure that the appropriate records are being maintained in the Operating Record.

- The Permittees are proposing to change the sampling line from Teflon® to an inert material.

  This change is being proposed because sampling line materials other than Teflon® are inert, less costly, and functionally equivalent.

- The Permittees are clarifying that the analytical laboratory may request sample containers, volumes, and holding times that are different than those listed in Attachment L, Table L-6.

  This change is required so that the samples are submitted in a manner that is compatible with the requirements of the analytical laboratory.

- The Permittees are proposing to combine the Request for Analysis and Chain of Custody example forms into one form.

  This change is being proposed to the form to minimize the administrative burden without loss of any required information. Using this form combines identifying the laboratory analytical request and chain of custody into one form.

- The Permittees are deleting the requirement for non-dedicated sample collection lines and referring the cleaning of other non-dedicated components to SOPs.

This change is being proposed because the Permittees do not use non-dedicated sample collection lines and the cleaning process is specified in SOPs.

- The Permittees are proposing the removal of TOX as an indicator parameter.

  The analytical results for TOX have resulted in low and variable concentrations in the DMP. The analysis is extremely difficult to perform on WIPP groundwater due to high chloride content. Deletion will reduce this analytical burden without reducing the effectiveness of the DMP. Halogenated organic compounds are analyzed using GC/MS and have not been detected.

- The Permittees are proposing to change the baseline value for methylene chloride to five micrograms per liter (µg/L).

  The value in the Permit of three micrograms per liter is not supported by the data collected as part of the baseline sampling program and appears to be in error. The proposed value is consistent with NMED screening levels for water and the minimum detection limit for this compound.

- The Permittees are making numerous editorial changes throughout Part 5 and Attachment L and deleting redundant text.

  For example the Permittees are proposing to standardize the term "ground-water" and "ground water" to the term "groundwater." Also, as an example, the Permittees are proposing to eliminate "branching from the main sample line..." in Attachment L, Section L-4c(2)(iii) because it is redundant to text in Attachment L, Section L-4c(2)(i).

  Such editorial changes are being made to make the Permit text consistent.

4. 20.4.1.900 NMAC (incorporating 40 CFR §270.42 (b)(1)(iv)), requires the applicant to provide the applicable information required by 40 CFR §§270.13 through 270.21, 270.62 and 270.63.

The attached regulatory crosswalk describes those portions of the Permit that are affected by this PMR. Where applicable, regulatory citations in this modification reference Title 20, Chapter 4, Part 1, NMAC, revised March 1, 2009, incorporating the CFR, Title 40 (40 CFR Parts 264 and 270). 40 CFR §§270.16 through 270.22, 270.62, 270.63 and 270.66 are not applicable at the WIPP. Consequently, they are not listed in the regulatory crosswalk table. 40 CFR §270.23 is applicable to the WIPP Hazardous Waste Disposal Units (**HWDUs**). This modification does not impact the conditions associated with the HWDUs.

5. 20.4.1.900 NMAC (incorporating 40 CFR §270.11(d)(1) and 40 CFR §270.30(k)), requires any person signing under paragraph a and b must certify the document in accordance with 20.4.1.900 NMAC.

The transmittal letter for this PMR contains the signed certification statement in accordance with Part 1, Condition 1.9 of the Permit.

Regulatory Crosswalk

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
§270.13		Contents of Part A permit application	Attachment B Part A		✓
§270.14(b)(1)		General facility description	Attachment A		✓
§270.14(b)(2)	§264.13(a)	Chemical and physical analyses	Part 2.3.1 Attachment C		✓
§270.14(b)(3)	§264.13(b)	Development and implementation of waste analysis plan	Part 2.3.1.1 Attachment C		✓
	§264.13(c)	Off-site waste analysis requirements	Part 2.2.1 Attachment C		✓
§270.14(b)(5)	§264.15(a-d)	General inspection requirements	Part 2.7 Attachment E-1a		✓
	§264.174	Container inspections	Attachment E-1b(1)		✓
§270.23(a)(2)	§264.602	Miscellaneous units inspections	Attachment E-1b Attachment E-1b(1)		✓
§270.14(b)(6)		Request for waiver from preparedness and prevention requirements of Part 264 Subpart C	NA		✓
§270.14(b)(7)	264 Subpart D	Contingency plan requirements	Part 2.12 Attachment D		✓
	§264.51	Contingency plan design and implementation	Part 2.12.1 Attachment D		✓
	§264.52 (a) & (c-f)	Contingency plan content	Attachment D		✓
	§264.53	Contingency plan copies	Part 2.12.2 Attachment D		✓
	§264.54	Contingency plan amendment	Part 2.12.3 Attachment D		✓
	§264.55	Emergency coordinator	Part 2.12.4 Attachment D-4a(1)		✓
	§264.56	Emergency procedures	Attachment D-4		✓
§270.14(b)(8)		Description of procedures, structures or equipment for:	Attachment A Part 2.11		✓
§270.14(b)(8)(i)		Prevention of hazards in unloading operations (e.g., ramps and special forklifts)	Part 2.11		✓
§270.14(b)(8)(ii)		Runoff or flood prevention (e.g., berms, trenches, and dikes)	Attachment A1-1c(1) Part 2.11		✓
§270.14(b)(8)(iii)		Prevention of contamination of water supplies	Part 2.11		✓
§270.14(b)(8)(iv)		Mitigation of effects of equipment failure and power outages	Part 2.11		✓
§270.14(b)(8)(v)		Prevention of undue exposure of personnel (e.g., personal protective equipment)	Part 2.11		✓
§270.14(b)(8)(vi) §270.23(a)(2)	§264.601	Prevention of releases to the atmosphere	Part 2.11 Part 4.4 Attachment D-4e Attachment G-1a		✓
	264 Subpart C	Preparedness and Prevention	Part 2.10		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
	§264.31	Design and operation of facility	Part 2.1		✓
	§264.32	Required equipment	Part 2.10.1 Attachment D		✓
	§264.33	Testing and maintenance of equipment	Part 2.10.2 Attachment E-1a		✓
	§264.34	Access to communication/alarm system	Attachment E-1a Part 2.10.3		✓
	§264.35	Required aisle space	Part 2.10.4		✓
	§264.37	Arrangements with local authorities	Attachment D-4a(3)		✓
§270.14(b)(9)	§264.17(a-c)	Prevention of accidental ignition or reaction of ignitable, reactive, or incompatible wastes	Part 2.9		✓
§270.14(b)(10)		Traffic pattern, volume, and controls, for example: Identification of turn lanes Identification of traffic/stacking lanes, if appropriate Description of access road surface Description of access road load-bearing capacity Identification of traffic controls	Attachment A4		✓
§270.14(b) (11)(i) and (ii)	§264.18(a)	Seismic standard applicability and requirements	Attachment G2-2.2 Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(11)(iii-v)	§264.18(b)	100-year floodplain standard	Attachment A1-1c(1) Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(12)	§264.16(a-e)	Personnel training program	Part 2.8 Attachment F		✓
§270.14(b)(13)	264 Subpart G	Closure and post-closure plans	Part 6 & 7 Attachment G & H		✓
§270.14(b)(13)	§264.111	Closure performance standard	Attachment G-1a		✓
§270.14(b)(13)	§264.112(a), (b)	Written content of closure plan	Attachment G-1		✓
§270.14(b)(13)	§264.112(c)	Amendment of closure plan	Part 6.3 Attachment G-1d(4)		✓
§270.14(b)(13)	§264.112(d)	Notification of partial and final closure	Attachment G-2a		✓
§270.14(b)(13)	§264.112(e)	Removal of wastes and decontamination/dismantling of equipment	Attachment G-1e(2)		✓
§270.14(b)(13)	§264.113	Time allowed for closure	Part 6.5 Attachment G-1d		✓
§270.14(b)(13)	§264.114	Disposal/decontamination	Part 6.6 Attachment G-1e(2)		✓
§270.14(b)(13)	§264.115	Certification of closure	Part 6.7 Attachment G-2a		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
§270.14(b)(13)	§264.116	Survey plat	Part 6.8 Attachment G-2b		✓
§270.14(b)(13)	§264.117	Post-closure care and use of property	Part 7.3 Attachment H-1a		✓
§270.14(b)(13)	§264.118	Post-closure plan; amendment of plan	Part 7.5 Attachment H-1a (1)		✓
§270.14(b)(13)	§264.178	Closure/containers	Part 6.9 Attachment A1-1h Attachment G-1		✓
§270.14(b)(13)	§264.601	Environmental performance standards-miscellaneous units	Attachment A-4 Attachment D-1 Attachment G-1a		✓
§270.14(b)(13)	§264.603	Post-closure care	Part 7.3 Attachment G-1a(3)		✓
§270.14(b)(14)	§264.119	Post-closure notices	Part 7.4 Attachment H-2		✓
§270.14(b)(15)	§264.142	Closure cost estimate	NA		✓
	§264.143	Financial assurance	NA		✓
§270.14(b)(16)	§264.144	Post-closure cost estimate	NA		✓
	§264.145	Post-closure care financial assurance	NA		✓
§270.14(b)(17)	§264.147	Liability insurance	NA		✓
§270.14(b)(18)	§264.149-150	Proof of financial coverage	NA		✓
§270.14(b)(19)(i), (vi), (vii), and (x)		Topographic map requirements Map scale and date Map orientation Legal boundaries Buildings Treatment, storage, and disposal operations Run-on/run-off control systems Fire control facilities	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(ii)	§264.18(b)	100-year floodplain	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(iii)		Surface waters	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(iv)		Surrounding land use	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
§270.14(b)(19)(v)		Wind rose	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(viii)	§264.14(b)	Access controls	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(ix)		Injection and withdrawal wells	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(xi)		Drainage on flood control barriers	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(19)(xii)		Location of operational units	Attachment B2 Part A Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.14(b)(20)		Other federal laws Wild and Scenic Rivers Act National Historic Preservation Act Endangered Species Act Coastal Zone Management Act Fish and Wildlife Coordination Act Executive Orders	Attachment B Renewal App. Sep. 2009, 270.14 Contents of Part B: General Requirements		✓
§270.15	§264 Subpart I	Containers	Part 3 Part 4.3 Attachment A1		✓
	§264.171	Condition of containers	Part 3.3 Attachment A1		✓
	§264.172	Compatibility of waste with containers	Part 3.4 Attachment A1		✓
	§264.173	Management of containers	Part 3.5 Attachment A1		✓
	§264.174	Inspections	Part 3.7 Attachment E-1 Attachment A1-1e		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
§270.15(a)	§264.175	Containment systems	Part 3.6 Attachment A1		✓
§270.15(c)	§264.176	Special requirements for ignitable or reactive waste	Attachment A1-1g Permit Part 2.1		✓
§270.15(d)	§264.177	Special requirements for incompatible wastes	Attachment A1-1g Permit Part 2.3.3.4		✓
	§264.178	Closure	Part 6 Attachment G		✓
§270.15(e)	§264.179	Air emission standards	Part 4.4.2 Attachment N		✓
§270.23	264 Subpart X	Miscellaneous units	Part 1.3.1 Attachment A2-1 Attachment G1.3.1		✓
§270.23(a)	§264.601	Detailed unit description	Part 4 Part 5 Attachment A2 Attachment L	✓	
§270.23(b)	§264.601	Hydrologic, geologic, and meteorologic assessments	Part 4 Part 5 Attachment A2 Attachment L	✓	
§270.23(c)	§264.601	Potential exposure pathways	Part 4 Part 5 Attachment A2 Attachment N Attachment L	✓	
§270.23(d)		Demonstration of treatment effectiveness	Part 4 Attachment A2 Attachment N		✓
	§264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	Part 4 Part 5 Attachment A2 Attachment E-1 Attachment N Attachment L	✓	
	§264.603	Post-closure care	Attachment H Attachment H1		✓
	264 Subpart E	Manifest system, record keeping, and reporting	Permit Part 1 Permit Part 2.13 & 2.14 Permit Part 4 Attachment C		✓
§270.30(j)(2)	§264.73(b)	Ground-water records	Part 1		✓
	264 Subpart F	Releases from solid waste management units	Part 5 & 7 Attachment G2 & L		✓
	§264.90	Applicability	Part 5 Attachment L		✓
	§264.91	Required programs	Attachment L		✓
	§264.92	Ground-water protection standard	Attachment L		✓
	§264.93	Hazardous constituents	Attachment L		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the WIPP Permit Application	Yes	No
	§264.94	Concentration limits	Part 5 Attachment L		✓
	§264.95	Point of compliance	Part 5 Attachment L		✓
	§264.96	Compliance period	Attachment L		✓
	§264.97	General ground-water monitoring requirements	Part 5 Attachment L		✓
	§264.98	Detection monitoring program	Part 5 Attachment L		✓
	§264.99	Compliance monitoring program	Part 5 Attachment L		✓
	§264.100	Corrective action program	Part 5 Attachment L		✓
	§264.101	Corrective action for solid waste management units	Part 8 Attachment L		✓
	264 Appendix IX	Ground-water Monitoring List	Part 5 Attachment L		✓

Attachment A
Table of Changes

Table of Changes

Affected Permit Section	Explanation of Change
Global	Changed "ground-water" and "ground water" to "groundwater"
Part 5, Section 5.3.2.	Deleted "10" from "Figure L-10" and replace with "7" to read "Figure L-7"
Part 5, Section 5.3.2.	Deleted "16" from "Figure L-16" and replace with "12" to read "Figure L-12"
Part 5, Section 5.4., Table 5.4.a	Deleted "Total organic halogen (**TOH**)"
Part 5, Section 5.4., Table 5.4.a	Replaced "Density" with "Specific Gravity"
Part 5, Section 5.4., Table 5.4.a	Deleted "Iron (Total Fe)"
Part 5, Section 5.5.	Deleted ", including background ground-water quality samples, "
Part 5, Section 5.5.1.	Deleted "semi" from "semiannually"
Part 5, Table 5.6	Replaced "3.00" with "5.00" for the Methylene chloride for WQSP wells 1 through 6
Part 5, Section 5.10.2.1.	Replaced "in compliance with the schedule on Table 5.10.2.1 below, and "with "in the Annual Groundwater Report in November of each year"
Part 5, Section 5.10.2.1., Table 5.10.2.1	Deleted table
Part 5, Section 5.10.2.2.	Replaced "submitted within 30 calendar days after data are collected" with "reported semiannually in May and November"
Part 5, Section 5.10.2.2.	Added "The November water level data shall be combined with the Annual Groundwater Report specified in Permit Part 5.10.2.3."
Part 5, Section 5.10.2.3.	Deleted "and Radionuclide Sampling" from heading
Part 5, Section 5.10.2.3.	Added "(to include annotated hydrographs)"
Part 5, Section 5.10.2.3.	Deleted "and the results of radionuclide specific analysis of groundwaters sampled from the DMWs"
Part 5, Section 5.10.2.3.	Replaced "Site Environmental" with "Culebra Groundwater"
Part 5, Section 5.10.2.3.	Replaced "by October 1" with "in November"
Attachment L, Global	Added "Amended Renewal Application" before Addendum L
Attachment L, Global	Deleted ", Amended Renewal Application" after section numbers
Attachment L, List of Abbreviations/Acronyms	Added "/UNITS" to title
Attachment L, List of Abbreviations/Acronyms	Deleted "ASER Annual Site Environmental Report"
Attachment L, List of Abbreviations/Acronyms	Deleted "AR/VR Approval/Variation Request"
Attachment L, List of Abbreviations/Acronyms	Replaced "CofC Chain of Custody" with "CofC/RFA chain of custody request for analysis"
Attachment L, List of Abbreviations/Acronyms	Added "Dewey Lake Dewey Lake Redbeds Formation"
Attachment L, List of Abbreviations/Acronyms	Added "DMW Detection Monitoring Wells"
Attachment L, List of Abbreviations/Acronyms	Deleted "EM Environmental Monitoring"

Affected Permit Section	Explanation of Change
Attachment L, List of Abbreviations/Acronyms	Deleted "ES&H Environmental, Safety, and Health Department"
Attachment L, List of Abbreviations/Acronyms	Deleted "FEIS Final Environmental Impact Statement"
Attachment L, List of Abbreviations/Acronyms	Added "(s)" to "gram"
Attachment L, List of Abbreviations/Acronyms	Deleted "GWSP Groundwater Surveillance Program"
Attachment L, List of Abbreviations/Acronyms	Added "LCSD lab control sample duplicate"
Attachment L, List of Abbreviations/Acronyms	Deleted "LD limit of detection"
Attachment L, List of Abbreviations/Acronyms	Added "Los Medaños Los Medaños Member of the Rustler Formation"
Attachment L, List of Abbreviations/Acronyms	Added "Magenta Magenta Member of the Rustler"
Attachment L, List of Abbreviations/Acronyms	Deleted "MOC Management and Operating Contractor"
Attachment L, List of Abbreviations/Acronyms	Added "molal moles per kilogram"
Attachment L, List of Abbreviations/Acronyms	Deleted "PRS Project Records Services"
Attachment L, List of Abbreviations/Acronyms	Added "QAO Quality Assurance Objective"
Attachment L, List of Abbreviations/Acronyms	Added "PABC Performance Assessment Baseline Calculation"
Attachment L, List of Abbreviations/Acronyms	Deleted "RFA request for analysis"
Attachment L, List of Abbreviations/Acronyms	Deleted "RIDS Records Inventory and Disposition Schedule"
Attachment L, List of Abbreviations/Acronyms	Added "SAP Sampling and Analysis Plan"
Attachment L, List of Abbreviations/Acronyms	Deleted "STLB sample tracking book"
Attachment L, List of Abbreviations/Acronyms	Deleted "TOX total organic halogens"
Attachment L, List of Abbreviations/Acronyms	Deleted "TSS total suspended solids"
Attachment L, List of Abbreviations/Acronyms	Added "UTLV upper tolerance limit value"
Attachment L, List of Abbreviations/Acronyms	Deleted "WQSP Water Quality Sampling Program"
Attachment L, Section L-1	Replaced "is a geologic repository for the disposal of transuranic (**TRU**) waste" with "facility is subject to regulation under Title 20 of the New Mexico Administrative Code (**NMAC**), Chapter 4, Part 1, Subpart V (20.4.1.500 NMAC). As required by 20.4.500 NMAC (incorporating 40 CFR §264.601), the Permittees shall demonstrate that the environmental performance standards for

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	a miscellaneous unit, which are applied to the hazardous waste disposal units (**HWDUs**) in the underground, will be met"
Attachment L, Section L-1	Deleted "The disposal horizon is located 2,150 feet (ft) (655 meters [m]) below the land surface in the bedded salt of the Salado Formation (hereinafter referred to as the Salado). At WIPP, water-bearing units occur both above and below the disposal horizon. Ground-water monitoring of the uppermost aquifer below the facility is not proposed at WIPP because that water-bearing unit (the Bell Canyon Formation) is not considered a credible pathway for a release from the repository. This is because the repository horizon and water-bearing sandstones of the Bell Canyon Formation are separated by over 2000 ft (610 m) of very low-permeability evaporite sediments (Addendum L1, Amended Renewal Application (DOE, 2009)). No natural credible pathway has been established for contaminant transport to aquifers below the repository horizon, as there is no hydrologic communication between the repository and underlying aquifer. The U.S. Environmental Protection Agency (**EPA**) concluded in 1990 that natural vertical communication does not exist based on their review of numerous studies (EPA, 1990). Furthermore, drilling boreholes for ground-water monitoring through the Salado and the Castile Formation (hereinafter referred to as the Castile) into the Bell Canyon aquifer would compromise the isolation properties of the repository medium."
Attachment L, Section L-1	Added "The WIPP facility is located in Eddy County in southeastern New Mexico (Figure L-1), within the Pecos Valley section of the southern Great Plains physiographic province. The facility is 26 miles (mi) (42 kilometers [km]) east of Carlsbad, New Mexico, in an area known as Los Medaños (the dunes). Los Medaños is a relatively flat, sparsely inhabited plateau with little water and limited land uses."
Attachment L, Section L-1	Deleted "Disposal of TRU mixed waste in the WIPP facility is subject to regulation under 20.4.1.500 NMAC. As required by 20.4.1.500 NMAC (incorporating 40 CFR §264.601), the Permittees shall demonstrate that the environmental performance standards for a miscellaneous unit, which are applied to the hazardous waste disposal units (**HWDUs**) in the underground, will be met."
Attachment L, Section L-1	Added "The WIPP facility (Figure L-2) consists of 16 sections of Federal land in Township 22 South, Range 31 East. The 16 sections of Federal land were withdrawn from the application of public land laws by the WIPP Land Withdrawal Act (**LWA**), Public Law 102-579. The WIPP LWA transferred the responsibility for the administration of the 16 sections from the Department of Interior, Bureau of Land Management, to the U.S. Department of Energy (**DOE**). This law specified that mining and drilling for purposes other than support of the WIPP project are prohibited within this 16 section area with the exception of Section 31. Oil and gas drilling activities are restricted in Section 31 from the surface down to 6,000 feet. The WIPP is a mined geologic repository for the disposal of transuranic (**TRU**) waste. The disposal horizon is located 2,150 feet (ft) (655 meters [m]) below the land surface in the bedded salt of the Salado Formation (**Salado**). At the WIPP facility, water-bearing units occur both above and below the disposal horizon. Groundwater monitoring of the uppermost aquifer below the facility is not required because the water-bearing unit (the Bell Canyon Formation (**Bell Canyon**)) is not considered a credible pathway for a release from the repository. This is because the repository horizon and water-bearing sandstones of the Bell Canyon are separated by over 2,000 ft (610 m) of very low-permeability evaporite sediments (Amended Renewal Application Addendum L1 (DOE, 2009)). No natural credible pathway has been established for contaminant transport to water-bearing zones below the repository horizon, as there is no hydrologic communication between the repository and underlying water-bearing zones. The U.S. Environmental Protection Agency (**EPA**) concluded in 1990 that natural vertical communication does not exist based on review of numerous studies (EPA, 1990). Furthermore, drilling boreholes for

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	groundwater monitoring through the Salado and the Castile Formation (**Castile**) into the Bell Canyon would compromise the isolation properties of the repository medium."
Attachment L, Section L-1	Added "the"
Attachment L, Section L-1	Replaced "in the past has focused" with "facility focuses"
Attachment L, Section L-1	Replaced "member" with "Member (Culebra)"
Attachment L, Section L-1	Replaced "(hereinafter referred to as the Culebra)" with "(Rustler)"
Attachment L, Section L-1	Replaced "Modeling of ground-water movement in the Culebra, based on the concept of a ground-water basin" with "Groundwater movement in the Culebra, using results from the basin-scale groundwater model"
Attachment L, Section L-1	Deleted "The WIPP site is located in Eddy County in southeastern New Mexico (Figure L-1) within the Pecos Valley section of the southern Great Plains physiographic province (Powers et al., 1978). The site is 26 miles (mi) (42 kilometers [km]) east of Carlsbad, New Mexico in an area known as Los Medaños (the dunes). Los Medaños is a relatively flat, sparsely inhabited plateau with little water and limited land uses. The WIPP site (Figure L-2) consists of 16 sections of Federal land in Township 22 South, Range 31 East. The 16 sections of Federal land were withdrawn from the application of public land laws by the WIPP Land Withdrawal Act (**LWA**), Public Law 102-579. The WIPP LWA transferred the responsibility for the administration of the 16 sections from the Department of Interior, Bureau of Land Management, to the U.S. Department of Energy (**DOE**). This law specified that mining and drilling for purposes other than support of the WIPP project are prohibited within this 16 section area with the exception of Section 31. Oil and gas drilling activities are restricted in Section 31 from the surface down to 6,000 feet."
Attachment L, Section L-1	Added "Culebra" before "groundwater"
Attachment L, Section L-1	Added "Culebra" before "groundwater"
Attachment L, Section L-1	Added "and rate determination"
Attachment L, Section L-1	Added "Culebra" before "groundwater"
Attachment L, Section L-1	Replaced "analytical" with "indicator"
Attachment L, Section L-1	Added "and hazardous constituents"
Attachment L, Section L-1	Added "Culebra" before "groundwater"
Attachment L, Section L-1	Deleted ", and establishes personnel responsibilities"
Attachment L, Section L-1	Replaced "sampling and analysis plan" with "DMP"
Attachment L, Section L-1	Replaced "field operating procedures, referenced throughout this plan." with "the WIPP Standard Operating Procedures (**SOP**s) (see Table L-3), which are maintained in facility files and which comply with the applicable requirements of 20.4.1.500 NMAC (incorporating 40 CFR § 264.97 (d))."
Attachment L, Section L-1	Added "Culebra" before "groundwater"
Attachment L, Section L-1	Added "Culebra" before "groundwater"
Attachment L, Section L-1	Added "Culebra" before "groundwater"
Attachment L, Section L-1	Added "and rate determination"
Attachment L, Section L-1	Deleted "These procedures prescribe proper field sampling techniques."
Attachment L, Section L-1	Replaced "Samples" with "Data required by this plan"

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Attachment L, Section L-1	Replaced "trained" with "qualified"
Attachment L, Section L-1	Replaced "under the supervision and direction of qualified engineers, scientists, or other technical personnel." with "in accordance with SOPs (Table L-3)."
Attachment L, Section L-1a(1)	Replaced "site" with "facility"
Attachment L, Section L-1a(1)	Added "bounded to the north and east by the Capitan Reef"
Attachment L, Section L-1a(1)	Deleted "During the Permian period, which came to a close about 245 million years ago, ancient seas covered the basin. Their later evaporation resulted in the deposition of a thick sequence of evaporites. Addendum L1, Section L1-1 of the Amended Renewal Application (DOE, 2009) presents a detailed discussion of the regional geologic history."
Attachment L, Section L-1a(1)	Added "and Amended Renewal Application Addendum L1, Section L1-1 (DOE 2009) for more detail"
Attachment L, Section L-1a(1)	Deleted ", which formed through evaporation of the Permian Sea,"
Attachment L, Section L-1a(1)	Deleted "(hereinafter referred to as the Rustler)"
Attathment L, Section L-1a(1)	Changed "Rustler's" to "Rustler"
Attachment L, Section L-1a(1)	Added "Redbeds Formation (Dewey Lake)"
Attachment L, Section L-1a(1)	Deleted "[1]" footnote indicator
Attachment L, Section L-1a(1)	Deleted "Formation (hereinafter referred to as the Bell Canyon)— "
Attachment L, Section L-1a(1)	Added "is"
Attachment L, Section L-1a(1)	Deleted footnote 1 " While there may be some uncertainty over the amount of vertical recharge occurring within the Rustler, the issue is only of significance to long-term performance calculations in which releases from the repository occur through the creation of a migration pathway resulting from drilling (inadvertently) in the WIPP area. The consequences of vertical recharge are bounded in the modeling by assuming that under future climate conditions (which are assumed to be cooler and wetter), the ground-water surface elevation (water table) raises near ground surface, at which time the water table tends to mimic topography."
Attachment L, Section L-1a(1)	Deleted "—"
Attachment L, Section L-1a(1)	Added "and"
Attachment L, Section L-1a(1)	Added "above"
Attachment L, Section L-1a(1)	Replaced "sequences" with "deposits"
Attachment L, Section L-1a(1)	Deleted "above"
Attachment L, Section L-1a(1)	Added "lithostatic"
Attachment L, Section L-1a(1)	Replaced "more than 2,000" with "approximately 2,200"
Attachment L, Section L-1a(1)	Replaced "13.8" with "14.9"
Attachment L, Section L-1a(1)	Replaced "moves" with "deforms"
Attachment L, Section L-1a(1)	Replaced "for millions of years" with "since deposition"
Attachment L, Section L-1a(2)(i)	Replaced "found" with "determined"
Attachment L, Section L-1a(2)(ii)	Added "naturally"
Attachment L, Section L-1a(2)(ii)	Deleted "As a comparison, the permeability of the Salado is roughly a thousand times less than that of a lower clay liner required of surface impoundments and landfills, assuming similar thicknesses."

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Attachment L, Section L-1a(2)(iii)	Deleted "(specifically, the Culebra Member, hereafter referred to as the Culebra)"
Attachment L, Section L-1a(2)(iii)	Replaced "6" with "5" to read "L-5"
Attachment L, Section L-1a(2)(iii)	Deleted "The Culebra is hydrologically confined."
Attachment L, Section L-1a(2)(iii)	Deleted "(Additional short-term pumping tests have been conducted in the Water Quality Sampling Program (**WQSP**) wells (see Addendum L1, Section L1-2a(3)(a)(ii) of the Amended Renewal Application (DOE, 2009))."
Attachment L, Section L-1a(2)(iii)	Deleted "recently"
Attachment L, Section L-1a(2)(iii)	Replaced "The hydraulic tests are designed to yield pressure data for estimation of hydrologic characteristics" with "Pressure data are collected during hydraulic tests for estimation of hydrologic characteristics"
Attachment L, Section L-1a(2)(iii)	Replaced "for input to flow modeling" with "in calibration of flow models"
Attachment L, Section L-1a(2)(iii)	Replaced "six" with "ten"
Attachment L, Section L-1a(2)(iii)	Deleted "Over the site, Culebra transmissivity varies over three to four orders of magnitude. Figure D6-30 shows variation in transmissivity in the Culebra in the WIPP region."
Attachment L, Section L-1a(2)(iii)	Replaced "3" with "7"
Attachment L, Section L-1a(2)(iii)	Replaced "9" with "13"
Attachment L, Section L-1a(2)(iii)	Replaced "P-18" with "SNL-15"
Attachment L, Section L-1a(2)(iii)	Added "(Roberts, 2007)"
Attachment L, Section L-1a(2)(iii)	Deleted "Qualitative correlations have been noted between transmissivity and several geologic features possibly related to open-fracture density, including (1) the distribution of overburden above the Culebra, (2) the distribution of halite in other members of the Rustler, (3) the dissolution of halite in the upper portion of the Salado, and (4) the distribution of gypsum fillings in fractures in the Culebra. Measured matrix porosities of the Culebra vary from 0.03 to 0.30. Fracture porosity values have not been measured directly, but interpreted values from tracer tests at the H-3, H-6, and H-11 hydropads vary from 5×10^{-4} to 3×10^{-3}. Data are insufficient to determine whether the average porosity of the matrix and fractures varies significantly on a regional scale."
Attachment L, Section L-1a(2)(iii)	Deleted "Previous conceptual models of the Culebra (see Addendum L1 of the Amended Renewal Application (DOE, 2009)) have not been able to consistently relate the hydrogeochemical facies, radiogenic ages, and flow constraints (that is, transmissivity, boundary conditions, etc.) in the Culebra." after "flow."
Attachment L, Section L-1a(2)(iii)	Deleted "However"
Attachment L, Section L-1a(2)(iii)	Changed "the" to "The"
Attachment L, Section L-1a(2)(iii)	Deleted "new"
Attachment L, Section L-1a(2)(iii)	Deleted "could"
Attachment L, Section L-1a(2)(iii)	Added "s" to explain
Attachment L, Section L-1a(2)(iii)	Deleted "new"
Attachment L, Section L-1a(2)(iii)	Added "basin-scale"
Attachment L, Section L-1a(2)(iii)	Deleted "basin"
Attachment L, Section L-1a(2)(iii)	Deleted "This differs from previous interpretations, wherein no-flow was assumed between Rustler units."

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Attachment L, Section L-1a(2)(iii)	Added "at WIPP"
Attachment L, Section L-1a(2)(iii)	Added "toward Nash Draw"
Attachment L, Section L-1a(2)(iii)	Added "currently"
Attachment L, Section L-1a(2)(iii)	Replaced "to a more southerly direction." with "in the Rustler from WIPP towards the Balmorhea-Loving Trough to the south."
Attachment L, Section L-1a(2)(iii)	Deleted "Four hydrogeochemical facies within the Culebra in the WIPP area (DOE, 1997) have been identified: • Zone A - saline (2-3 molal) NaCl brines, Mg/Ca ratio of 1.2 to 2; • Zone B - dilute (<0.1 molal) CaSO4 - rich ground water; • Zone C - variable composition (0.3-1.6 molal); Mg/Ca ratio 0.3 to 1.2; and • Zone D - high salinities (3-7 molal); K/Na weight ratios (0.2). Facies A ground-water flow is slow, has not changed over the last 14,000 years, and probably recharged more than 600,000 years ago. Vertical leakage occurs to Facies A, and both lateral and vertical ground-water flow rates are extremely low. Facies B occurs in an area with greater vertical fracturing in the Culebra, and therefore exhibits more vertical infiltration and more rapid lateral flow in the Culebra. Flow in Facies B is currently to the south (it may mix with Facies C water to the southeast) but was more toward the west during wetter climates; vertical infiltration from the Dewey Lake to the Culebra Facies B is assumed by the Permittees to have occurred during wetter climates in an area south of the WIPP site. Facies C water was not diluted to create Facies B water. Facies C occurs "in between" Facies A and B, and ground-water flow entered the Culebra prior to the climate change (to drier conditions) 14,000 years ago. Facies C ground-water flow is to the south at WIPP, where the Permittees theorized that it joins with a small amount of Facies A solute being transported from the east. Ground-water flow rate in Facies C is faster than in A but slower than in B, and the proposed recharge area from the Dewey Lake to the Culebra was to the northeast of the WIPP site. Facies C ground water infiltrated into the Dewey Lake and then interacted with anhydrite and halite along its path to the Culebra, wherein it mixed with smaller amounts of Facies A water. the Permittees concluded that the presence of anhydrite within Rustler units does not preclude slow downward infiltration (DOE, 1997)."
Attachment L, Section L-1a(2)(iii)	Added "Using data from 22 wells, Siegel, Robinson, and Myers (1991) originally defined four hydrochemical facies (A, B, C, and D) for Culebra groundwater based primarily on ionic strength and major constituents. With the data now available from 59 wells, Domski and Beauheim (2008) defined transitional A/C and B/C facies, as well as a new facies E for high-moles per kilogram (molal) Na-Mg Cl brines. • Zone B - Dilute (ionic strength ≤0.1 molal) $CaSO_4$-rich groundwater, from southern high-transmissivity area. Mg/Ca molar ratio 0.32 to 0.52. • Zone B/C - Ionic strength 0.18 to 0.29 molal, Mg/Ca molar ratio 0.4 to 0.6. • Zone C - Variable composition waters, ionic strength 0.3 to 1.0 molal, Mg/Ca molar ratio 0.4 to 1.1. • Zone A/C - Ionic strength 1.1 to 1.6 molal, Mg/Ca molar ratio 0.5 to 1.2. • Zone A - Ionic strength >1.66 molal, up to 5.3 molal, Mg/Ca molar ratio 1.2 to 2.4. • Zone D - Defined based on inferred contamination related to potash refining operations. Ionic strength 3 molal, K/Na weight ratios of ~0.2. • Zone E - Wells east of the mudstone-halite margins, ionic strength 6.4 to 8.6 molal, Mg/Ca molar ratio 4.1 to 6.6. The low-ionic-strength (≤0.1 molal) facies B waters contain more sulfate than chloride, and are found southwest and south of the WIPP site within and down

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	the Culebra hydraulic gradient from the southernmost closed catchment basins, mapped by Powers (2006), in the southwest arm of Nash Draw. These waters reflect relatively recent recharge through gypsum karst overlying the Culebra. However, with total dissolved solids (TDS) concentrations in excess of 3,000 mg/L, the facies B waters do not represent modern-day precipitation rapidly reaching the Culebra. They must have residence times in the Rustler sulfate units of thousands of years before reaching the Culebra. The higher-ionic-strength (0.3–1 molal) facies C brines have differing compositions, representing meteoric waters that have dissolved $CaSO_4$, overprinted with mixing and localized processes. Facies A brines (ionic strength 1.6–5.3 molal) are high in NaCl and are clustered along the extent of halite in the middle of the Tamarisk Member of the Rustler Formation. Facies A represents old waters (long flow paths) that have dissolved halite and/or connate brine, or a mixture of the two, from facies E. The facies D brines, as identified by Siegel, Robinson, and Myers (1991), are high-ionic-strength solutions found in western Nash Draw with high K/Na ratios representing waters contaminated with effluent from potash refining operations. Similar water is found at shallow depth (<36 ft (11 m)) in the upper Dewey Lake at SNL-1, just south of the Intrepid East tailings pile. The newly defined facies E waters are very high ionic strength (6.4–8.6 molal) NaCl brines with high Mg/Ca ratios. The facies E brines are found east of the WIPP site, where Rustler halite is present above and below the Culebra, and halite cements are present in the Culebra. They represent primitive brines present since deposition of the Culebra and immediately overlying strata."
Attachment L, Section L-1a(2)(iii)	Changed "Facies" to "facies"
Attachment L, Section L-1a(2)(iii)	Added "basin-scale"
Attachment L, Section L-1a(2)(iii)	Deleted "basin"
Attachment L, Section L-1a(2)(iii)	Replaced "Ground-water levels in the Culebra in the WIPP region have been measured for several decades. Water-level rises have been observed in the WIPP region and are possibly related to recovery from impacts caused by shaft installation, response to potash effluent discharge, or are unexplained, as discussed below. The extent of water-level rise observed at a particular well depends on several factors, but the proximity of the observation point to the potential cause of the water-level rise appears to be a primary factor. In the vicinity of the WIPP site, water-level rises are believed to be caused by recovery from drainage into the shafts. Drainage into shafts has been reduced by a number of grouting programs over the years, most recently in 1993 around the Air Intake Shaft. Northwest of the site, in and near Nash Draw, water levels appear to fluctuate in response to effluent discharge from potash mines. Correlation of water-level fluctuation with potash mine discharge, however, cannot be proven definitively because sufficient data on the timing and volumes of discharge are not available. Water-level rises in the vicinity of the H-9 hydropad, about 6.5 miles south of the site, are thought to be caused by neither WIPP activities nor potash mining discharge. They remain unexplained. The Permittees continue to monitor ground-water levels throughout the region." with "Groundwater levels in the Culebra in the WIPP region have been measured in numerous wells. Water-level rises have been observed in the WIPP region and are attributed to causes discussed in the Renewal Application Addendum L1, Section L1-2a(3)(a)(ii). The extent of water-level rise observed at a particular well depends on several factors, but the proximity of the observation point to the cause of the water-level change appears to be a primary factor. Hydrological investigations conducted from 2003 through 2007 provided new information, some of it confirming long-held assumptions and some offering new insight into the hydrological system around the WIPP site. A Culebra monitoring network optimization study was completed by McKenna (2004) and updated by Kuhlman (2010) to identify locations where new Culebra monitoring

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	wells would be of greatest value and to identify wells that could be removed from the network with little loss of information. As discussed in Amended Renewal Application Addendum L1, Section L1-2a(3)(a)(ii), extensive hydrological testing has been performed in the new wells. This testing has involved both single well tests, which provide information on local transmissivity and heterogeneity, and long-term (19 to 32 days) pumping tests that have created observable responses in wells up to 5.9 mi (9.5 km) away."
Attachment L, Section L-1a(2)(iii)	Replaced "unnamed lower member" with "Los Medaños Member"
Attachment L, Section L-1a(2)(iii)	Added "(**Los Medaños**)"
Attachment L, Section L-1a(2)(iii)	Changed "member" to "Member"
Attachment L, Section L-1a(2)(iii)	Added "(**Magenta**)" after "Rustler"
Attachment L, Section L-1a(2)(iii)	Added "basin-scale"
Attachment L, Section L-1a(2)(iii)	Deleted "basin"
Attachment L, Section L-1a(2)(iii)	Deleted "Recent simulations to enhance the conceptual understanding of the geohydrology of the Rustler can be found in Corbet and Knupp, 1996."
Attachment L, Section L-1a(2)(iii)	Deleted "(shown, for example, as Well H-8 in Figure L-7). However, the Permittees identified the Culebra as potential aquifer in the Compliance Certification Application (DOE, 1996). Because of this, the Culebra will be the focus of future ground-water monitoring at WIPP as it is also the most transmissive continuous water-bearing zone at WIPP and is the most likely pathway for contaminant migration"
Attachment L, Section L-2	Added "The requirements of"
Attachment L, Section L-2	Replaced "applies" with "apply"
Attachment L, Section L-3	Deleted "Ground-water" from section heading
Attachment L, Section L-3a	Deleted "The Permittees have established a RCRA "Ground-water Detection Monitoring Program (DMP) Plan" to define and protect ground-water resources at WIPP. One of the objectives of the WIPP DMP is to establish, by means of ground-water sampling and analysis, an accurate and representative ground-water database that is scientifically defensible and demonstrates regulatory compliance. In addition, the DMP will be used to determine background or existing conditions of ground-water quality and quantity, including ground-water surface elevation and direction of flow, around the WIPP facility area."
Attachment L, Section L-3a	Added "DMP"
Attachment L, Section L-3a	Deleted "all"
Attachment L, Section L-3a	Added "applicable"
Attachment L, Section L-3a	Replaced "§§ 264.90 through 264.101" with "264 Subpart F"
Attachment L, Section L-3a	Deleted "all"
Attachment L, Section L-3a	Deleted "The ground-water quality data generated by monitoring activities will provide a comprehensive background database against which future"
Attachment L, Section L-3a	Changed "analytical" to "Analytical"
Attachment L, Section L-3a	Replaced "can be compared" with "collected"
Attachment L, Section L-3a	Added "are compared to the baseline established in this Permit to determine whether or not a release has occurred"
Attachment L, Section L-3a	Deleted "Ground-water monitoring at WIPP has been historically conducted by several programs including the WIPP Site Characterization Program, the WIPP

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	WQSP, and recently the WIPP Ground-water Surveillance Program (**GWSP**). Ground-water quality and ground-water surface elevation data have been collected by these programs for over 12 years at WIPP. Data from the WQSP wells (which are widely distributed across the area, see Figure L-8) will be used to continually define changes in the area's potentiometric surface and ground-water flow directions. New monitoring wells included in the WIPP GWSP (WQSP wells 1-6a) were constructed to the specifications provided in the RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (EPA, 1986) and constitute the RCRA ground-water monitoring network specified in this DMP as required by 20.4.1.500 NMAC (incorporating 40 CFR §§264.90 through 264.101). These wells are being used to establish background ground-water quality, ground-water surface elevations and flow directions in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §§264.97(f) and (g) and 264.98(e)). Justification for the locations of these wells (3 upgradient and 4 downgradient) is presented below."
Attachment L, Section L-3a	Added "There are two separate components of the Groundwater Monitoring Program, the Detection Monitoring Program (DMP) and the Water Level Monitoring Program (WLMP). The first component consists of a network of six Detection Monitoring Wells (DMWs). The DMWs (WQSP 1-6) were constructed to be consistent with the specifications provided in the Groundwater Monitoring Technical Enforcement Guidance Document and constitute the RCRA groundwater monitoring network specified in the DMP. The DMWs were used to establish background groundwater quality in accordance with 20.4.1.500 NMAC (incorporating 40 CFR § 264.97 and 264.98 (f)). The second component of the Groundwater Monitoring Program is the WLMP, which is used to determine the groundwater surface elevation and flow direction. Table L-4 is a list of the wells used in the WLMP as of January 1, 2011. The list of wells is subject to change due to plugging and abandonment and drilling of new wells."
Attachment L, Section L-3b	Deleted "The WQSP wells 1 through 6 constitute the RCRA DMP for WIPP (Figure L-9 and Permit Attachment B, Figure B2-3) during detection monitoring as required by 20.4.1.500 NMAC (incorporating 40 CFR §§264.90 through 264.101). This monitoring plan is a continuation of the current WIPP GWSP, and these wells will serve as the monitoring locations during background water-quality characterization and the RCRA DMP (Figure L-9 and Permit Attachment B, Figure B2-3)."
Attachment L, Section L-3b	Replaced "were" with "are"
Attachment L, Section L-3b	Added "(north)"
Attachment L, Section L-3b	Deleted "The locations of the three upgradient wells were selected to be representative of the flow vectors of ground water moving downgradient onto the WIPP site. Figure 34 of Davies, 1989, shows the simulation of direction and magnitude of ground-water flow. The upgradient wells were located based on the flow vectors resulting from this model simulation. The original WQSP observation wells, as well as those in the RCRA DMP, have been and will continue to be used as piezometer wells to support collection of ground-water surface elevation and ground-water flow modeling data to demonstrate regulatory compliance. Well location surveys for each of the seven wells were performed by the Permittees' survey personnel using the State Plane Coordinates-North American Datum Model 27 method. Results of the surveys are on file with the New Mexico State Engineers Department along with the associated extraction permits for each well."
Attachment L, Section L-3b	Replace "were" with "are"
Attachment L, Section L-3b	Added "(south)"
Attachment L, Section L-3b	Deleted "in concert with the flow vectors shown by this model simulation" after "area"

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Attachment L, Section L-3b	Added "to be located generally in the path of contaminants that might be released from the shaft area in the Culebra."
Attachment L, Section L-3b	Deleted "based on the greatest velocity magnitude of ground-water flow leaving the shaft area as shown on Figure 34 of Davies, 1989, and upgradient of the WIPP LWA boundary"
Attachment L, Section L-3b	Added "Well"
Attachment L, Section L-3b	Deleted "around wells DOE-1 and H-11"
Attachment L, Section L-3b	Deleted "The Culebra has been selected for the focus of the DMP due to it being regionally extensive and exhibiting the most significant transmissivity of the water-bearing units at WIPP. The Culebra has been extensively studied during all past hydrologic characterization programs and found to be the most likely hydrologic pathway to the accessible environment or compliance point for any potential contamination."
Attachment L, Section L-3b	Replaced "The RCRA ground-water monitoring network was not installed immediately downgradient of this plane. However, because the Underground HWDUs at WIPP are Subpart X units, and due to the relatively unique containment and transport aspects of the site, monitoring at the proposed locations will allow for detection of releases prior to release of these contaminants to the general public at the LWA boundary." with "Wells WQSP-4, 5, and 6 are situated to demonstrate that during the operating life of the facility (including closure), release of contaminants to the general public will not occur."
Attachment L, Section L-3b	Deleted "The DMP wells were located to intercept flow vectors downgradient away from the WIPP shafts area based on current density corrected potentiometric surfaces (Figure L-9). Based on natural contours of the potentiometric surface (Figure L-9) the selected well placement locations are downgradient of the general flow direction from the shaft area."
Attachment L, Section L-3b	Added "suggests"
Attachment L, Section L-3b	Deleted "of contaminant migration throughout the Culebra to the Land Withdrawal Act boundary suggests"
Attachment L, Section L-3b	Added "from the Waste Handling shaft to the LWA boundary"
Attachment L, Section L-3b	Added "." After "years"
Attachment L, Section L-3b	Deleted "if, under worst case conditions,"
Attachment L, Section L-3b	Added "This assumes conditions where"
Attachment L, Section L-3b	Deleted "could"
Attachment L, Section L-3b	Added "(post closure) to the Culebra via the sealed shafts"
Attachment L, Section L-3b	Deleted "If contaminants were to migrate from the disposal facility, they would be detected by the DMP wells located midway between the shafts and LWA such that samples from wells could detect these contaminants long before they could reach the LWA boundary."
Attachment L, Section L-3b	Added "for the Culebra"
Attachment L, Section L-3b	Deleted "s" on "suggests"
Attachment L, Section L-3b	Deleted "Recent (December 1996)"
Attachment L, Section L-3b	Changed "potentiometric" to "Potentiometric"
Attachment L, Section L-3b	Added ". The wells used for measuring the potentiometric surface of the Culebra are measured monthly and listed in Table L-4."
Attachment L, Section L-3b	Deleted "(Figure L-9). WQSP-4, WQSP-5, and WQSP-6 have been located downgradient of the waste emplacement areas according to present-day

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	adjusted potentiometric surfaces. Potentiometric surfaces that have not been corrected for density differences and that contain transient relics of previous pumping-drawdown events do not reflect accurate natural ground-water flow directions and should not be used to assess the adequacy of ground-water monitoring locations. Previous potentiometric surface maps showing a potentiometric low and hydrologic gradient toward the area between WQSP-3 and WQSP-4 had not been adjusted to freshwater head equivalents, and had also been influenced by the long-term pumping at well H-19. Hence, some historic maps may not represent natural Culebra flow directions or gradients, and appropriateness of the RCRA monitoring network cannot be definitively evaluated using these data."
Attachment L, Section L-3b(1)	Changed section heading from "DMP Well Construction Specification" to "Detection Monitoring Well Construction Specification"
Attachment L, Section L-3b(1)(i)	Deleted section heading
Attachment L, Section L-3b(1)(i)	Added "Diagrams of the six DMP wells are shown in Figures L-7 through L-12. Detailed descriptions of geology and construction methods may be found in DOE 1995."
Attachment L, Section L-3b(1)(i)	Replaced "Well WQSP-1 was" with "The six WQSP Culebra wells were"
Attachment L, Section L-3b(1)(i)	Replaced "16" with "October 26"
Attachment L, Section L-3b(1)(i)	Replaced ", to a" with ". The"
Attachment L, Section L-3b(1)(i)	Replaced "737 ft (225 m) bgs" with "each well is shown in Table L-5"
Attachment L, Section L-3b(1)(i)	Replaced "borehole was" with "wells were"
Attachment L, Section L-3b(1)(i)	Deleted "extends 15 ft (5 m)"
Attachment L, Section L-3b(1)(i)	Replaced "unnamed lower member of the Rustler" with "Los Medaños as shown in Table L-5"
Attachment L, Section L-3b(1)(i)	Replaced "well was" with "wells were"
Attachment L, Section L-3b(1)(i)	Replaced "a depth of 693 ft (211 m) bgs using" with "the top of the Culebra using"
Attachment L, Section L-3b(1)(i)	Deleted ". The interval from 693 to 737 ft (225 to 211 m) bgs (the total depth) was drilled using air mist with a foaming agent as the drilling fluid. WQSP-1 was drilled to 695.6 ft (212 m) bgs using"
Attachment L, Section L-3b(1)(i)	Added "and"
Attachment L, Section L-3b(1)(i)	Replaced "and was" with ". The wells were then"
Attachment L, Section L-3b(1)(i)	Deleted "from 695.6 to 737 ft (212 to 225 m) bgs"
Attachment L, Section L-3b(1)(i)	Deleted "-" after 'in."
Attachment L, Section L-3b(1)(i)	Added "to total depth"
Attachment L, Section L-3b(1)(i)	Added "See Table L-5 for the drilling and coring intervals for each well."
Attachment L, Section L-3b(1)(i)	Replaced "WQSP-1 was" with "WQSP wells were"
Attachment L, Section L-3b(1)(i)	Replaced space with "-"
Attachment L, Section L-3b(1)(i)	Replaced "WQSP-1 was" with "After reaming, wells were
Attachment L, Section L-3b(1)(i)	Replaced "737 ft (224.6 m) bgs" with "total depth"
Attachment L, Section L-3b(1)(i)	Replaced "from 702 to 727 ft (214 to 222 m) bgs" with "as shown in Table L-5"
Attachment L, Section L-3b(1)(i)	Deleted "from 640 to 651 ft (195 to 198 m) bgs"

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Attachment L, Section L-3b(1)(i)	Replaced "from 651 to 737 ft (198 to 225 m) bgs." with "as indicated in Table L-5."
Attachment L, Section L-3b(1)(i)	Deleted "Based on core log results, the Culebra is located from 699 to 722 ft (213 to 220 m) bgs (see Figure L-10)."
Attachment L, Section L-3b(1)(ii)	Deleted section
Attachment L, Section L-3b(1)(iii)	Deleted section
Attachment L, Section L-3b(1)(iv)	Deleted section
Attachment L, Section L-3b(1)(v)	Deleted section
Attachment L, Section L-3b(1)(vi)	Deleted section
Attachment L, Section L-4a	Deleted "The seven RCRA monitoring wells have been sampled on a semiannual basis since their installation in 1995 to establish background ground-water quality in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §§264.97 and 264.98). This has included at least two full rounds of 20.4.1.500 NMAC (Incorporating 40 CFR §264) Appendix IX analysis for samples from each of the proposed RCRA detection monitoring wells. In addition, ground-water samples were collected from the DMP wells (from March 1997 until waste emplacement) at a frequency of four sample replicates collected semiannually from each well for the indicator parameters of pH, specific conductance (**SC**), total organic carbon (**TOC**), and total organic halogen (**TOX**) to further establish background ground-water quality until detection monitoring in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.98) becomes applicable. A total of four rounds of Appendix IX analysis will be conducted for samples from each well for use in background ground-water quality determinations. Detection monitoring will start when the Permittees emplace waste and continue through the post-closure phase as required by 20.4.1.500 NMAC (incorporating 40 CFR §264.90[c]). During detection monitoring, one sample and one sample duplicate will be collected semiannually from each well in the RCRA detection monitoring network. As shown in Table L-2, the DMP will continue to collect ground-water quality samples for all seven wells on a semiannual basis during the life of the DMP. 20.4.1.500 NMAC (incorporating 40 CFR §264.97[g][2]) provides that an alternate sampling frequency to that provided in 20.4.1.500 NMAC (incorporating 40 CFR §264.98) may be proposed by the Permittees. Given the nature and rate of ground-water flow in the area surrounding WIPP, collecting and analyzing one sample semiannually will be protective of human health and the environment because any hazardous constituent leaving the underground disposal facility will not have the potential to migrate beyond the ground-water monitoring network in a one-year time frame. Ground-water flow characteristics are presented in detail in Addendum L1, Section L1-2a of the Amended Renewal Application (DOE, 2009)."
Attachment L, Section L-4a	Replaced "seven DMP wells" with "six DMWs"
Attachment L, Section L-4a	Replaced "DMP well" with "DMW"
Attachment L, Section L-4a	Added "annual"
Attachment L, Section L-4a	Replaced "other existing WQSP well sites" with "WLMP wells"
Attachment L, Section L-4a	Replaced "to supplement the area water-level database and to help define regional changes in ground-water flow directions and gradients" with "when accessible"
Attachment L, Section L-4a	Replaced "RCRA DMP" with "DMW"
Attachment L, Section L-4a	Added "sampling"
Attachment L, Section L-4a	Deleted "If any change occurs which could affect the ability of the DMP to fulfill

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	the requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264 Subpart F), the Permittees shall promptly notify NMED in writing and apply for a permit modification, if appropriate."
Attachment L, Section L-4b	Added "and Hazardous Constituents" to section heading
Attachment L, Section L-4b	Replaced "analytes of interest" with "parameters listed in Part 5, Table 5.4.a and hazardous constituents listed in Part 5, Table 5.4.b are"
Attachment L, Section L-4b	Replaced "to establish" with "as part of the DMP."
Attachment L, Section L-4b	Deleted "background ground-water quality prior to emplacement of waste include all indicator parameters and all other parameters listed in 20.4.1.500 NMAC (incorporating 40 CFR §264) Appendix IX. Field measurements of pH, SC, temperature, chloride, Eh, total iron, and alkalinity are also measured during background sampling ." "The DMP was initiated upon waste emplacement, at which time the semiannual samples will be analyzed for the parameters listed in Table L-3. Parameters to be analyzed by the contract laboratory such as specific conductance, total dissolved solids, total suspended solids, density, pH, total organic carbon, and total organic halogens were included as indicator parameters because of their universal commonality to ground water. Parameters such as chloride, alkalinity, calcium, magnesium, and potassium were included as matrix-specific general indicator parameters. Calcium, magnesium, potassium, chloride, and iron may be deleted during detection monitoring, with prior approval of NMED. Organic and inorganic compounds on the right hand side of Table L-3 were chosen because they will occur in the waste to be disposed at the WIPP facility."
Attachment L, Section L-4b	Replaced "parameters" with "constituents"
Attachment L, Section L-4b	Replaced "the tentatively identified compound (**TIC**) process specified in the Waste Analysis Plan, Permit Attachment C" with "changes to the list of hazardous waste numbers authorized for disposal at the WIPP facility."
Attachment L, Section L-4b	Replaced "compounds" with "constituents"
Attachment L, Section L-4b	Replaced "DMP list" with "Part 5, Table 5.4.b"
Attachment L, Section L-4b	Added "(e.g., constituent not in 40 CFR §264 Appendix IX)"
Attachment L, Section L-4c	Replaced "well" with "DMW"
Attachment L, Section L-4c	Replaced "DMP analytical suite" with "parameters and constituents in Part 5, Tables 5.4.a and 5.4.b"
Attachment L, Section L-4c(1)	Replaced "is a subprogram of the DMP. The quality assurance activities of the WLMP are in strict accordance with WP 13-1, and the quality assurance implementing procedure specific to ground-water surface elevation monitoring is WIPP Procedure WP 02-EM1014[2]. Current versions of both WP 13-1 and WP 02-EM1014 are maintained in the WIPP Operating Record. with "activities are conducted in accordance with the WIPP facility SOPs listed in Table L-3. "
Attachment L, Section L-4c(1)	Deleted footnote 2 "[2]WP 02-EM1014 "Groundwater Level Measurements" is a technical procedure that specifies the steps followed by Environmental Monitoring (**EM**) personnel for making manual ground-water level measurements in ground-water wells in the vicinity of the WIPP facility. The procedure provides general instructions including prerequisites, safety precautions, performance frequency, quality assurance, and records. Specific instructions are included for using the water level measurement electrical conductance probe and data management."
Attachment L, Section L-4c(1)	Deleted "Ground-water surface elevation monitoring is in progress now and will continue through the post-closure care period specified in Permit Part 7. This section of the plan addresses the activities of the WLMP during the

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	preoperational and operational phases of WIPP. Collection of ground-water surface elevation data is required by 20.4.1.500 NMAC (incorporating 40 CFR §264.97(f)). These data also provide: Data collection as required by the Environmental Monitoring Plan. A means to fulfill commitments made in the Final Environmental Impact Statement (**FEIS**). A means to comply with future ground-water inventory and monitoring regulations. Input for making land use decisions, (i.e., designing long-term active and passive institutional controls for the site). Assistance in understanding any changes to readings from the water-pressure transducers installed in each of the shafts to monitor water conditions behind the liners. An understanding of whether or not the horizontal and vertical gradients of flow are changing over time. The objective of the WLMP is to extend the documented record of ground-water surface elevation fluctuations in the Culebra and Magenta members of the Rustler in the vicinity of the WIPP facility and to meet the requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.97(f)). Ground-water surface elevation data will be collected from each well of the RCRA DMP. Ground-water surface elevation data will also be collected from other Culebra wells, as well as monitoring wells completed in other water-bearing zones overlying and underlying the WIPP repository horizon (see Figure L-18) when access to those zones is possible. This includes, but is not limited to, the Bell Canyon, the Forty-niner, the contact zone between the Rustler and Salado, and the Dewey Lake."
Attachment L, Section L-4c(1)	Added "Groundwater surface elevation measurements will be taken monthly at each of the six DMWs and prior to the annual sampling event. Additionally,"
Attachment L, Section L-4c(1)	Changed "G" to "g" in "Groundwater"
Attachment L, Section L-4c(1)	Replaced "at least one accessible completed interval at each available well pad" with "the other Culebra wells as listed in Table L-4,"
Attachment L, Section L-4c(1)	Added "when accessible"
Attachment L, Section L-4c(1)	Deleted "At well pads with two or more wells completed in the same interval, quarterly measurements will be taken in the redundant wells ("
Attachment L, Section L-4c(1)	Changed "well to "Well"
Attachment L, Section L-4c(1)	Replaced "18" with "14" to read "L-14"
Attachment L, Section L-4c(1)	Deleted ")"
Attachment L, Section L-4c(1)	Deleted "Ground-water surface elevation measurements will be taken monthly at each of the seven DMP wells, as well as prior to each sampling event."
Attachment L, Section L-4c(1)	Replaced "report" with "Annual Culebra Groundwater Report"
Attachment L, Section L-4c(1)	Replaced "may" with "will be evaluated to determine if they"
Attachment L, Section L-4c(1)	Replaced "DMP" with "WQSP"
Attachment L, Section L-4c(1)	Added "c" to end of "Section L-5"
Attachment L, Section L-4c(1)	Added "the"
Attachment L, Section L-4c(1)	Added "facility"
Attachment L, Section L-4c(1)	Deleted "both vertically in well bores and areally from well to well"
Attachment L, Section L-4c(1)	Deleted "at WIPP"

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Attachment L, Section L-4c(1)	Added "Culebra groundwater"
Attachment L, Section L-4c(1)	Replaced "bores" with "s listed in Table L-4"
Attachment L, Section L-4c(1)	Added "d" to "measure"
Attachment L, Section L-4c(1)	Deleted "When both of these parameters are known, equivalent freshwater heads will be calculated. The concept of freshwater head is discussed in Lusczynski (1961). A discussion explaining the calculation of freshwater heads from mid-formation depth at WIPP can be found in Haug, et al. (1987). Freshwater heads are useful in identifying hydraulic gradients in aquifers of variable density such as those existing at the WIPP site. Freshwater head at a given point is defined as the height of a column of freshwater that will balance the existing pressure at that point (Lusczynski, 1961)."
Attachment L, Section L-4c(1)	Replaced "ground-" with "Culebra"
Attachment L, Section L-4c(1)	Replaced "g" with "γ"
Attachment L, Section L-4c(1)	Replaced "pressure" with "length of freshwater head"
Attachment L, Section L-4c(1)	Replaced "ρ" with "γ"
Attachment L, Section L-4c(1)	Added "ratio of borehole density to density of fresh water"
Attachment L, Section L-4c(1)	Replaced "g" with "ρ"
Attachment L, Section L-4c(1)	Replaced "density (expressed as specific gravity)." With "specific gravity."
Attachment L, Section L-4c(1)	Added "Density measurements are made annually. Density for the DMWs will be expressed as specific gravity as measured in the field during sampling events using a hydrometer. Freshwater head for other Culebra wells will be calculated as described above from fluid density measurements obtained using pressure transducers.
Attachment L, Section L-4c(1)(i)	Replaced "When using an electrical conductance probe, the depth to water will be determined by reading the appropriate measurement markings on the embossed measuring tape when the alarm is activated at the surface. WIPP Procedure WP 02-EM1014 specifies" with "An SOP will be used when making water-level measurements for this program. The SOP will specify"
Attachment L, Section L-4c(1)(i)	Added ", and provide general instructions including prerequisites, safety precautions, performance frequency, quality assurance, data management, and records"
Attachment L, Section L-4c(1)(i)	Deleted "A current revision of this procedure will be maintained in the WIPP Operating Record."
Attachment L, Section L-4c(1)(ii)	Deleted "All"
Attachment L, Section L-4c(1)(ii)	Changed "incoming" to "Incoming"
Attachment L, Section L-4c(1)(ii)	Deleted "timely"
Attachment L, Section L-4c(1)(ii)	Replaced "to" with "that"
Attachment L, Section L-4c(1)(ii)	Replaced "assure" with "ensures"
Attachment L, Section L-4c(1)(ii)	Replaced "i.e." with "e.g."
Attachment L, Section L-4c(1)(ii)	Replaced "guidelines outlined in WIPP Procedures WP 02-EM3001[3] and WP 02-EM1014[4]" with "applicable SOPs (see Table L-3)""
Attachment L, Section L-4c(1)(ii)	Deleted footnotes 3 and 4 "[3]WP 02-EM3001 "Administrative Processes for Environmental Monitoring Programs" is a management control procedure to provide the administrative guidance to be used by Environmental Monitoring (EM) personnel to maintain

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	quality control (QC) associated with EM sampling activities and to assure that data acquired under the WIPP Environmental Monitoring Program are valid. The precautions and limitations portion of this procedure assure that only qualified personnel acquire samples under the EM program, that cross contamination of sampling equipment is prevented, and that sample hold times are not exceeded. The Performance portion of the procedure provides step-by-step instructions for Quality Assurance/Quality Control (QA/QC) implementation, the use of data sheets and sample tracking logbooks, sample tacking from collection to submittal, and actions to take if sample results indicate the potential for exceeding a regulatory limit. [4]WP 02-EM1014 "Groundwater Level Measurement", is a technical procedure which lists the equipment required and the operational checks necessary to perform groundwater level measurements. This procedure as well as WP 02-EM3001 also provides information on performing validation and verification of laboratory data."
Attachment L, Section L-4c(1)(ii)	Deleted "Current copies of these procedures are maintained within the WIPP Operating Record."
Attachment L, Section L-4c(1)(ii)	Replaced "will" with "program"
Attachment L, Section L-4c(1)(ii)	Added "s" to "calculate"
Attachment L, Section L-4c(1)(ii)	Replaced "will also adjust" with "program adjusts"
Attachment L, Section L-4c(1)(ii)	Deleted "The data contained on the computerized work sheet will be translated into a database file. A printout will be made of the database file. The data each month will then be compiled into report format and transmitted to the appropriate agencies as requested by the Permittees."
Attachment L, Section L-4c(1)(ii)	Replaced "all" with "the"
Attachment L, Section L-4c(1)(ii)	Added "in Table L-4"
Attachment L, Section L-4c(1)(ii)	Replaced "one month after data are collected" with "in May and November"
Attachment L, Section L-4c(1)(ii)	Added "Semi-annual groundwater reports will also include annotated hydrographs and trend analysis."
Attachment L, Section L-4c(1)(ii)	Deleted "A computerized database file will be maintained for all ground-water surface elevation data. Monthly and quarterly data will be appended into a yearly file. Upon verification that the yearly database is free of errors, it will be appended into the project database file. A printed copy of the current project database (through December of the preceding year) will be kept in the Environment, Safety and Health Department (**ES&H**) EM fire-resistant storage area."
Attachment L, Section L-4c(2)(i)	Deleted "The water-bearing units at WIPP are highly variable in their ability to yield water to monitoring wells. The Culebra, the most transmissive hydrologic unit in the WIPP area, exhibits transmissivities that range many orders of magnitude across the site area and is the primary focus of the DMP."
Attachment L, Section L-4c(2)(i)	Replaced "seven new DMP wells" with "six DMWs"
Attachment L, Section L-4c(2)(i)	Deleted "The wells used for ground-water quality sampling vary in yield, depth, and pumping lift. These factors affect the duration of pumping as well as the equipment required at each well."
Attachment L, Section L-4c(2)(i)	Replaced "DMP wells will be" with "DMWs are"
Attachment L, Section L-4c(2)(i)	Replaced "down hole" and "down-hole"
Attachment L, Section L-4c(2)(i)	Replaced "will be" with "are"
Attachment L, Section L-4c(2)(i)	Deleted "The electronic flow controller allows personnel collecting samples to control the rate of discharge during well purging to minimize the potential for

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	loss of volatiles from the sample."
Attachment L, Section L-4c(2)(i)	Replaced "a minimum of" with "no more than"
Attachment L, Section L-4c(2)(i)	Added "or until field parameters have stabilized, whichever occurs first."
Attachment L, Section L-4c(2)(i)	Deleted "at a rate that will minimize the agitation of recharge water. This will be accomplished by monitoring formation pressure and matching the rate of discharge from the well as nearly as possible to the rate of recharge to the well. WIPP Procedure WP 02-EM1002[5] specifies the methods used for controlling flow rates and monitoring formation pressure. A current version of this document will be maintained in the WIPP Operating Record."
Attachment L, Section L-4c(2)(i)	Deleted footnote 5 "[5] WP 02-EM1002 "Electric Submersible Pump Monitoring System Installation and Operation" is a technical procedure that provides step-by-step instructions for acquiring ground-water samples using electric submersible pumps (ESPs). The procedure addresses the equipment in general, lists precautions and limitations which assure that only qualified individuals operate the equipment, prerequisite actions which assure the correct installation and operation. The procedure details how to install the various subsystems such as the surface discharge and pressure monitoring system and the pressure monitoring bubbler and how to start up and shut down the ESP."
Attachment L, Section L-4c(2)(i)	Replaced "requirements will be used" with "will be performed in accordance with an SOP"
Attachment L, Section L-4c(2)(i)	Replaced "DMP wells will be" with "DMWs are"
Attachment L, Section L-4c(2)(i)	Deleted "Details of well construction are presented in Section L-3b(1)."
Attachment L, Section L-4c(2)(i)	Replaced "will be" with "is"
Attachment L, Section L-4c(2)(i)	Deleted "will"
Attachment L, Section L-4c(2)(i)	Added "s" to "take"
Attachment L, Section L-4c(2)(i)	Deleted "Teflon®"
Attachment L, Section L-4c(2)(i)	Replaced "will also be" with "is"
Attachment L, Section L-4c(2)(i)	Added "The sampling line is manufactured from a chemically inert material."
Attachment L, Section L-4c(2)(i)	Deleted "Flow through the pipe will be regulated on the surface by a flow control valve and/or variable speed drive controller."
Attachment L, Section L-4c(2)(i)	Replaced "will be" with "is"
Attachment L, Section L-4c(2)(i)	Replaced "will be" with "is"
Attachment L, Section L-4c(2)(i)	Deleted "Teflon®"
Attachment L, Section L-4c(2)(i)	Replaced "will be" with "is"
Attachment L, Section L-4c(2)(i)	Deleted "Teflon®"
Attachment L, Section L-4c(2)(i)	Replaced "will be" with "is"
Attachment L, Section L-4c(2)(i)	Replaced "will be" with "is"
Attachment L, Section L-4c(2)(i)	Deleted section on Pressure Monitoring Systems
Attachment L, Section L-4c(2)(i)	Deleted section on Sampling Overview
Attachment L, Section L-4c(2)(ii)	Added "' SOP for serial sampling will provide criteria for determining when a final sample should be taken."
Attachment L, Section L-4c(2)(ii)	Deleted "will consider a serial sample representative of undisturbed ground water when the majority of field indicator parameter measurements have

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	stabilized within ±5 percent of the average of analytical results for the field indicator parameter from the background ground-water quality for each DMP well. Nonstabilization of one or two field indicator parameters attributable to matrix interferences, instrument drift, or other unforeseen reasons will not preclude the collection of final samples, provided the volume of purged water exceeds three well bore volumes."
Attachment L, Section L-4c(2)(ii)	Added "Each DMW will be purged to no more than three well bore volumes, or until field parameters stabilize, whichever occurs first. Well stabilization occurs when the field-analyzed parameters are within ± 5% of three consecutive measurements. A well bore volume is defined as the volume of water from static water level to the bottom of the well sump. Serial samples will be analyzed in the mobile field laboratory for field indicator parameters."
Attachment L, Section L-4c(2)(ii)	Deleted "report, in the operating record, any final samples collected when field indicator parameters were not stabilized, and will"
Attachment L, Section L-4c(2)(ii)	Added "and place that explanation in the WIPP Operating Record"
Attachment L, Section L-4c(2)(ii)	Replaced "Team Leader (see Section L-7)" with "Permittees"
Attachment L, Section L-4c(2)(ii)	Deleted "chloride, divalent cations (hardness), alkalinity, total iron,"
Attachment L, Section L-4c(2)(ii)	Deleted "Eh"
Attachment L, Section L-4c(2)(ii)	Deleted "Protocols for collection of serial samples are specified in WIPP Procedure WP 02-EM1006[6]. Analysis of serial samples are specified in WIPP Procedure WP 02-EM1005[7]. Current versions of these procedures will be maintained in the WIPP Operating Record."
Attachment L, Section L-4c(2)(ii)	Replaced "Eh" with "specific conductance"
Attachment L, Section L-4c(2)(ii)	Deleted footnotes 6 and 7 "[6]WP 02-EM1006 "Final Sample and Serial Sample Collection" is a technical procedure that provides step-by-step instructions for acquiring ground-water samples from the WQSP wells and from privately-owned wells in the vicinity of WIPP. The procedure addresses the equipment in general, lists precautions and limitations which assure that only qualified individuals operate the equipment, and prerequisite actions which assure the data quality. The procedure addresses collection of samples from private wells, collection of serial ground-water samples, the collection of final samples for submittal to the laboratory, and data review by the monitoring task leader." "[7]WP 02-EM1005 "Groundwater Serial Sample Analysis" is a technical procedure that provides step-by-step instructions for on site analysis of ground water to determine ground-water stability prior to the collection of final samples for analysis. The procedure addresses the equipment in general, lists precautions and limitations which assure that only qualified individuals operate the equipment, prerequisite actions which assure data quality. The procedure addresses the field measurement of Eh, pH, temperature, specific gravity, specific conductance, alkalinity, chloride, divalent cation, and total iron as indicators of ground-water stability."
Attachment L, Section L-4c(2)(ii)	Deleted "Teflon®"
Attachment L, Section L-4c(2)(ii)	Added "the"
Attachment L, Section L-4c(2)(ii)	Deleted "The iron, divalent cation, chloride, alkalinity"
Attachment L, Section L-4c(2)(ii)	Changed "specific" to "Specific"
Attachment L, Section L-4c(2)(ii)	Deleted "Teflon®"
Attachment L, Section L-4c(2)(ii)	Added ", that are certified clean by the laboratory,"
Attachment L, Section L-4c(2)(ii)	Deleted "Teflon®"

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Attachment L, Section L-4c(2)(ii)	Replaced "Filtered water will be used to rinse the sample bottle prior to serial sample collection." with "Serial samples collected in laboratory-certified clean containers do not require rinsing prior to sample collection."
Attachment L, Section L-4c(2)(ii)	Replaced "Eh" with "specific conductance"
Attachment L, Section L-4c(2)(ii)	Replaced "The filtered sample collected for solute analyses will be immediately analyzed for iron and alkalinity because these two solution parameters are extremely sensitive to changes in the ambient water-sample pressure and temperature. A sample and duplicate of filtered water will be collected and analyzed for solute parameters (alkalinity, chloride, divalent cations, and iron)." with "Samples collected will immediately be analyzed for pH and specific conductance (**SC**) as these parameters are most sensitive to changes in ambient temperature."
Attachment L, Section L-4c(2)(ii)	Replaced "Eh" with "specific conductance"
Attachment L, Section L-4c(2)(ii)	Deleted "Samples to be analyzed for chloride and divalent cations (after preservation with nitric acid and stored at 4°C) may be stored for one week prior to analysis with confidence that the analytical results will not be altered."
Attachment L, Section L-4c(2)(ii)	Replaced "WIPP Procedure WP 02-EM1006" with "Standard Operating Procedures (see Table L-3)"
Attachment L, Section L-4c(2)(ii)	Added "and analysis"
Attachment L, Section L-4c(2)(ii)	Deleted "WIPP Procedure WP 02-EM1005 defines the protocols for serial sample analysis. Current versions of these procedures will be maintained in the WIPP Operating Record. During the first two years of DMP well serial sampling, the first sample will be analyzed as soon as possible after the pump is turned on and daily thereafter for a period of four days or until the field indicator parameters (chloride, divalent cations, alkalinity, and iron) stabilize. pH and SC will be continually monitored by using a flow cell with ion-specific electrodes and a real-time readout. When detection monitoring begins, the serial sampling process may be modified and the decision to collect final samples would then be based on the number of well bore volumes purged and results of the analysis of chloride, temperature, specific gravity, pH, and SC. Removal of serial sampling from the DMP will be accomplished through a permit modification and a modification to this plan."
Attachment L, Section L-4c(2)(iii)	Replaced "4" with "6" to read "L-6"
Attachment L, Section L-4c(2)(iii)	Added "; however, the analytical laboratory may request sample containers, volumes, and holding times that are different, when appropriate"
Attachment L, Section L-4c(2)(iii)	Deleted "Non-dedicated sample collection lines from the well head to the sample collection area will be discarded after each use."
Attachment L, Section L-4c(2)(iii)	Added "in accordance with SOPs"
Attachment L, Section L-4c(2)(iii)	Deleted "with two gallons of fresh water, then rinsed with five gallons of 5 percent nitric acid solution and rinsed with five gallons of DI water"
Attachment L, Section L-4c(2)(iii)	Moved "blank" after "rinsate"
Attachment L, Section L-4c(2)(iii)	Replaced "decontamination" with "cleanliness"
Attachment L, Section L-4c(2)(iii)	Deleted "Teflon®"
Attachment L, Section L-4c(2)(iii)	Deleted "branching from the main sample line"
Attachment L, Section L-4c(2)(iii)	Replaced "procedures, assure that" with "SOPs (see Table L-3) define how"
Attachment L, Section L-4c(2)(iii)	Deleted ". WIPP Procedure WP 02-EM1006 defines the requirements for collection of final samples"
Attachment L, Section L-4c(2)(iii)	Deleted "A current version of this procedure will be maintained in the WIPP

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	Operating Record."
Attachment L, Section L-4c(2)(iii)	Replaced "4" with "6" to read "L-6"
Attachment L, Section L-4c(2)(iii)	Added "; however, the analytical laboratory may request sample containers, volumes, and holding times that are different, when appropriate"
Attachment L, Section L-4c(2)(iii)	Deleted "Standard Operating Procedures [" and "]"
Attachment L, Section L-4c(2)(iii)	Replaced "procedures" with "SOPs"
Attachment L, Section L-4c(2)(iii)	Deleted "contract"
Attachment L, Section L-4c(2)(iii)	Deleted "Before the final sample is taken, all plastic and glass containers will be rinsed with the pumped ground water, either filtered or unfiltered, dependent upon analysis protocol. When the rinsing procedure is completed the final sample will be collected."
Attachment L, Section L-4c(2)(iii)	Replaced "contract" with "the analytical"
Attachment L, Section L-4c(2)(iii)	Replaced "general chemistry, radionuclides, metals, and selected VOCs that are specific to the waste anticipated to arrive at WIPP." with "parameters and hazardous constituents specified in Part 5, Tables 5.4.a and 5.4.b."
Attachment L, Section L-4c(2)(iii)	Deleted "Table L-3 presents the specific analytes for the DMP."
Attachment L, Section L-4c(2)(iii)	Added "Project"
Attachment L, Section L-4c(2)(iii)	Replaced "as" with "when"
Attachment L, Section L-4c(2)(iii)	Deleted "by the Permittees or NMED"
Attachment L, Section L-4c(2)(iii)	Deleted "Resulting "
Attachment L, Section L-4c(2)(iii)	Changed "wastes" to "Wastes"
Attachment L, Section L-4c(2)(iii)	Added "resulting from the sampling and field analysis of groundwater"
Attachment L, Section L-4c(2)(iii)	Replaced "Procedure WP 02-RC.01[8]." with "SOPs (see Table L-3)."
Attachment L, Section L-4c(2)(iii)	Deleted "A current version of this procedure will be maintained in the WIPP Operating Record."
Attachment L, Section L-4c(2)(iii)	Deleted footnote 8 "[8]WP 02-RC.01 "Site-Generated, Non-Radioactive Hazardous Waste Management Plan" is a step-by-step procedure that defines site-generate non-radioactive hazardous waste (SGNRHW) and lists responsibilities of waste management organizations including the generator, waste handlers, sampling personnel, safety personnel, and compliance personnel. In addition, the procedure defines training requirements, container marking requirements, spill response, and list prohibitions. A Section of the procedure is focused on waste management practices including the management in satellite accumulation areas, the hazardous waste staging area for materials awaiting analysis, the establishment of accumulation times, and hazardous waste disposal."
Attachment L, Section L-4c(2)(iv)	Deleted "with either high purity hydrochloric acid, nitric acid, or sulfuric acid (ULTREX or equivalent), depending upon the standard method of treatment required for the particular parameter suite or"
Attachment L, Section L-4c(2)(iv)	Replaced "contract" with "the analytical"
Attachment L, Section L-4c(2)(iv)	Deleted "SOPs (see Table L-4)"
Attachment L, Section L-4c(2)(iv)	Replaced "contract" with "analytical"
Attachment L, Section L-4c(2)(iv)	Deleted "use procedures that"
Attachment L, Section L-4c(2)(iv)	Deleted "and"

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Attachment L, Section L-4c(2)(iv)	Added ", and the shipping requirements"
Attachment L, Section L-4c(2)(iv)	Replaced "if" with "when"
Attachment L, Section L-4c(2)(iv)	Added "WIPP SOPs (see Table L-3) provide instructions to ensure proper sample preservation and shipping."
Attachment L, Section L-4c(2)(iv)	Added "the"
Attachment L, Section L-4c(2)(iv)	Replaced "will use" with "facility uses"
Attachment L, Section L-4c(2)(iv)	Replaced "(CofC) Forms and" with "/"
Attachment L, Section L-4c(2)(iv)	Replaced "(RFA) Forms" with "(CofC/RFA) forms"
Attachment L, Section L-4c(2)(iv)	Replaced "parameters" with "constituents"
Attachment L, Section L-4c(2)(iv)	Replaced "Procedure WP 02-EM3001" with "SOPs (see Table L-3)"
Attachment L, Section L-4c(2)(iv)	Deleted "s" from "provides"
Attachment L, Section L-4c(2)(iv)	Deleted "A current revision of this procedure will be maintained within the WIPP Operating Record. Insulated shipping containers packaged with crushed ice or reusable ice packs will be used to keep the samples cool during transport to the contract laboratory. Holding times for specific analytical parameters require samples to be shipped by express air freight. The coolers will be packaged to meet Department of Transportation and International Air Transportation Association commercial carrier regulations."
Attachment L, Section L-4c(2)(v)	Deleted "EM"
Attachment L, Section L-4c(2)(v)	Replaced "Procedure WP 02-EM3001" with "facility SOPs see (Table L-3)"
Attachment L, Section L-4c(2)(v)	Deleted "These procedures will be strictly followed throughout the course of each sample collection and analysis event. A current revision of this procedure will be maintained in the WIPP Operating Record."
Attachment L, Section L-4c(2)(v)	Deleted "will"
Attachment L, Section L-4c(2)(v)	Replaced "log books" with "data"
Attachment L, Section L-4c(2)(v)	Replaced "request for analysis/chain of custody (RFA and CofC" and ")" with "CofC/RFA"
Attachment L, Section L-4c(2)(v)	Replaced "The forms are briefly defined in the following subsections. with "An example form is shown in Figure L-13."
Attachment L, Section L-4c(2)(v)	All sample documentation will be completed for each sample and reviewed by the Team Leader or his/her designee for completeness and accuracy."
Attachment L, Section L-4c(2)(v)	Deleted "The Team Leader (see Section L-7) will assign the numbers prior to sample collection."
Attachment L, Section L-4c(2)(v)	Deleted "permanent,"
Attachment L, Section L-4c(2)(v)	Replaced "The" with "For example,"
Attachment L, Section L-4c(2)(v)	Replaced "will be" with "that are"
Attachment L, Section L-4c(2)(v)	Deleted "that"
Attachment L, Section L-4c(2)(v)	Changed subeading from "Sample Tracking Logbook" to "Sample Identification and Tracking"
Attachment L, Section L-4c(2)(v)	Deleted "A"
Attachment L, Section L-4c(2)(v)	Changed "sample" to "Sample"
Attachment L, Section L-4c(2)(v)	Replaced "logbook (STLB) form will be completed for each sample collected."

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	with "information will be completed for each sample collected."
Attachment L, Section L-4c(2)(v)	Replaced "STB will" with "sample tracking information"
Attachment L, Section L-4c(2)(v)	Added "s" to "include"
Attachment L, Section L-4c(2)(v)	Replaced "C of C" with "CofC/RFA form"
Attachment L, Section L-4c(2)(v)	Deleted "RFA No.;"
Attachment L, Section L-4c(2)(v)	Replaced "STLB" with "Sample tracking"
Attachment L, Section L-4c(2)(v)	Deleted "and checked by the Team Leader. When samples are shipped, the STLB will remain in the custody of the EM Section for sample tracking purposes."
Attachment L, Section L-4c(2)(v)	Added "Sample tracking is monitored and documented with the CofC/RFA form and the shipping airbill. Both of these documents are included in the data packets. Receipt at the laboratory may be monitored, if necessary, via the shipper's website tracking application. Samples are considered complete when a copy of the original CofC/RFA form is merged with the Field Lab copy of the same document."
Attachment L, Section L-4c(2)(v)	Changed subeading from "Request for Analysis and Chain of Custody" to "Chain of Custody and Request for Analysis"
Attachment L, Section L-4c(2)(v)	Deleted "n" from "An"
Attachment L, Section L-4c(2)(v)	Replaced "RFA and CofC" with "CofC/RFA"
Attachment L, Section L-4c(2)(v)	Deleted "An example of the RFA and CofC form is presented in Figures L-17a and L-17b."
Attachment L, Section L-4c(2)(v)	Replaced "RFA and CofC" with "CofC/RFA"
Attachment L, Section L-4c(2)(v)	Added "analytical"
Attachment L, Section L-4c(2)(v)	Replaced "RFA and CofC" with "CofC/RFA form"
Attachment L, Section L-4c(2)(v)	Replaced "RFA and CofC" with "CofC/RFA form"
Attachment L, Section L-4c(2)(v)	Replaced "Team Leader" with "Permittees"
Attachment L, Section L-4c(2)(v)	Replaced "RFA and CofC" with "CofC/RFA"
Attachment L, Section L-4c(2)(v)	Added "analytical"
Attachment L, Section L-4c(3)	Replaced "by a commercial laboratory." with "using"
Attachment L, Section L-4c(3)	Changed "Methods" to "methods"
Attachment L, Section L-4c(3)	Deleted "will be specified in procurement documents and will be"
Attachment L, Section L-4c(3)	Replaced "recommended procedures in" with "guidance found in"
Attachment L, Section L-4c(3)	Added "In Part 5,"
Attachment L, Section L-4c(3)	Replaced "L-3" with "s 5.4.a and 5.4.b"
Attachment L, Section L-4c(3)	Added "and constituents"
Attachment L, Section L-4c(3)	Deleted "The Permittees will establish the criteria for laboratory selection, including the stipulation that the laboratory follow the procedures specified in SW 846 and that the laboratory follow EPA protocols."
Attachment L, Section L-4c(3)	Replaced "selected" with "analytical"
Attachment L, Section L-4c(3)	Added "protocols such as"

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Attachment L, Section L-4c(3)	Added "." After "EPA SW 846"
Attachment L, Section L-4c(3)	Deleted "requirements and the requirements specified by the EPA protocols."
Attachment L, Section L-4c(3)	Added "analytical"
Attachment L, Section L-4c(3)	Added "WIPP"
Attachment L, Section L-4c(3)	Changed "operating record" to Operating Record."
Attachment L, Section L-4c(3)	Added "." After "Record"
Attachment L, Section L-4c(3)	Deleted "and will be available for review upon request by NMED."
Attachment L, Section L-4c(3)	Replaced "WIPP repository" with "Culebra groundwater"
Attachment L, Section L-4c(3)	Replaced "Once the initial qualification criteria, as specified above, have been met, the Permittees will select a laboratory based upon competitive bid. The selected laboratory will perform analytical work for the Permittees for a predetermined period of time, as specified in the contract between the Permittees and the selected laboratory. As this period of performance comes to an end, a new laboratory selection/competitive bid process will be initiated by the Permittees. The same or a different laboratory may be selected for the new contract period." with "The laboratory will maintain documentation of sample handling and custody, analytical results, and internal quality control (QC) data. Additionally, the laboratory will analyze QC samples in accordance with this plan and its own internal QC program for indicators of analytical accuracy and precision. Data generated outside of laboratory acceptance limits will trigger an evaluation and, if appropriate, corrective action as directed by the Permittees. The laboratory will report the results of the environmental sample and QC sample analyses and any necessary corrective actions that were performed. In the event that more than one analytical laboratory is used (e.g., for different analyses), each one will have the responsibilities specified above."
Attachment L, Section L-4c(3)	Replaced "The" with "A copy of the laboratory"
Attachment L, Section L-4c(3)	Deleted "for the laboratory currently under contract"
Attachment L, Section L-4c(3)	Deleted "in a file"
Attachment L, Section L-4c(3)	Replaced "the operating record by the Permittees." with "WIPP facility files and will be available for inspection by the NMED."
Attachment L, Section L-4c(3)	Deleted "The Permittees will provide NMED with an initial set of applicable laboratory SOPs for information purposes, and provide NMED with any updated SOPs on an annual basis."
Attachment L, Section L-4c(3)	Replaced "on behalf of the Permittees by the Management and Operating Contractor (**MOC**) Environmental Monitoring (**EM**). Data validation results are documented on an Approval/Variation Request (**AR/VR**) form (Procedure WP 15-PC3041). If no discrepancies are found in the data, the AR/VR form will be signed and the approved box will be checked. If however, discrepancies are found, the AR/VR form will be signed and the disapproved or approved-on-condition box will be checked and the form will be returned to the team leader accompanied by an attached report discussing the data validation results, any anomalies, and resolutions. Copies of the data validation report will be distributed to the EM Manager, QA Manager, the Team Leader, and the Contract Administrator. Copies of the data validation report will be kept on file in the EM records section for review upon request by NMED." with "and reported in the Annual Culebra Groundwater Report and will be maintained in the WIPP facility Operating Record."
Attachment L, Section L-4d(1)	Changed section heading "Sampling Equipment Calibration Requirements" to "Sampling and Groundwater Elevation Monitoring Equipment Calibration"

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Attachment L, Section L-4d(1)	Deleted "the WQSP and"
Attachment L, Section L-4d(1)	Replaced "maintenance administrative procedures specified below" with "SOPs"
Attachment L, Section L-4d(1)	Replaced "EM Section" with "Permittees"
Attachment L, Section L-4d(1)	Replaced ", in accordance with written procedures. The EM Section will also be responsible" with "and"
Attachment L, Section L-4d(2)	Replaced "Procedure WP 10-AD3029[9] A current revision of this procedure will be maintained in the WIPP Operating Record." with "facility SOPs (see Table L-3)."
Attachment L, Section L-4d(2)	Deleted footnote 9 "[9]WP 10-AD3029 "Calibration and Control of Monitoring and Data Collection Equipment" provides the step-by-step protocols for the establishment and maintenance of a master database of monitoring and data collection (**M&DC**) equipment, the recall process for equipment needing calibration, the performance of calibrations, the management of calibration results to determine the adequacy of recall frequencies, functional testing of M&DC equipment, and reporting including out-of-tolerance reporting and expired calibration reporting. In addition, the procedure provides step-by-step process for the storage of calibrated M&DC equipment and the use of rental equipment."
Attachment L, Section L-4d(2)	Replaced "EM Section" with "Permittees"
Attachment L, Section L-4d(2)	Replaced "calibrating the needed" with "ensuring"
Attachment L, Section L-4d(2)	Added "is calibrated"
Attachment L, Section L-4d(2)	Replaced "written procedures" with "SOPs"
Attachment L, Section L-4d(2)	Replaced "EM Section" with "Permittees"
Attachment L, Section L-4d(2)	Re[;aced "current" with "copies of records of the most recent"
Attachment L, Section L-4d(2)	Deleted "records"
Attachment L, Section L-4e	Added "Analytical" to section heading
Attachment L, Section L-4e	Deleted "As required by 20.4.1.500 NMAC (incorporating 40 CFR §§264.97 and 264.98), data collected to establish background ground-water quality and" Added "Analytical data collected"
Attachment L, Section L-4e	Replaced "DMP." with "Permittees"
Attachment L, Section L-4e	Deleted "Statistical analysis of DMP data will conform to EPA guidance "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities""
Attachment L, Section L-4e	Replaced "1989)" with "2009)."
Attachment L, Section L-4e	Deleted "and "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance" (EPA, 1992)."
Attachment L, Section L-4e(1)	Deleted "Environmental parameters vary with space and time. The effect of one or both of these two factors on the expected value of a point measurement will be statistically evaluated through spatial analysis and time series analysis. These methods often require extensive sampling efforts that may exceed the practical limits of the DMP sampling procedures. Spatial analysis may have limited use DMP during the operational period, although the effect of spatial auto-correlation on the interpretation of the data will be considered for each parameter. Spatial variability will be accounted for by the use of predetermined key sampling locations. Data analysis will be performed on a location-specific basis, or data from different locations will be combined only when the data are statistically homogeneous. Statistical

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	homogeneity will be determined by evaluating mean values and variances from the residuals from the individual well data. Time series analysis plays a more important role in data analysis for the DMP. Parameters will be reported as time series, either in tabular form or as time plots. For key time series parameters, these plots will be in the form of control charts on which control levels will be identified based on preoperational database, fixed standards, control location databases, or other standards for comparison. Where significant seasonal changes in the expected value of the parameter are identified in the preoperational database or in the control locations, corrections in the control levels which reflect the seasonal change will be made and documented."
Attachment L, Section L-4e(1)	Added "Temporal and spatial analyses of the data were completed as part of establishing the water quality baseline (Crawley and Nagy, 1998; IT, 2000). As a result, the Permittees determined to evaluate changes relative to baseline on an individual location basis and to report the concentrations of constituents as a time series, either in tabular form or as time plots. No particular seasonal variations have been noted in the concentrations of groundwater samples collected during the spring and autumn; therefore, continuing temporal analysis is not required. The analytical results for constituents will be reported as time series, either in tabular form or as time plots or both, and compared to the 95th percentile values or reporting limits identified in Part 5, Table 5.6."
Attachment L, Section L-4e(2)	Deleted "For data sets which include more than ten data points that are homogeneous in space and time (including seasonal homogeneity) and have less than ten percent missing data, a test for conformance to the normal distribution will be performed. The test for normality of the data will be performed in accordance with the methodologies presented in "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance" (EPA, 1992). If normality is not met, the data will be log-transformed (or transformed using a suitable mathematical transformation, e.g., square root) and retested for normality. If the transformed data fit a normal distribution, the original data will be accepted as having lognormal or an otherwise mathematically-transformed normal distribution. If normality is still not found, two courses may be taken. One will be to continue to test the fit to standard families of distributions, such as the gamma, beta, and Weibull, with proper modifications to subsequent analyses based on these results. The other course will be to use nonparametric methods of data analysis. For data sets smaller than ten, but homogeneous and complete, the lognormal distribution will be assumed. Data sets with more than ten percent missing data will be analyzed using nonparametric methods. Nonhomogeneous data sets will be subdivided into homogeneous sets and each of these analyzed individually. Descriptive statistics will be calculated for each homogeneous data set. At a minimum, these include a central value and a range of variation. The central value is the arithmetic mean of the untransformed data if the data are not censored at either end. If the data are censored, either a trimmed mean or the median will be used as the central value (which may be within the censored range). If the data set is greater than ten and is uncensored, the standard deviation will be calculated and used as a basis for the reported range in variation. If these criteria are not met, the range between the 0.25 and 0.75 cartelist will be used."
Attachment L, Section L-4e(2)	Added "Techniques were established to compare detection monitoring data generated during the baseline studies. A 95th upper tolerance limit value (UTLV) or 95th percentile was determined from those data sets where target analytes were measured at concentrations above the method detection limits. The UTLV is provided for normal or lognormal distributions and a 95th percentile confidence interval is provided for data sets that are nonparametric or have

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	greater than 15 percent non-detects. For analytes with only a few detects (greater than 95 percent non-detects), an accurate 95th percentile cannot be calculated. For these analytes, the maximum detected concentration is used as the baseline value. For the analytes that are non-detect in all the samples, the method reporting limit was used as the baseline value."
Attachment L, Section L-4e(3)	Changed section heading from "Data Anomalies" to "Action Levels"
Attachment L, Section L-4e(3)	Deleted "Data anomalies include data points reported as being below the limit of detection (**LD**) or otherwise censored over a specific range of values, missing data points occurring randomly in the data set, and outliers that cannot be ascribed to a known source of variation. Whenever possible, sample values which are reported below detection limits will be incorporated into the database as sample values measured at one-half the detection limit for statistical analysis. When values are not available, alternative methods of analysis, as specified in previous sections, will be used. In particular, the use of nonparametric statistics will be required. Missing data points comprising less than 10 percent of the data set do not significantly affect data analyses. Results based on data in which more than 10 percent is missing will be identified as such at the time of reporting. Consideration of the potential effect of missing data shall be made when the majority of the data are missing from a discrete time span."
Attachment L, Section L-4e(3) Attachment L, Section L-4e(3)	Replaced "Formal testing for outliers will only be done in accordance with EPA guidance. The" with "Using baseline distributions, actions levels were identified in accordance with methodologies described in the baseline documents. Action levels are based on the 95th percentile or reporting limits identified in the baseline. If the groundwater concentration of a constituent identified in Part 5, Table 5.6 is found to exceed an action level, a test for outliers is performed in accordance with the"
Attachment L, Section L-4e(3)	Deleted "Section 8.2 of the"
Attachment L, Section L-4e(3)	Replaced "1989" with "2009"
Attachment L, Section L-4e(3)	Deleted "will be used to check for outliers"
Attachment L, Section L-4e(3)	Deleted "If an outside source of variation is not identified to account for outliers in a data set, it will be included in the data set and all subsequent analyses. If the inclusion of such outliers is found to affect the final results of the analyses significantly, both results (with and without outliers) will be reported."
Attachment L, Section L-4e(4)	Added "TRU mixed"
Attachment L, Section L-4e(4)	Added "Part 5,"
Attachment L, Section L-4e(4)	Replaced "L-3" with "5.4.b"
Attachment L, Section L-4e(4)	Replaced "DMP ground-water" with "detection"
Attachment L, Section L-4e(4)	Added "during each of the ten background sampling events (with the exceptions of trans-1,2-dichloroethylene and vanadium that were added after TRU mixed waste disposal began)"
Attachment L, Section L-4e(4)	Deleted "If any background ground-water quality parameter or constituent has not been measured prior to waste receipt, measurements will be made for those parameters or constituents in hydraulically upgradient DMP ground-water monitoring wells for a sequence of four sampling events. Following completion of the four sampling events, the arithmetic mean and variance shall then be calculated by the field supervisor or designee for each well."
Attachment L, Section L-4e(4)	Deleted "will then"
Attachment L, Section L-4e(4)	Replaced "background value against which statistical values" with "statistical baseline (Part 5, Table 5.6) that is used"

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Attachment L, Section L-4e(4)	Added "evaluating the significance of the results of"
Attachment L, Section L-4e(4)	Deleted "will be compared"
Attachment L, Section L-4e(4)	Added ". Time-trend control charts with associated screening values for each constituent are used for this evaluation"
Attachment L, Section L-4e(4)	Replaced "Statistical analysis and comparison will be accomplished using one of the five statistical tests specified in" with "The Permittees will compare the results from groundwater constituents of ongoing semi-annual groundwater sample analysis to these baseline values in accordance with"
Attachment L, Section L-4e(4)	Replaced "98" with "97"
Attachment L, Section L-4e(4)	Added "(4)"
Attachment L, Section L-4e(4)	Deleted ", which may include Cochran's Approximation to the Behrens-Fisher students' t-test at the 0.01 level of significance (described in Appendix IV to 20.4.1.500 NMAC (incorporating 40 CFR §264)"
Attachment L, Section L-4e(4)	Replaced "a significant increase" with "that a constituent statistically exceeds the baseline"
Attachment L, Section L-4e(4)	Replaced "monitoring site" with "of the DMWs"
Attachment L, Section L-4e(4)	Added ")" after "CFR §264.98(f))"
Attachment L, Section L-4e(4)	Replaced "2" with "3"
Attachment L, Section L-4e(4)	Replaced "in" with "to"
Attachment L, Section L-4e(4)	Added "NMED in the"
Attachment L, Section L-4e(4)	Replaced "Site Environmental" with "Culebra Groundwater"
Attachment L, Section L-4e(4)	Deleted "(**ASER**)"
Attachment L, Section L-4e(4)	Replaced "and will be reported to NMED" with "in November"
Attachment L, Section L-4e(4)	Deleted "in October"
Attachment L, Section L-5a	Deleted ". Laboratory data reports will be forwarded to the Team Leader (see Section L-7) and NMED"
Attachment L, Section L-5a	Replaced "Analytical parameter" with "Parameter and constituent"
Attachment L, Section L-5a	Added "s" to result"
Attachment L, Section L-5a	Added "as specified in the Permit Part 5"
Attachment L, Section L-5b	Added "for constituents"
Attachment L, Section L-5b	Deleted "semi-"
Attachment L, Section L-5b	Replaced "Team Leader" with "Permitees"
Attachment L, Section L-5b	Replaced "Team Leader" with "Permitees"
Attachment L, Section L-5b	Replaced "ASER" with "Annual Culebra Groundwater Report"
Attachment L, Section L-5c	Changed section heading "Semi-Annual Groundwater Surface Elevation Report and Annual Site Environmental Report" to "Annual Culebra Groundwater Report"
Attachment L, Section L-5c	Replaced ", and to the EM Manager and NMED in the ASER" with "in the Annual Culebra Groundwater Report"
Attachment L, Section L-5c	Replaced "ASER" with "report"
Attachment L, Section L-5c	Added "DMW and WLMP"

Affected Permit Section	Explanation of Change
Attachment L, Section L-5c	Changed "Well" to "well"
Attachment L, Section L-5c	Deleted "Any"
Attachment L, Section L-5c	Changed "pumping" to "Pumping"
Attachment L, Section L-5c	Added "related to"
Attachment L, Section L-5c	Deleted "activities"
Attachment L, Section L-5c	Added "that may have taken place since the last annual groundwater report"
Attachment L, Section L-5c	Added " • A discussion of the origins of abnormal unexpected changes in the groundwater surface elevation, which is not attributable to site tests or natural stabilization of the site hydrologic system that exceeds 2 ft in a DMP well over the course of the period covered by the Annual Culebra Groundwater Report (this may indicate changes in recharge/discharge which would affect the assumptions regarding DMP well placement and constitute new information as specified in 20.4.1.900 NMAC (incorporating 40 CFR §270.41(a)(2)). • The results of the annual measurements of densities. • Annotated hydrographs. • Groundwater flow rate and direction. - Potentiometric surface map generated using the following steps: - Examine hydrographs to identify month having the largest number of Culebra water levels available with the fewest wells affected by pumping or other anthropogenic events. - Convert water levels from subject month to equivalent freshwater heads using fluid densities appropriate to the date. - Fit trend surface through freshwater heads. - Extrapolate the trend surface to the boundaries of the model domain used for the current Performance Assessment Baseline Calculations (PABC) and define initial fixed-head boundary conditions based on the trend surface. - Using the ensemble-average Culebra transmissivity field used for the current PABC, optimize the model boundary heads to improve the fit of the model to the freshwater heads at the wells using optimization software interactively with MODFLOW. - Run MODFLOW with optimal boundary conditions fit. - Contour MODFLOW head results on WIPP site. - Compute particle path and travel time from the Waste Handling Shaft to the LWA Boundary. - Data analysis that will accompany the potentiometric surface map will include: • Measured versus modeled scatter plot diagram • Frequency of modeled head residuals • Modeled residual freshwater head at each well • Explanations for modeled misfit residuals greater than 16.4 feet (5 meters). • Semi-annual groundwater surface elevation results will be reported as specified in Permit Part 5, Condition 5.10.2.2."
Attachment L, Section L-5c	Deleted "• Radionuclide specific data collected during the previous year."
Attachment L, Section L-5c	Replaced "ASER" with "Annual Culebra Groundwater Report"

Affected Permit Section	Explanation of Change
Attachment L, Section L-5c	Added "facility"
Attachment L, Section L-5c	Changed "operating record" to "Operating Record"
Attachment L, Section L-6	Replaced "ground-water surface elevation" with "water level"
Attachment L, Section L-6	Deleted "events"
Attachment L, Section L-6	Replaced "the form" with "either"
Attachment L, Section L-6	Replaced "in the EM section" with "at the Permittees facility or the Operating Record"
Attachment L, Section L-6	Replaced "records" with "files"
Attachment L, Section L-6	Added "• Field Data Entry Sheets"
Attachment L, Section L-6	Deleted "• STLBs"
Attachment L, Section L-6	Added "CofC/"
Attachment L, Section L-6	Deleted "and CofC"
Attachment L, Section L-6	Deleted "s" on "forms"
Attachment L, Section L-6	Deleted "Contract"
Attachment L, Section L-6	Replaced "These and all raw analytical records generated in conjunction with ground-water sampling" with "Detection Monitoring Program monitoring, testing, and analytical data"
Attachment L, Section L-6	Replaced "ground-water surface elevation monitoring" with "WLMP data"
Attachment L, Section L-6	Replaced "stored in fire resistant cabinets" with "maintained in the WIPP facility Operating Record."
Attachment L, Section L-6	Deleted "in the EM section according to the Records Inventory and Disposition Schedule (**RIDS**) and will be made available for inspection upon request. The following records will be transmitted to the Permittees' Project Records Services (**PRS**) for long-term storage in accordance with the RIDS: • Instrument maintenance and calibration records • QC sample data • Control charts and calculation • Sample tracking and control documentation • Raw analytical results."
Attachment L, Section L-7	Deleted section
Attachment L, Section L-7a	Deleted section
Attachment L, Section L-7b	Deleted section
Attachment L, Section L-7c	Deleted section
Attachment L, Section L-7d	Deleted section
Attachment L, Section L-7e	Deleted section
Attachment L, Section L-7f	Deleted section
Attachment L, Section L-8	Renumbered section from "L-8" to "L-7"
Attachment L, Section L-8	Deleted "Specific"
Attachment L, Section L-8	Deleted "requirements for WIPP are defined in WIPP document WP 13-1. A current revision of this document will be maintained in the WIPP Operating Record."

Affected Permit Section	Explanation of Change
Attachment L, Section L-8	Changed "Requirements" to "requirements"
Attachment L, Section L-8a	Renumbered section from "L-8a" to "L-7a"
Attachment L, Section L-8a	Replaced "QA Program—Overview" with "Data Quality Objectives and Quality Assurance Objectives" in section heading
Attachment L, Section L-8a	Deleted "The QA program was developed to assure that integrity and quality will be maintained for all samples collected and that equipment and records will be maintained in accordance with EPA guidance. The QA Program identifies data quality objectives (**DQO**), processes for assuring sample quality, and processes for generating and maintaining quality records."
Attachment L, Section L-8b	Renumbered section from "L-8b" to "L-7a(1)"
Attachment L, Section L-8b	Changed "DQOs" to "Data Quality Objectives" in section heading
Attachment L, Section L-8b	Added "Data Quality Objectives"
Attachment L, Section L-8b	Added parentheses around "DQOs"
Attachment L, Section L-8b	Replaced "will be" with "have been"
Attachment L, Section L-8b	Added "s" to "DQO"
Attachment L, Section L-8b	Added "DMP are shown in the following sections."
Attachment L, Section L-8b	Deleted "project will be to collect accurate and defensible data of known quality that will be sufficient to assess the concentrations of constituents in the ground water underlying the WIPP area. The data generated thus far by the DMP has been used to establish background ground-water quality. For the purpose of this DMP, DQOs for measurement data will be specified in terms of accuracy, precision, completeness, representativeness, and comparability. Measurements of data quality in terms of accuracy and precision will be derived from the analysis of QC samples generated in the field and laboratory. Appropriate QC procedures will be used so that known and acceptable levels of accuracy and precision will be maintained for each data set. This section defines the acceptance criteria for each QC analysis performed. The following subsections define each DQO."
Attachment L, Section L-8b	Added new sections "L-7a(1)(i) Detection Monitoring Program Collect accurate and defensible data of known quality that will be sufficient to assess the concentrations of constituents in the ground water underlying the WIPP area. L-7a(1)(ii) Water Level Monitoring Program Collect accurate and defensible data of known quality that will be sufficient to assess the groundwater flow direction and rate at the WIPP facility. L-7a(2) Quality Assurance Objectives Quality Assurance Objectives (QAOs) for measurement data have been specified in terms of accuracy, precision, completeness, representativeness, and comparability."
Attachment L, Section L-8b(1)	Renumbered section from "L-8a(1)" to "L-7a(2)(i)"
Attachment L, Section L-8b(1)	Replaced "samples" with "recoveries"
Attachment L, Section L-8b(1)(i)	Renumbered section from "L-8b(1)(i)" to "L-7a(2)(i)(A)"
Attachment L, Section L-8b(1)(i)	Added parentheses around "SC"
Attachment L, Section L-8b(1)(i)	Replaced "Eh" with "specific conductance"
Attachment L, Section L-8b(1)(i)	Added "specific gravity"

Affected Permit Section	Explanation of Change
Attachment L, Section L-8b(1)(i)	Deleted "check"
Attachment L, Section L-8b(1)(i)	Replaced "assure" with "ensure"
Attachment L, Section L-8b(1)(i)	Replaced "Procedure WP 10-AD3029" with "SOPs"
Attachment L, Section L-8b(1)(i)	Delete "s"
Attachment L, Section L-8b(1)(i)	Deleted "A current revision of this document or procedure will be maintained in the WIPP Operating Record."
Attachment L, Section L-8b(1)(ii)	Renumbered section from "L-8b(1)(ii)" to "L-7a(2)(i)(B)"
Attachment L, Section L-8b(1)(ii)	Replaced "samples" with "recoveries"
Attachment L, Section L-8b(2)	Renumbered section from "L-8b(2)" to "L-7a(2)(ii)"
Attachment L, Section L-8b(2)(i)	Renumbered section from "L-8b(2)(i)" to "L-7a(2)(ii)(A)"
Attachment L, Section L-8b(2)(i)	Deleted "Precision of field measurements of water-quality parameters will meet or exceed required reporting levels."
Attachment L, Section L-8b(2)(i)	Added "Specific conductance"
Attachment L, Section L-8b(2)(i)	Added parentheses around "SC"
Attachment L, Section L-8b(2)(i)	Deleted "optionally Eh"
Attachment L, Section L-8b(2)(i)	Added "," after "10%"
Attachment L, Section L-8b(2)(i)	Replaced "and" with "specific gravity to 0.01 by hydrometer,"
Attachment L, Section L-8b(2)(i)	Added "and SC"
Attachment L, Section L-8b(2)(i)	Added "Water-level measurement will be precise to ±0.01 ft. The precision of water density measurements, when measured in the field using down hole instrumentation, will be determined on a well-by-well basis and will result in no more than ±2 ft of error in the derived fresh-water head."
Attachment L, Section L-8b(2)(ii)	Renumbered section from "L-8b(2)(ii)" to "L-7a(2)(ii)(B)"
Attachment L, Section L-8b(2)(ii)	Replaced "Precision of laboratory analyses will be assessed by performing the same analyses twice on LCSs with each analytical batch assessed at a minimum frequency of 1 in 20 ground-water samples for nonradiological parameters and 1 in 10 for radiological parameters. The laboratory will determine analytical precision control limits by performing replicate analyses of control samples. Precision measurements will be expressed as RPD." with "Precision of laboratory analyses will be determined by analyzing a LCS and a lab control sample duplicate (LCSD) or by analyzing one of the field samples in duplicate depending on the requirements of the particular standard method. The precision is measured as the RPD of the recoveries for the spiked LCS/LCSD pair or the RPD of the duplicate sample analysis results."
Attachment L, Section L-8b(3)	Renumbered section from "L-8b(3)" to "L-7a(2)(iii)"
Attachment L, Section L-8b(3)	Replaced "1991" with "1999"
Attachment L, Section L-8b(3)	Added "National"
Attachment L, Section L-8b(3)	Replaced "1988" with "2004"
Attachment L, Section L-8b(3)	Added "method"
Attachment L, Section L-8b(3)	Added "method"
Attachment L, Section L-8b(4)	Renumbered section from "L-8b(4)" to "L-7a(2)(iv)"
Attachment L, Section L-8b(4)	Added "during sample shipment or"
Attachment L, Section L-8b(4)	Replaced "noncritical measurements (i.e., field measurements)" with "analysis

Affected Permit Section	Explanation of Change
	of Part 5, Table 5.4.a parameters"
Attachment L, Section L-8b(4)	Replaced "for critical measurements (i.e., compliance data)" with "analysis of Part 5, Table 5.4.b hazardous constituents"
Attachment L, Section L-8b(4)	Added "for Part 5, Table 5.4.b constituents"
Attachment L, Section L-8b(4)	Replaced "WIPP EM Manager" with "Permittees"
Attachment L, Section L-8b(4)	Deleted "on behalf of the Permittees"
Attachment L, Section L-8b(5)	Renumbered section from "L-8b(5)" to "L-7a(2)(v)"
Attachment L, Section L-8b(5)	Added "For water levels and density, representativeness is a qualitative term that describes the extent to which a sampling design adequately reflects the environmental conditions of a site. The SOPs for measurement ensure that samples are representative of site conditions."
Attachment L, Section L-8b(6)	Renumbered section from "L-8b(6)" to "L-7a(2)(vi)"
Attachment L, Section L-8b(6)	Added "and semivolatile organic compounds (**SVOCs**)"
Attachment L, Section L-8b(6)	Added "Culebra"
Attachment L, Section L-8b(6)	Changed "Ground-water" to "groundwater"
Attachment L, Section L-8c	Renumbered section from "L-8c" to "L-7b"
Attachment L, Section L-8c	Replaced "ground-water monitoring system was" with "approved"
Attachment L, Section L-8c	Deleted "ed" from "designed"
Attachment L, Section L-8c	Replaced "and will be maintained to meet specifications established in" with "for the DMP is specified in this Permit. Modifications to the DMP will be processed in accordance with"
Attachment L, Section L-8c	Replaced "500" with "900"
Attachment L, Section L-8c	Deleted "§"
Attachment L, Section L-8c	Replaced "264 Subpart F and 264.601 through 264.603"with "270.42"
Attachment L, Section L-8d	Renumbered section from "L-8d" to "L-7c"
Attachment L, Section L-8d	Deleted "Provisions and responsibilities for"
Attachment L, Section L-8d	Change "the" to "The"
Attachment L, Section L-8d	Added "the"
Attachment L, Section L-8d	Added "facility"
Attachment L, Section L-8d	Added "(see Table L-3)"
Attachment L, Section L-8d	Deleted "Any"
Attachment L, Section L-8d	Changed "activities" to "Activities"
Attachment L, Section L-8d	Replaced "ground-water monitoring" with "the DMP"
Attachment L, Section L-8d	Added "data quality"
Attachment L, Section L-8d	Deleted "documented and"
Attachment L, Section L-8d	Deleted "and the requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264 Subpart F) Technical procedures, as specified elsewhere in this DMP, have been developed for each quality-affecting function performed for ground-water monitoring. The technical procedures unique to the DMP will be controlled by the ES&H at WIPP. The procedures are sufficiently detailed and include, when

Affected Permit Section	Explanation of Change
	applicable, quantitative or qualitative acceptance criteria. Procedures were prepared in accordance with requirements in WIPP document WP 13-1. A current revision of this document will be maintained in the WIPP Operating Record."
Attachment L, Section L-8e	Renumbered section from "L-8e" to "L-7d"
Attachment L, Section L-8e	Replaced "Permittees" with "Document controls"
Attachment L, Section L-8e	Replaced "procedures" with "SOPs"
Attachment L, Section L-8e	Added "adequately identified or"
Attachment L, Section L-8f	Deleted section
Attachment L, Section L-8g	Renumbered section from "L-8g" to "L-7e"
Attachment L, Section L-8g	Added "(see Table L-3)"
Attachment L, Section L-8g	Replaced "QA Department" with "Permittees"
Attachment L, Section L-8g	Added "SOPs."
Attachment L, Section L-8g	Deleted "inspections and surveillance on the scope of work. EM section personnel will be responsible for performance checks as defined in applicable procedures and determined for the Permittees by MOC metrology laboratory personnel. Performance checks for the DMP will determine the acceptability of purchased items and assess degradation that occurs during use. A current revision of this document will be maintained in the WIPP Operating Record."
Attachment L, Section L-8h	Renumbered section from "L-8h" to "L-7f"
Attachment L, Section L-8h	Added "(see Table L-3)"
Attachment L, Section L-8h	Added "equipment"
Attachment L, Section L-8h	Replaced "Procedure WP 10-AD3029" with "facility SOPs (see Table L-3)"
Attachment L, Section L-8h	Deleted "A current revision of this document or procedure will be maintained in the WIPP Operating Record."
Attachment L, Section L-8i	Renumbered section from "L-8i" to "L-7g"
Attachment L, Section L-8i	Replaced "WIPP document" with "In accordance with"
Attachment L, Section L-8i	Deleted "specifies the system used at WIPP for ensuring that appropriate measures are established to control nonconforming conditions. Nonconforming conditions connected to the DMP will be identified in and controlled by documented procedures." with "(see Table L-3),
Attachment L, Section L-8i	Changed "Equipment" to "equipment"
Attachment L, Section L-8i	Deleted "A current revision of this document will be maintained in the WIPP Operating Record."
Attachment L, Section L-8j	Renumbered section from "L-8j" to "L-7h"
Attachment L, Section L-8j	Added "(see Table L-3)"
Attachment L, Section L-8j	Deleted "A current revision of this document will be maintained in the WIPP Operating Record."
Attachment L, Section L-8k	Renumbered section from "L-8k" to "L-7i"
Attachment L, Section L-8k	Added "(see Table L-3)"
Attachment L, Section L-8k	Deleted "A current revision of this document will be maintained in the WIPP Operating Record."
Attachment L, Section L-8k	Added "record"

Affected Permit Section	Explanation of Change
Attachment L, Section L-8k	Replaced "EM RIDS" with "Environmental Monitoring Records Inventory and Disposition Schedule"
Attachment L, Section L-8k	Deleted "QA records will document the results of the DMP implementing procedures and will be sufficient to demonstrate that all quality-related aspects are valid. The records will be identifiable, legible, and retrievable."
Attachment L, Section L-9	Renumbered section from "L-9" to "L-8"
Attachment L, Section L-9	Added "Crawley, M. and M. Nagy, 1998. "WIPP RCRA Background Groundwater Quality Baseline Report," DOE/WIPP-98-2285."
Attachment L, Section L-9	Added "Domski, P.S., and R.L. Beauheim. 2008. Evaluation of Culebra Brine Chemistry. AP-125. ERMS 549336. Carlsbad, NM: Sandia National Laboratories.
Attachment L, Section L-9	Deleted "Gilbert, R.O., 1987. Statistical Methods for Environmental Pollution Monitoring, Van Nostrand Reinhold, New York. Haug, A., V.A. Kelly, A.M. LaVenue, and J.F. Pickens, 1987. "Modeling of Ground-Water Flow in the Culebra Dolomite at the Waste Isolation Pilot Plant (WIPP) Site: Interim Report," SAND86-7167, Sandia National Laboratories/New Mexico, Albuquerque, New Mexico."
Attachment L, Section L-9	Added "IT Corporation, "2000 Addendum 1 Waste Isolation Pilot Plant RCRA Background Groundwater Quality Baseline Update Report." Albuquerque, New Mexico."
Attachment L, Section L-9	Added "Kuhlman, K.L. 2010. Analysis Report, AP-111 Revision 1, Culebra Water Level Monitoring Network Design. ERMS 554054. Carlsbad, NM: Sandia National Laboratories."
Attachment L, Section L-9	Deleted "Lusczynski, N.J., 1961. "Head and Flow of Ground Water of Variable Density," Journal of Geophysical Research, Vol. 66, No. 12, pp. 4247–4256."
Attachment L, Section L-9	Added "McKenna, S. A. 2004. Analysis Report: Culebra Water Level Monitoring Network Design. AP-111. ERMS 540477. Carlsbad, NM: Sandia National Laboratories."
Attachment L, Section L-9	Deleted "Powers, D.W., S.J. Lambert, S.E. Shaffer, L.R. Hill, and W.D. Weart, eds., 1978. "Geologic Characterization Report for the Waste Isolation Pilot Plant (WIPP) Site, Southeastern New Mexico," SAND78-1596, Sandia National Laboratories/New Mexico, Albuquerque, New Mexico."
Attachment L, Section L-9	Added "Powers, D. W. 2006. Analysis Report: Task 1B of AP-114; Identify Possible Area of Recharge to the Culebra West and South of WIPP (April 1). ERMS 543094. Carlsbad, NM: Sandia National Laboratories. Roberts, R. M. 2007. Analysis of Culebra Hydraulic Tests Performed Between June 2006 and September 2007. ERMS 547418. Carlsbad, NM: Sandia National Laboratories. Siegel, M.D., K. L. Robinson, and J. Myers. 1991. "Solute Relationships in Groundwaters from the Culebra Dolomite and Related Rocks in the Waste Isolation Pilot Plant Area, Southeastern New Mexico," SAND88-0196. U.S. Department of Energy (DOE), 1995. "Basic Data Report for WQSP-1 through WQSP-6A," DOE/WIPP-95-2154."
Attachment L, Section L-9	Deleted "U.S. Department of Energy (DOE), 1996. "United States Department of Energy Waste Isolation Pilot Plant Compliance Certification Application," DOE/CAO-1996–2184, U.S. Department of Energy, Carlsbad Area Office, Carlsbad, New Mexico. U.S. Department of Energy (DOE), 1997. Responses to EPA's Request in EPA's March 19, 1997 Letter on the WIPP CCA. May 14, 1997."
Attachment L, Section L-9	Replaced "1992" with "2009"

Affected Permit Section	Explanation of Change
Attachment L, Section L-9	Replaced "Addendum to Interim Final Guidance" with "Unified Guidance"
Attachment L, Section L-9	Replaced "1991" with "1999"
Attachment L, Section L-9	Deleted "U.S. Environmental Protection Agency (EPA), 1989. "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities," U.S. Environmental Protection Agency, Washington, D.C."
Attachment L, Section L-9	Replaced "1988" with "2004"
Attachment L, Table L-1	Changed "Above" to "above"
Attachment L, Table L-1	Replaced "Coefficient" with "Storage"
Attachment L, Table L-1	Deleted "Specific capacity 0.029 to 0.04 ℓ/s/m"
Attachment L, Table L-1	Deleted Transmissivity and Permeability columns
Attachment L, Table L-1	Replaced "Unnamed lower member" with "Los Medaños"
Attachment L, Table L-2	Changed "DMP monitoring wells" to "DMWs"
Attachment L, Table L-2	Changed "Semiannually" to "Annually"
Attachment L, Table L-2	Deleted "All other WIPP surveillance wells"
Attachment L, Table L-2	Deleted "On special request only"
Attachment L, Table L-2	Changed "DMP monitoring wells" to "DMWs"
Attachment L, Table L-2	Replaced "All other WIPP surveillance well sites" with "WLMP Wells (see Table L-4)"
Attachment L, Table L-2	Deleted "Redundant wells at all other WIPP surveillance well sites"
Attachment L, Table L-2	Deleted "Quarterly"
Attachment L, Table L-3	Deleted table
Attachment L, Tables	Inserted new Table L-3
Attachment L, Tables	Inserted new Table L-4
Attachment L, Tables	Inserted new Table L-5
Attachment L, Table L-4	Renumbered from "Table L-4" to "Table L-6"
Attachment L, Table L-4	Added "Suggested" to table caption
Attachment L, Table L-4	Deleted "TOX 3 250 ml Glass yes No H_2SO_4, pH<2 7 days[2]" in row 1 of the table data
Attachment L, Table L-4	Added ")" after "(Total" in row 10 of the table data
Attachment L, Figure L-2	Updated figure
Attachment L, Figure L-3	Updated figure
Attachment L, Figure L-4	Updated figure
Attachment L, Figure L-5	Deleted figure
Attachment L, Figures	Inserted new Figure L-5
Attachment L, Figure L-6	Deleted figure
Attachment L, Figure L-7	Deleted figure
Attachment L, Figure L-8	Renumbered figure from "L-8" to "L-6" and updated figure
Attachment L, Figure L-8	Replaced "WQSP" with "Detection"

Affected Permit Section	Explanation of Change
Attachment L, Figure L-8	Added "ing" to "Monitor" in figure caption
Attachment L, Figure L-9	Deleted figure
Attachment L, Figure L-10	Renumbered figure from "L-10" to "L-7" and updated figure
Attachment L, Figure L-11	Renumbered figure from "L-11" to "L-8" and updated figure
Attachment L, Figure L-12	Renumbered figure from "L-12" to "L-9" and updated figure
Attachment L, Figure L-13	Renumbered figure from "L-13" to "L-10" and updated figure
Attachment L, Figure L-14	Renumbered figure from "L-14" to "L-11" and updated figure
Attachment L, Figure L-15	Renumbered figure from "L-15" to "L-12" and updated figure
Attachment L, Figure L-16	Deleted figure
Attachment L, Figure L-17a	Renumbered figure from "L-17a" to "L-13" and updated figure
Attachment L, Figure L-17a	Replaced "Record" with "Request for Analysis Form" in figure caption
Attachment L, Figure L-17b	Deleted figure
Attachment L, Figure L-18	Deleted figure
Attachment L, Figures	Inserted new Figure L-14

Attachment B
Proposed Revised Permit Text

5.3.2. Well Maintenance

The Permittees shall maintain the DMWs specified in Table 5.3.1 and in Permit Attachment L, Section L-3b and Figures L-~~10~~7 through L-~~16~~12, and as required by 20.4.1.500 NMAC (incorporating 40 CFR §264.97(c) and §264.98(b)).

5.4. DETECTION MONITORING PROGRAM PARAMETERS AND CONSTITUENTS

The Permittees shall conduct the DMP at the DMWs as specified in Table 5.3.1 for the indicator parameters listed in Table 5.4.a and the hazardous constituents listed in Table 5.4.b below and as required by 20.4.1.500 NMAC (incorporating 40 CFR §264.98(a)):

Table 5.4.a – Indicator Parameters

pH	Specific conductance
Total organic carbon (**TOC**)	~~Total organic halogen (**TOH**)~~
Total dissolved solids (**TDS**)	Total suspended solids (**TSS**)
~~Density~~Specific Gravity	Calcium
Magnesium	Potassium
Chloride	~~Iron (Total Fe)~~

5.5. SAMPLING AND ANALYSIS PROCEDURES

Except as provided in Permit Section 5.6, the Permittees shall use the following techniques and procedures to obtain and analyze DMP samples~~, including background ground-water quality samples,~~ from the DMWs specified in Table 5.3.1, as required by 20.4.1.500 NMAC (incorporating 40 CFR §264.97(d) and (e)):

5.5.1. Sample Collection Procedures

The Permittees shall collect one DMP sample and one DMP sample duplicate ~~semi~~annually from each DMW using the procedures specified in Permit Attachment L, Section L-4c, as required by 20.4.1.500 NMAC (incorporating 40 CFR §§264.97(g)(2), 264.98(d), and 264.601(a)).

Table 5.6 – WQSP Well Background Values

Hazardous Constituent	WQSP-1	WQSP-2	WQSP-3	WQSP-4	WQSP-5	WQSP-6
Chloroform	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
1,2-dichloroethane	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
Carbon tetrachloride	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
Chlorobenzene	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
1,1-dichloroethylene	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
1,1-dichloroethane	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
Methylene chloride	~~3.00~~5.00 µg/L	5.00~~3.00~~ µg/L	5.00~~3.00~~ µg/L	5.00~~3.00~~ µg/L	5.00~~3.00~~ µg/L	5.00~~3.00~~ µg/L

Table 5.6 – WQSP Well Background Values						
Hazardous Constituent	**WQSP-1**	**WQSP-2**	**WQSP-3**	**WQSP-4**	**WQSP-5**	**WQSP-6**
1,1,2,2-tetrachloroethane	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
Toluene	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
1,1,1-trichloroethane	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
Cresols	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
1,4-dichlorobenzene	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
1,2-dichlorobenzene	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
trans-1,2-dichloroethylene	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
2,4-dinitrophenol	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
2,4-dinitrotoluene	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
Hexachloroethane	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
Hexachlorobenzene	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
Isobutanol	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
Methyl ethyl ketone	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
Pentachlorophenol	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
Pyridine	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
Tetrachloroethylene	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
1,1,2-Trichloroethane	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
Trichloroethylene	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
Trichlorofluoromethane	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
Xylenes	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
Nitrobenzene	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L	5.00 µg/L
Vinyl chloride	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L	1.00 µg/L
Arsenic	0.10 mg/L	0.06 mg/L	0.21 mg/L	0.50 mg/L	0.50 mg/L	0.50 mg/L
Barium	1.00 mg/L	1.00 mg/L	1.00 mg/L	1.00 mg/L	1.00 mg/L	1.00 mg/L
Cadmium	0.20 mg/L	0.50 mg/L	0.50 mg/L	0.50 mg/L	0.05 mg/L	0.05 mg/L
Chromium	0.50 mg/L	0.50 mg/L	2.00 mg/L	2.00 mg/L	0.50 mg/L	0.50 mg/L
Lead	0.11 mg/L	0.17 mg/L	0.80 mg/L	0.53 mg/L	0.05 mg/L	0.15 mg/L
Mercury	.002 mg/L	.002 mg/L	.002 mg/L	.002 mg/L	.002 mg/L	.002 mg/L
Selenium	0.15 mg/L	0.15 mg/L	2.00 mg/L	2.00 mg/L	0.10 mg/L	0.10 mg/L
Silver	0.50 mg/L	0.50 mg/L	0.31 mg/L	0.52 mg/L	0.50 mg/L	0.50 mg/L
Antimony	0.33 mg/L	0.50 mg/L	1.00 mg/L	0.80 mg/L	0.07 mg/L	0.14 mg/L
Beryllium	0.02 mg/L	1.00 mg/L	0.10 mg/L	0.25 mg/L	0.02 mg/L	0.02 mg/L
Nickel	0.50 mg/L	0.50 mg/L	5.00 mg/L	5.00 mg/L	0.10 mg/L	0.50 mg/L
Thallium	1.00 mg/L	1.00 mg/L	5.80 mg/L	1.00 mg/L	0.21 mg/L	0.56 mg/L
Vanadium	0.10 mg/L	0.10 mg/L	5.00 mg/L	5.00 mg/L	2.70 mg/L	0.10 mg/L

5.10.2.1. Data Evaluation Results

The Permittees shall submit to the Secretary the analytical results required by Permit Sections 5.5.1 and 5.9.2, and the results of the statistical analyses required by Permit Section 5.9.3, in the Annual Culebra Groundwater Report in November of each year ~~in compliance with the schedule on Table 5.10.2.1 below, and~~ as required by 20.4.1.500 NMAC (incorporating 40 CFR §264.97(j)):

~~Table 5.10.2.1 - Analytical Results Submittal Schedule~~	
~~Samples to be collected during the preceding months of:~~	~~Results due to the NMED Secretary by:~~
~~March – May~~	~~120calendar days after final sample is collected~~
~~September – November~~	~~120 calendar days after final sample is collected~~

5.10.2.2. ~~Ground-Water~~Groundwater Surface Elevation Results

The Permittees shall submit to the Secretary ~~ground-water~~ groundwater surface elevation data specified in Permit Section 5.7. This submittal shall include both ~~ground-water~~groundwater surface elevations calculated from field measurements and fresh-water head elevations calculated as specified in Permit Attachment L, Section L-4c(1). Water level data shall be ~~submitted~~ reported semiannually in May and November~~within 30 calendar days after data are collected~~. The November water level data shall be combined with the Annual Culebra Groundwater Report specified in Permit Part 5.10.2.3.

5.10.2.3. ~~Ground-Water~~ Groundwater Flow ~~and Radionuclide Sampling~~ Results

The Permittees shall submit to the Secretary an evaluation of the ~~ground-water~~groundwater flow data (to include annotated hydrographs) specified in Permit Section 5.8 ~~and the results of radionuclide-specific analysis of groundwaters sampled from the DMWs~~ in the Annual Culebra Groundwater ~~Site Environmental~~ Report ~~by October 1~~ in November of each calendar year.

ATTACHMENT L
WIPP ~~GROUND-WATER~~GROUNDWATER DETECTION MONITORING PROGRAM PLAN

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ATTACHMENT L

WIPP ~~GROUND-WATER~~GROUNDWATER DETECTION MONITORING PROGRAM PLAN

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LIST OF ABBREVIATIONS/ACRONYMS/UNITS

~~ASER~~	~~Annual Site Environmental Report~~
~~AR/VR~~	~~Approval/Variation Request~~
Bell Canyon	Bell Canyon Formation
bgs	below ground surface
Castile	Castile Formation
cm	centimeter(s)
Culebra	Culebra Member of the Rustler Formation
CofC/RFA	~~Chain of Custody~~chain of custody/request for analysis
°C	degree(s) Celsius
%C	percent completeness
Dewey Lake	Dewey Lake Redbeds Formation
DI	deionized
DMP	Detection Monitoring Program
DMW	Detection Monitoring Well
DOE	U.S. Department of Energy
DQO	data quality objectives
~~EM~~	~~Environmental Monitoring~~
EPA	U.S. Environmental Protection Agency
~~ES&H~~	~~Environment, Safety, and Health Department~~
~~FEIS~~	~~Final Environmental Impact Statement~~
ft	foot (feet)
ft^2	square foot (square feet)
g/cm^3	gram(s) per cubic centimeter
~~GWSP~~	~~Groundwater Surveillance Program~~
HWDU	hazardous waste disposal unit(s)
km	kilometer(s)
km^2	square kilometer(s)
$lb/in.^2$	pound(s) per square inch
LCS	laboratory control samples
LCSD	lab control sample duplicate
~~LD~~	~~limit of detection~~
Los Medaños	Los Medaños Member of the Rustler Formation
LWA	Land Withdrawal Act
m	meter(s)
M&DC	monitoring and data collection
m^2	square meter(s)
Magenta	Magenta Member of the Rustler
mg/L	milligram(s) per liter
mi	mile(s)

mi^2	square mile(s)
molal	moles per kilogram
~~MOC~~	~~Management and Operating Contractor~~
MPa	megapascal(s)
mV	millivolt(s)
NIST	National Institute for Standards and Technology
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
~~PRS~~	~~Project Records Services~~
QA	Quality Assurance
QA/QC	quality assurance/quality control
QAO	Quality Assurance Objective
QC	quality control
PABC	Performance Assessment Baseline Calculation
RCRA	Resource Conservation and Recovery Act
~~RFA~~	~~request for analysis~~
~~RIDS~~	~~Records Inventory and Disposition Schedule~~
RPD	relative percent difference
Rustler	Rustler Formation
%R	percent recovery
Salado	Salado Formation
SAP	Sampling and Analysis Plans
SC	specific conductance
SOP	Standard Operating Procedure
~~STLB~~	~~sample tracking logbook~~
TDS	total dissolved solids
TOC	total organic carbon
~~TOX~~	~~total organic halogens~~
TRU	transuranic
TSDF	treatment, storage, and disposal facilities
~~TSS~~	~~total suspended solids~~
UTLV	upper tolerance limit value
VOC	volatile organic compound
WIPP	Waste Isolation Pilot Plant
WLMP	WIPP Groundwater Level Monitoring Program
~~WQSP~~	~~Water Quality Sampling Program~~
µg/L	microgram(s) per liter
µm	micrometers

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ATTACHMENT L

WIPP ~~GROUND-WATER~~GROUNDWATER DETECTION MONITORING PROGRAM PLAN

L-1 Introduction

The Waste Isolation Pilot Plant (**WIPP**) ~~is a geologic repository for the disposal of transuranic (**TRU**) waste~~ facility is subject to regulation under Title 20 of the New Mexico Administrative Code (**NMAC**), Chapter 4, Part 1, Subpart V (20.4.1.500 NMAC). As required by 20.4.500 NMAC (incorporating 40 CFR §264.601), the Permittees shall demonstrate that the environmental performance standards for a miscellaneous unit, which are applied to the hazardous waste disposal units (**HWDUs**) in the underground, will be met. ~~The disposal horizon is located 2,150 feet (ft) (655 meters [m]) below the land surface in the bedded salt of the Salado Formation (hereinafter referred to as the Salado). At WIPP, water-bearing units occur both above and below the disposal horizon. Ground-water monitoring of the uppermost aquifer below the facility is not proposed at WIPP because that water-bearing unit (the Bell Canyon Formation) is not considered a credible pathway for a release from the repository. This is because the repository horizon and water-bearing sandstones of the Bell Canyon Formation are separated by over 2000 ft (610 m) of very low-permeability evaporite sediments (Addendum L1, Amended Renewal Application (DOE, 2009)). No natural credible pathway has been established for contaminant transport to aquifers below the repository horizon, as there is no hydrologic communication between the repository and underlying aquifer. The U.S. Environmental Protection Agency (**EPA**) concluded in 1990 that natural vertical communication does not exist based on their review of numerous studies (EPA, 1990). Furthermore, drilling boreholes for ground-water monitoring through the Salado and the Castile Formation (hereinafter referred to as the Castile) into the Bell Canyon aquifer would compromise the isolation properties of the repository medium.~~

The WIPP facility is located in Eddy County in southeastern New Mexico (Figure L-1), within the Pecos Valley section of the southern Great Plains physiographic province. The facility is 26 miles (mi) (42 kilometers [km]) east of Carlsbad, New Mexico, in an area known as Los Medaños (the dunes). Los Medaños is a relatively flat, sparsely inhabited plateau with little water and limited land uses. ~~Disposal of TRU mixed waste in the WIPP facility is subject to regulation under 20.4.1.500 NMAC. As required by 20.4.1.500 NMAC (incorporating 40 CFR §264.601), the Permittees shall demonstrate that the environmental performance standards for a miscellaneous unit, which are applied to the hazardous waste disposal units (**HWDUs**) in the underground, will be met.~~

The WIPP facility (Figure L-2) consists of 16 sections of Federal land in Township 22 South, Range 31 East. The 16 sections of Federal land were withdrawn from the application of public land laws by the WIPP Land Withdrawal Act (**LWA**), Public Law 102-579. The WIPP LWA transferred the responsibility for the administration of the 16 sections from the Department of Interior, Bureau of Land Management, to the U.S. Department of Energy (**DOE**). This law specified that mining and drilling for purposes other than support of the WIPP project are prohibited within this 16 section area with the exception of Section 31. Oil and gas drilling activities are restricted in Section 31 from the surface down to 6,000 feet.

The WIPP is a mined geologic repository for the disposal of transuranic (**TRU**) waste. The disposal horizon is located 2,150 feet (ft) (655 meters [m]) below the land surface in the bedded

salt of the Salado Formation (**Salado**). At the WIPP facility, water-bearing units occur both above and below the disposal horizon. Groundwater monitoring of the uppermost aquifer below the facility is not required because the water-bearing unit (the Bell Canyon Formation (**Bell Canyon**)) is not considered a credible pathway for a release from the repository. This is because the repository horizon and water-bearing sandstones of the Bell Canyon are separated by over 2,000 ft (610 m) of very low-permeability evaporite sediments (Amended Renewal Application Addendum L1 (DOE, 2009)). No natural credible pathway has been established for contaminant transport to water-bearing zones below the repository horizon, as there is no hydrologic communication between the repository and underlying water-bearing zones. The U.S. Environmental Protection Agency (**EPA**) concluded in 1990 that natural vertical communication does not exist based on review of numerous studies (EPA, 1990). Furthermore, drilling boreholes for groundwater monitoring through the Salado and the Castile Formation (**Castile**) into the Bell Canyon would compromise the isolation properties of the repository medium.

~~Ground-water~~Groundwater monitoring at the WIPP facility ~~in the past has focused~~ focuses on the Culebra ~~member~~ Member (**Culebra**) of the Rustler Formation (**Rustler**) ~~(hereinafter referred to as the Culebra)~~ because it represents the most significant hydrologic contaminant migration pathway to the accessible environment. The Culebra is the most significant water-bearing unit lying above the repository. ~~Modeling of ground-water movement in the Culebra, based on the concept of a ground-water basin~~Groundwater movement in the Culebra, using results from the basin-scale groundwater model, is discussed in detail in Amended Renewal Application Addendum L1, Section L1-2a~~, Amended Renewal Application~~ (DOE, 2009).

~~The WIPP site is located in Eddy County in southeastern New Mexico (Figure L-1) within the Pecos Valley section of the southern Great Plains physiographic province (Powers et al., 1978). The site is 26 miles (mi) (42 kilometers [km]) east of Carlsbad, New Mexico in an area known as Los Medaños (the dunes). Los Medaños is a relatively flat, sparsely inhabited plateau with little water and limited land uses.~~

~~The WIPP site (Figure L-2) consists of 16 sections of Federal land in Township 22 South, Range 31 East. The 16 sections of Federal land were withdrawn from the application of public land laws by the WIPP Land Withdrawal Act (**LWA**), Public Law 102-579. The WIPP LWA transferred the responsibility for the administration of the 16 sections from the Department of Interior, Bureau of Land Management, to the U.S. Department of Energy (**DOE**). This law specified that mining and drilling for purposes other than support of the WIPP project are prohibited within this 16 section area with the exception of Section 31. Oil and gas drilling activities are restricted in Section 31 from the surface down to 6,000 feet.~~

This monitoring plan addresses requirements for sample collection, Culebra ~~ground-water~~groundwater surface elevation monitoring, Culebra ~~ground-water~~groundwater flow direction and rate determination, data management, and reporting of Culebra ~~ground-water~~groundwater monitoring data. It also identifies indicator ~~analytical~~ parameters and hazardous constituents selected to assess Culebra ~~ground-water~~groundwater quality~~, and establishes personnel responsibilities~~ for the WIPP ~~ground-water~~groundwater detection monitoring program (**DMP**). Because quality assurance is an integral component of the ~~ground-water~~groundwater sampling, analysis, and reporting process, quality assurance/quality control (**QA/QC**) elements and associated data acceptance criteria are included in this plan.

Instructions for performing field activities that will be conducted in conjunction with this DMP ~~sampling and analysis plan~~ are provided in the WIPP Standard Operating Procedures (**SOPs**)

(see Table L-3), which are maintained in facility files and which comply with the applicable requirements of 20.4.1.500 NMAC (incorporating 40 CFR § 264.97 (d)). ~~field operating procedures, referenced throughout this plan.~~ Procedures are required for each aspect of the Culebra ~~ground-water~~groundwater sampling process, including Culebra ~~ground-water~~groundwater surface elevation measurement, Culebra ~~ground-water~~groundwater flow direction and rate determination, sampling equipment installation and operation, field water-quality measurements, and sample collection. ~~These procedures prescribe proper field sampling techniques.~~ Data required by this plan ~~Samples~~ will be collected by ~~trained~~ qualified personnel in accordance with SOPs (Table L-3). ~~under the supervision and direction of qualified engineers, scientists, or other technical personnel.~~

L-1a Geologic and Hydrologic Characteristics

L-1a(1) Geology

The WIPP ~~site~~ facility is situated within the Delaware Basin bounded to the north and east by the Capitan Reef, which is part of the larger Permian Basin, located in the south-central region of North America. ~~During the Permian period, which came to a close about 245 million years ago, ancient seas covered the basin. Their later evaporation resulted in the deposition of a thick sequence of evaporites. Addendum L1, Section L1-1 of the Amended Renewal Application (DOE, 2009) presents a detailed discussion of the regional geologic history.~~ Three major evaporite-bearing formations were deposited in the Delaware Basin (see Figures L-3 and L-4 and Amended Renewal Application Addendum L1, Section L1-1 (DOE, 2009) for more detail):

- The Castile~~, which formed through evaporation of the Permian Sea,~~ consists of interbedded anhydrites and halite. Its upper boundary is at a depth of about 2,825 ft (861 m) below ground surface (**bgs**), and its thickness at the WIPP facility is 1,250 ft (381 m).

- The repository is located in the Salado, which overlies the Castile and resulted from prolonged desiccation that produced predominantly halite, with some carbonates, anhydrites, and clay seams. Its upper boundary is at a depth of about 850 ft (259 m) bgs, and it is about 2,000 ft (610 m) thick in the repository area.

- The Rustler Formation ~~(hereinafter referred to as the Rustler)~~ was deposited in a lagoonal environment during a major freshening of the basin and consists of carbonates, anhydrites, and halites. Its beds consist of clay and anhydrite and contain small amounts of brine. The Rustler~~'s~~ upper boundary is about 500 ft (152 m) bgs, and it ranges up to 350 ft (107 m) in thickness in the repository area.

These evaporite-bearing formations lie between two other formations significant to the geology and hydrology of the WIPP site. The Dewey Lake Redbeds Formation (**Dewey Lake**) overlying the Rustler is dominated by nonmarine sediments and consists almost entirely of mudstone, claystone, siltstone, and interbedded sandstone (see Amended Renewal Application Addendum L1, Section L1-1c(6) ~~of the Amended Renewal Application~~ (DOE, 2009)). This formation forms a 500-ft- (152-m) thick barrier of fine-grained sediments that retard the downward percolation of water into the evaporite units below.[4] The Bell Canyon ~~Formation (hereinafter referred to as the~~

~~[4] While there may be some uncertainty over the amount of vertical recharge occurring within the Rustler, the issue is only of significance to long-term performance calculations in which releases from the repository occur through the creation of a migration pathway resulting from drilling (inadvertently) in the WIPP area. The consequences of vertical recharge are bounded in the modeling~~

~~Bell Canyon)—~~ is the first water-bearing unit below the repository (see Amended Renewal Application Addendum L1, Section L1-1c(2) ~~of the Amended Renewal Application~~ (DOE, 2009))~~—~~ and is confined above by the thick evaporite ~~sequences~~ deposits of the Castile ~~above~~. It consists of 1,200 ft (366 m) of interbedded sandstone, shale, and siltstone.

The Salado was selected to host the WIPP repository for several reasons. First, it is regionally extensive, underlying an area of more than 36,000 square mi (mi^2) (93,240 square kilometers [km^2]). Second, its permeability is extremely low. Third, salt behaves mechanically in a plastic manner under pressure (the lithostatic pressure at the disposal horizon is approximately 2,200 ~~more than 2,000~~ pounds per square inch [lb/in.^{2}] or ~~13.8~~14.9 megapascals [MPa]) and eventually ~~moves~~ deforms to fill any opening (referred to as creep). Fourth, any fluid remaining in small fractures or openings is saturated with salt, is incapable of further salt dissolution, and has probably remained in place ~~for millions of years~~since deposition. Finally, the Salado lies between the Rustler and the Castile (Figure L-5), which contain very low permeability layers that help confine and isolate waste within and keep water outside of the WIPP repository (see Amended Renewal Application Addendum L1, Section L1-1c(5) and L1-1c(3) ~~of the Amended Renewal Application~~ (DOE, 2009)).

L-1a(2) ~~Ground-water~~Groundwater Hydrology

The general hydrogeology of the area surrounding the WIPP facility is described in this section starting with the first geologic unit below the Salado. Addendum L1, Section L1-2a of the Amended Renewal Application (DOE, 2009) provides more detailed discussions of the local and regional hydrogeology. Relevant hydrological parameters for the various rock units above the Salado at WIPP are summarized in Table L-1.

L-1a(2)(i) The Castile

The Castile is a basin-filling evaporite sequence of sediments surrounded by the Capitan Reef. The Castile represents a major regional ~~ground-water~~groundwater aquitard that effectively prevents upward migration of water from the underlying Bell Canyon. Fluid present in the Castile is very restricted because evaporites do not readily maintain pore space, solution channels, or open fractures at depth. Drill-stem tests conducted in the Castile during construction of the WIPP facility ~~found~~ determined its permeability to be lower than detection limits; however, the hydraulic conductivity has been conservatively estimated to be less than 10^{-8} ft (3×10^{-9} m) per day. A description of the Castile brine reservoirs outside the WIPP area is provided in Addendum L1, Section L1-2a(2)(b) of the Amended Renewal Application (DOE, 2009).

L-1a(2)(ii) The Salado

The Salado is an evaporite sequence that filled the remainder of the Delaware Basin and lapped extensively over the Capitan Reef and the back-reef sediments beyond. The Salado consists of approximately 2,000 ft (610 m) of bedded halite, with interbeds or seams of anhydrite, clay, and polyhalite. It acts hydrologically as a regional confining bed. The porosity of the Salado is very low and naturally interconnected pores are probably nonexistent in halite at the depth of the disposal horizon. Fluids associated with the Salado occur mainly as very small fluid inclusions in

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~~by assuming that under future climate conditions (which are assumed to be cooler and wetter), the ground-water surface elevation (water table) raises near ground surface, at which time the water table tends to mimic topography.~~

the halite crystals and also occur between crystal boundaries (interstitial fluid) of the massive crystalline salt formation; fluids also occur in clay seams and anhydrite beds. Permeabilities measured from the surface in the area of the WIPP facility range from 0.01 to 25 microdarcies. The most reliable value, 0.3 microdarcy, was obtained from well DOE-2. The results of permeability testing at the disposal horizon are within the range of 0.001 to 0.01 microdarcy. ~~As a comparison, the permeability of the Salado is roughly a thousand times less than that of a lower clay liner required of surface impoundments and landfills, assuming similar thicknesses.~~

L-1a(2)(iii) The Rustler

The Rustler has been the subject of extensive characterization activities because it contains the most transmissive hydrologic units overlying the Salado ~~(specifically, the Culebra Member, hereafter referred to as the Culebra)~~. Within the Rustler, five members have been identified. Of these, the Culebra is the most transmissive and has been the focus of most of the Rustler hydrologic studies.

The Culebra is the first continuous water-bearing zone above the Salado and is up to approximately 30 ft (9 m) thick. Water in the Culebra is usually present in fractures and is confined by overlying gypsum or anhydrite and underlying clay and anhydrite beds. The hydraulic gradient within the Culebra in the area of the WIPP facility is approximately 20 ft per mi (3.8 m per km) and becomes much flatter south and southwest of the site (Figure L-~~6~~5). Culebra transmissivities in the Nash Draw range up to 1,250 square ft (ft^2) (116 square m [m^2]) per day; closer to the WIPP facility, they are as low as 0.007 to 74 ft^2 (0.00065 to 7.0 m^2) per day. ~~The Culebra is hydrologically confined.~~

The two primary types of field tests that are being used to characterize the flow and transport characteristics of the Culebra are hydraulic tests and tracer tests.

The hydraulic tests consist of pump, injection, and slug testing of wells across the study area (see Amended Renewal Application Addendum L1, Section L1-2a(3)(a)(ii) ~~of the Amended Renewal Application~~ (DOE, 2009)). The most detailed hydraulic test data exist for the WIPP hydropads (e.g., H-19). The hydropads generally comprise a network of three or more wells located within a few tens of meters of each other. Long-term pumping tests have been conducted at hydropads H-3, H-11, and H-19 and at well WIPP-13 (see Amended Renewal Application Addendum L1, Section L1-2a(3)(a)(ii) ~~of the Amended Renewal Application~~ (DOE, 2009)). These pumping tests provided transient pressure data both at the hydropad and over a much larger area. Tests often included use of automated data-acquisition systems, providing high-resolution (in both space and time) data sets. In addition to long-term pumping tests, slug tests and short-term pumping tests have been conducted at individual wells to provide pressure data that can be used to interpret the transmissivity at that well (see Amended Renewal Application Addendum L1, Section L1-2a(3)(a)(ii) ~~of the Amended Renewal Application~~ (DOE, 2009)). ~~(Additional short-term pumping tests have been conducted in the Water Quality Sampling Program (WQSP) wells (see Addendum L1, Section L1-2a(3)(a)(ii) of the Amended Renewal Application (DOE, 2009)).~~ Detailed cross-hole hydraulic testing has ~~recently~~ been conducted at the H-19 hydropad (see Amended Renewal Application Addendum L1, Section L1-2a(3)(a)(ii) ~~of the Amended Renewal Application~~ (DOE, 2009)).

~~The hydraulic tests are designed to yield pressure data for estimation of hydrologic characteristics~~ Pressure data are collected during hydraulic tests for estimation of hydrologic characteristics such as transmissivity, permeability, and storativity. The pressure data from long-term pumping tests and the interpreted transmissivity values for individual wells are used ~~for~~

~~input to flow modeling~~in calibration of flow models. Some of the hydraulic test data and interpretations are also important for the interpretation of transport characteristics. For instance, the permeability values interpreted from the hydraulic tests at a given hydropad are needed for interpretations of tracer test data at that hydropad.

There is strong evidence that the permeability of the Culebra varies spatially and varies sufficiently that it cannot be characterized with a uniform value or range over the region of interest to WIPP. The transmissivity of the Culebra varies spatially over ~~six~~ten orders of magnitude from east to west in the vicinity of WIPP. ~~Over the site, Culebra transmissivity varies over three to four orders of magnitude. Figure D6-30 shows variation in transmissivity in the Culebra in the WIPP region.~~ Transmissivities have been calculated at 1×10^{-3}~~7~~ square feet per day (1×10^{-9}~~13~~ square meters per second) at well ~~P-18~~SNL-15 east of the WIPP site to 1×10^{3} square feet per day (1×10^{-3} square meters per second) at well H-7 in Nash Draw (see Amended Renewal Application Addendum L1, Section L1-2a(3)(a)(ii) ~~of the Amended Renewal Application~~ (DOE, 2009)).

Transmissivity variations in the Culebra are believed to be controlled by the relative abundance of open fractures rather than by primary (that is, depositional) features of the unit (Roberts, 2007). Lateral variations in depositional environments were small within the mapped region, and primary features of the Culebra show little map-scale spatial variability, according to Holt and Powers, 1988. Direct measurements of the density of open fractures are not available from core samples because of incomplete recovery and fracturing during drilling, but observation of the relatively unfractured exposures in the WIPP shafts suggests that the density of open fractures in the Culebra decreases to the east. ~~Qualitative correlations have been noted between transmissivity and several geologic features possibly related to open fracture density, including (1) the distribution of overburden above the Culebra, (2) the distribution of halite in other members of the Rustler, (3) the dissolution of halite in the upper portion of the Salado, and (4) the distribution of gypsum fillings in fractures in the Culebra.~~

~~Measured matrix porosities of the Culebra vary from 0.03 to 0.30. Fracture porosity values have not been measured directly, but interpreted values from tracer tests at the H-3, H-6, and H-11 hydropads vary from 5×10^{-4} to 3×10^{-3}. Data are insufficient to determine whether the average porosity of the matrix and fractures varies significantly on a regional scale.~~

Geochemical and radioisotope characteristics of the Culebra have been studied. There is considerable variation in ~~ground-water~~groundwater geochemistry in the Culebra. The variation has been described in terms of different hydrogeochemical facies that can be mapped in the Culebra. A halite-rich hydrogeochemical facies exists in the region of the WIPP site and to the east, approximately corresponding to the regions in which halite exists in units above and below the Culebra, and in which a large portion of the Culebra fractures are gypsum filled. An anhydrite-rich hydrogeochemical facies exists west and south of the WIPP site, where there is relatively less halite in adjacent strata and where there are fewer gypsum-filled fractures. Radiogenic isotopic signatures suggest that the age of the ~~ground-water~~groundwater in the Culebra is on the order of 10,000 years or more (see Amended Renewal Application Addendum L1 ~~of the Amended Renewal Application~~ (DOE, 2009)).

The radiogenic ages of the Culebra ~~ground-water~~groundwater and the geochemical differences provide information potentially relevant to the ~~ground-water~~groundwater flow directions and ~~ground-water~~groundwater interaction with other units and are important constraints on conceptual models of ~~ground-water~~groundwater flow. ~~Previous conceptual models of the Culebra (see Addendum L1 of the Amended Renewal Application (DOE, 2009)) have not been~~

~~able to consistently relate the hydrogeochemical facies, radiogenic ages, and flow constraints (that is, transmissivity, boundary conditions, etc.) in the Culebra.~~

~~However, t~~The Permittees have proposed a ~~new~~ conceptualization of ~~ground-water~~groundwater flow that ~~could~~ explains observed geochemical facies and ~~ground-water~~groundwater flow patterns. The ~~new~~ conceptualization, referred to as the basin-scale ~~ground-water~~groundwater ~~basin~~ model, offers a three dimensional approach to treatment of Supra-Salado rock units, and assumes vertical leakage (albeit very slow) between rock units of the Rustler exists (where hydraulic head is present).

Flow in the Culebra is considered transient. ~~This differs from previous interpretations, wherein no flow was assumed between Rustler units.~~ The model assumes that the ~~ground-water~~groundwater system is dynamic and is responding to the drying of climate that has occurred since the late Pleistocene period. The Permittees assumed that recharge rates during the late Pleistocene period were sufficient to maintain the water table near land surface, but has since dropped significantly. Therefore, the impact of local topography on ~~ground-water~~groundwater flow was greater during wetter periods, with discharge from the Rustler at WIPP to the west toward Nash Draw; flow is currently dominated by more regional topographic effects during drier times, with flow in the Rustler from WIPP towards the Balmorhea-Loving Trough to the south. ~~to a more southerly direction.~~

~~Four hydrogeochemical facies within the Culebra in the WIPP area (DOE, 1997) have been identified:~~

- ~~Zone A - saline (2-3 molal) NaCl brines, Mg/Ca ratio of 1.2 to 2;~~
- ~~Zone B - dilute (<0.1 molal) CaSO4 - rich ground water;~~
- ~~Zone C - variable composition (0.3-1.6 molal); Mg/Ca ratio 0.3 to 1.2; and~~
- ~~Zone D - high salinities (3-7 molal); K/Na weight ratios (0.2).~~

~~Facies A ground-water flow is slow, has not changed over the last 14,000 years, and probably recharged more than 600,000 years ago. Vertical leakage occurs to Facies A, and both lateral and vertical ground-water flow rates are extremely low. Facies B occurs in an area with greater vertical fracturing in the Culebra, and therefore exhibits more vertical infiltration and more rapid lateral flow in the Culebra. Flow in Facies B is currently to the south (it may mix with Facies C water to the southeast) but was more toward the west during wetter climates; vertical infiltration from the Dewey Lake to the Culebra Facies B is assumed by the Permittees to have occurred during wetter climates in an area south of the WIPP site. Facies C water was not diluted to create Facies B water. Facies C occurs "in between" Facies A and B, and ground-water flow entered the Culebra prior to the climate change (to drier conditions) 14,000 years ago. Facies C ground-water flow is to the south at WIPP, where the Permittees theorized that it joins with a small amount of Facies A solute being transported from the east. Ground-water flow rate in Facies C is faster than in A but slower than in B, and the proposed recharge area from the Dewey Lake to the Culebra was to the northeast of the WIPP site. Facies C ground water infiltrated into the Dewey Lake and then interacted with anhydrite and halite along its path to the Culebra, wherein it mixed with smaller amounts of Facies A water. the Permittees concluded that the presence of anhydrite within Rustler units does not preclude slow downward infiltration (DOE, 1997).~~

Using data from 22 wells, Siegel, Robinson, and Myers (1991) originally defined four hydrochemical facies (A, B, C, and D) for Culebra groundwater based primarily on ionic strength and major constituents. With the data now available from 59 wells, Domski and Beauheim

(2008) defined transitional A/C and B/C facies, as well as a new facies E for high–moles per kilogram (molal) Na-Mg Cl brines.

- Zone B - Dilute (ionic strength ≤0.1 molal) $CaSO_4$-rich groundwater, from southern high-transmissivity area, Mg/Ca molar ratio 0.32 to 0.52.
- Zone B/C - Ionic strength 0.18 to 0.29 molal, Mg/Ca molar ratio 0.4 to 0.6.
- Zone C - Variable composition waters, ionic strength 0.3 to 1.0 molal, Mg/Ca molar ratio 0.4 to 1.1.
- Zone A/C - Ionic strength 1.1 to 1.6 molal, Mg/Ca molar ratio 0.5 to 1.2.
- Zone A - Ionic strength >1.66 molal, up to 5.3 molal, Mg/Ca molar ratio 1.2 to 2.4.
- Zone D - Defined based on inferred contamination related to potash refining operations. Ionic strength 3 molal, K/Na weight ratios of ~0.2.
- Zone E - Wells east of the mudstone-halite margins, ionic strength 6.4 to 8.6 molal, Mg/Ca molar ratio 4.1 to 6.6.

The low-ionic-strength (≤0.1 molal) facies B waters contain more sulfate than chloride, and are found southwest and south of the WIPP site within and down the Culebra hydraulic gradient from the southernmost closed catchment basins, mapped by Powers (2006), in the southwest arm of Nash Draw. These waters reflect relatively recent recharge through gypsum karst overlying the Culebra. However, with total dissolved solids (**TDS**) concentrations in excess of 3,000 mg/L, the facies B waters do not represent modern-day precipitation rapidly reaching the Culebra. They must have residence times in the Rustler sulfate units of thousands of years before reaching the Culebra.

The higher-ionic-strength (0.3–1 molal) facies C brines have differing compositions, representing meteoric waters that have dissolved $CaSO_4$, overprinted with mixing and localized processes. Facies A brines (ionic strength 1.6–5.3 molal) are high in NaCl and are clustered along the extent of halite in the middle of the Tamarisk Member of the Rustler Formation. Facies A represents old waters (long flow paths) that have dissolved halite and/or connate brine, or a mixture of the two from facies E. The facies D brines, as identified by Siegel, Robinson, and Myers (1991), are high-ionic-strength solutions found in western Nash Draw with high K/Na ratios representing waters contaminated with effluent from potash refining operations. Similar water is found at shallow depth (<36 ft (11 m)) in the upper Dewey Lake at SNL-1, just south of the Intrepid East tailings pile. The newly defined facies E waters are very high ionic strength (6.4–8.6 molal) NaCl brines with high Mg/Ca ratios. The facies E brines are found east of the WIPP site, where Rustler halite is present above and below the Culebra, and halite cements are present in the Culebra. They represent primitive brines present since deposition of the Culebra and immediately overlying strata.

Previously, the Permittees and others believed the geochemistry of Culebra ~~ground water~~groundwater was inconsistent with flow directions. This was based on the premise that ~~F~~facies C water must transform to facies B water (e.g. become "fresher"), which is inconsistent with the observed flow direction. It is now believed that the observed geochemistry and flow directions can be explained with different recharge areas and Culebra travel paths (Amended Renewal Application Addendum L1 ~~of the Amended Renewal Application~~ (DOE, 2009)).

Head distribution in the Culebra (see Amended Renewal Application Addendum L1 ~~of the Amended Renewal Application~~ (DOE, 2009)) is consistent with basin-scale ~~ground-water~~groundwater ~~basin~~ modeling results indicating that the generalized ~~ground-water~~groundwater flow direction in the Culebra is currently north to south. However, the fractured nature of the Culebra, coupled with variable fluid densities, can cause localized flow patterns to differ from general flow patterns.

~~Ground-water levels in the Culebra in the WIPP region have been measured for several decades. Water-level rises have been observed in the WIPP region and are possibly related to recovery from impacts caused by shaft installation, response to potash effluent discharge, or are unexplained, as discussed below. The extent of water-level rise observed at a particular well depends on several factors, but the proximity of the observation point to the potential cause of the water-level rise appears to be a primary factor.~~

~~In the vicinity of the WIPP site, water-level rises are believed to be caused by recovery from drainage into the shafts. Drainage into shafts has been reduced by a number of grouting programs over the years, most recently in 1993 around the Air Intake Shaft. Northwest of the site, in and near Nash Draw, water levels appear to fluctuate in response to effluent discharge from potash mines. Correlation of water-level fluctuation with potash mine discharge, however, cannot be proven definitively because sufficient data on the timing and volumes of discharge are not available. Water-level rises in the vicinity of the H-9 hydropad, about 6.5 miles south of the site, are thought to be caused by neither WIPP activities nor potash mining discharge. They remain unexplained. The Permittees continue to monitor ground-water levels throughout the region.~~

Groundwater levels in the Culebra in the WIPP region have been measured in numerous wells. Water-level rises have been observed in the WIPP region and are attributed to causes discussed in the Renewal Application Addendum L1, Section L1-2a(3)(a)(ii) (DOE, 2009). The extent of water-level rise observed at a particular well depends on several factors, but the proximity of the observation point to the cause of the water-level change appears to be a primary factor.

Hydrological investigations conducted from 2003 through 2007 provided new information, some of it confirming long-held assumptions and some offering new insight into the hydrological system around the WIPP site. A Culebra monitoring network optimization study was completed by McKenna (2004) and updated by Kuhlman (2010) to identify locations where new Culebra monitoring wells would be of greatest value and to identify wells that could be removed from the network with little loss of information.

As discussed in Amended Renewal Application Addendum L1, Section L1-2a(3)(a)(ii) (DOE, 2009), extensive hydrological testing has been performed in the new wells. This testing has involved both single well tests, which provide information on local transmissivity and heterogeneity, and long-term (19 to 32 days) pumping tests that have created observable responses in wells up to 5.9 mi (9.5 km) away.

Inferences about vertical flow directions in the Culebra have been made from well data collected by the Permittees. Beauheim (1987) reported flow directions towards the Culebra from both the underlying Los Medaños~~unnamed lower member~~ Member of the Rustler **(Los Medaños)** and the overlying Magenta ~~member~~ Member of the Rustler **(Magenta)** over the WIPP site, indicating that the Culebra acts as a drain for the units around it. This is consistent with results of basin-

scale ~~ground-water~~groundwater ~~basin~~ modeling. ~~Recent simulations to enhance the conceptual understanding of the geohydrology of the Rustler can be found in Corbet and Knupp, 1996.~~

Use of water from the Culebra in the WIPP area is quite limited because of its varying yields and high salinity. The Culebra is not used for water supply in the immediate WIPP site vicinity. Its nearest use is approximately 7 mi (11 km) southwest of the WIPP facility, where salinity is low enough to allow its use for livestock watering ~~(shown, for example, as Well H-8 in Figure L-7). However, the Permittees identified the Culebra as potential aquifer in the Compliance Certification Application (DOE, 1996). Because of this, the Culebra will be the focus of future ground-water monitoring at WIPP as it is also the most transmissive continuous water-bearing zone at WIPP and is the most likely pathway for contaminant migration~~.

L-2 General Regulatory Requirements

Because geologic repositories such as the WIPP facility are defined under the Resource Conservation and Recovery Act (**RCRA**) as land disposal facilities and as miscellaneous units, the ~~ground-water~~groundwater monitoring requirements of 20.4.1.500 NMAC (incorporating 40 CFR §§264.600 through 264.603) shall be addressed. The requirements of 20.4.1.500 NMAC (incorporating 40 CFR §§264.90 through 264.101) ~~applies~~ apply to miscellaneous unit treatment, storage, and disposal facilities (**TSDF**) only if ~~ground-water~~groundwater monitoring is needed to satisfy 20.4.1.500 NMAC (incorporating 40 CFR §§264.601 through 264.603) environmental performance standards.

The New Mexico Environment Department (**NMED**) has concluded that ~~ground-water~~groundwater monitoring in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264 Subpart F) at WIPP is necessary to meet the requirements of 20.4.1.500 NMAC (incorporating 40 CFR §§264.601 through 264.603).

L-3 WIPP ~~Ground-water~~ Detection Monitoring Program (DMP)—Overview

L-3a Scope

~~The Permittees have established a RCRA "Ground-water Detection Monitoring Program (DMP) Plan" to define and protect ground-water resources at WIPP. One of the objectives of the WIPP DMP is to establish, by means of ground-water sampling and analysis, an accurate and representative ground-water database that is scientifically defensible and demonstrates regulatory compliance. In addition, the DMP will be used to determine background or existing conditions of ground-water quality and quantity, including ground-water surface elevation and direction of flow, around the WIPP facility area.~~

This DMP plan governs ~~all ground-water~~groundwater sampling events conducted to meet the applicable requirements of 20.4.1.500 NMAC (incorporating 40 CFR 264~~§§~~ Subpart F ~~264.90 through 264.101~~), and ensures that ~~all~~ such data are gathered in accordance with these and other applicable requirements. ~~The ground-water quality data generated by monitoring activities will provide a comprehensive background database against which future a~~Analytical results collected ~~can be compared~~ during the DMP are compared to the baseline established in this Permit to determine whether or not a release has occurred.

~~Ground-water monitoring at WIPP has been historically conducted by several programs including the WIPP Site Characterization Program, the WIPP WQSP, and recently the WIPP Ground-water Surveillance Program (**GWSP**). Ground-water quality and ground-water surface~~

~~elevation data have been collected by these programs for over 12 years at WIPP. Data from the WQSP wells (which are widely distributed across the area, see Figure L-8) will be used to continually define changes in the area's potentiometric surface and ground-water flow directions. New monitoring wells included in the WIPP GWSP (WQSP wells 1-6a) were constructed to the specifications provided in the RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (EPA, 1986) and constitute the RCRA ground-water monitoring network specified in this DMP as required by 20.4.1.500 NMAC (incorporating 40 CFR §§264.90 through 264.101). These wells are being used to establish background ground-water quality, ground-water surface elevations and flow directions in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §§264.97(f) and (g) and 264.98(e)). Justification for the locations of these wells (3 upgradient and 4 downgradient) is presented below.~~

There are two separate components of the Groundwater Monitoring Program, the Detection Monitoring Program (DMP) and the Water Level Monitoring Program (WLMP). The first component consists of a network of six Detection Monitoring Wells (DMWs). The DMWs (WQSP 1-6) were constructed to be consistent with the specifications provided in the Groundwater Monitoring Technical Enforcement Guidance Document and constitute the RCRA groundwater monitoring network specified in the DMP. The DMWs were used to establish background groundwater quality in accordance with 20.4.1.500 NMAC (incorporating 40 CFR § 264.97 and 264.98 (f)). The second component of the Groundwater Monitoring Program is the WLMP, which is used to determine the groundwater surface elevation and flow direction. Table L-4 is a list of the wells used in the WLMP as of January 1, 2011. The list of wells is subject to change due to plugging and abandonment and drilling of new wells.

L-3b Current WIPP DMP

~~The WQSP wells 1 through 6 constitute the RCRA DMP for WIPP (Figure L-9 and Permit Attachment B, Figure B2-3) during detection monitoring as required by 20.4.1.500 NMAC (incorporating 40 CFR §§264.90 through 264.101). This monitoring plan is a continuation of the current WIPP GWSP, and these wells will serve as the monitoring locations during background water quality characterization and the RCRA DMP (Figure L-9 and Permit Attachment B, Figure B2-3).~~

Wells WQSP-1, WQSP-2, and WQSP-3 ~~were~~ are located directly upgradient (north) of the WIPP shaft area. ~~The locations of the three upgradient wells were selected to be representative of the flow vectors of ground water moving downgradient onto the WIPP site. Figure 34 of Davies, 1989, shows the simulation of direction and magnitude of ground-water flow. The upgradient wells were located based on the flow vectors resulting from this model simulation. The original WQSP observation wells, as well as those in the RCRA DMP, have been and will continue to be used as piezometer wells to support collection of ground-water surface elevation and ground-water flow modeling data to demonstrate regulatory compliance. Well location surveys for each of the seven wells were performed by the Permittees' survey personnel using the State Plane Coordinates North American Datum Model 27 method. Results of the surveys are on file with the New Mexico State Engineers Department along with the associated extraction permits for each well.~~

WQSP-4, WQSP-5, and WQSP-6 ~~were~~ are located downgradient (south) of the WIPP shaft area ~~in concert with the flow vectors shown by this model simulation~~. All three Culebra downgradient wells (WQSP-4, 5, and 6) were sited to be located generally in the path of contaminants that might be released from the shaft area in the Culebra. ~~based on the greatest velocity magnitude of ground-water flow leaving the shaft area as shown on Figure 34 of~~

~~Davies, 1989, and upgradient of the WIPP LWA boundary.~~ Well WQSP-4 was also specifically located to monitor the zone of higher transmissivity~~around wells DOE-1 and H-11~~, which may represent faster flow path away from the WIPP shaft area to the LWA boundary (Amended Renewal Application Addendum L1, Section L1-2a(3)(a)(ii) ~~of the Amended Renewal Application~~ (DOE, 2009)).

~~The Culebra has been selected for the focus of the DMP due to it being regionally extensive and exhibiting the most significant transmissivity of the water-bearing units at WIPP. The Culebra has been extensively studied during all past hydrologic characterization programs and found to be the most likely hydrologic pathway to the accessible environment or compliance point for any potential contamination.~~

The compliance point is defined in 20.4.1.500 NMAC (incorporating 40 CFR §264.95) as the vertical plane immediately downgradient of the hazardous waste management unit area (i.e., at the downgradient footprint of the WIPP repository). Permit Part 5 specifies the point of compliance as "the vertical surface located at the hydraulically downgradient limit of the Underground HWDUs that extends to the Culebra Member of the Rustler Formation."~~ The RCRA ground-water monitoring network was not installed immediately downgradient of this plane. However, because the Underground HWDUs at WIPP are Subpart X units, and due to the relatively unique containment and transport aspects of the site, monitoring at the proposed locations will allow for detection of releases prior to release of these contaminants to the general public at the LWA boundary.~~ Wells WQSP-4, 5, and 6 are situated to demonstrate that during the operating life of the facility (including closure), release of contaminants to the general public will not occur.

~~The DMP wells were located to intercept flow vectors downgradient away from the WIPP shafts area based on current density corrected potentiometric surfaces (Figure L-9). Based on natural contours of the potentiometric surface (Figure L-9) the selected well placement locations are downgradient of the general flow direction from the shaft area.~~ Transport modeling suggests ~~of contaminant migration throughout the Culebra to the Land Withdrawal Act boundary suggests~~ that travel times from the Waste Handling shaft to the LWA boundary could be on the order of thousands of years.~~ if, under worst case conditions,~~ This assumes conditions where hazardous constituents ~~could~~ migrate from the sealed repository (post closure) to the Culebra via the sealed shafts. ~~If contaminants were to migrate from the disposal facility, they would be detected by the DMP wells located midway between the shafts and LWA such that samples from wells could detect these contaminants long before they could reach the LWA boundary.~~

Potentiometric surfaces and ~~ground-water~~groundwater flow directions defined for the Culebra prior to large-scale pumping in the WIPP area and the excavation of WIPP shafts suggest~~s~~ that flow was generally to the south-southeast from the waste disposal and shaft areas (Mercer, 1983; Davies, 1989). ~~Recent (December 1996) p~~Potentiometric surface maps of the Culebra adjusted for density differences show very similar characteristics. The wells used for measuring the potentiometric surface of the Culebra are measured monthly and listed in Table L-4. ~~(Figure L-9). WQSP-4, WQSP-5, and WQSP-6 have been located downgradient of the waste emplacement areas according to present-day adjusted potentiometric surfaces.~~

~~Potentiometric surfaces that have not been corrected for density differences and that contain transient relics of previous pumping-drawdown events do not reflect accurate natural ground-water flow directions and should not be used to assess the adequacy of ground-water monitoring locations. Previous potentiometric surface maps showing a potentiometric low and hydrologic gradient toward the area between WQSP-3 and WQSP-4 had not been adjusted to~~

~~freshwater head equivalents, and had also been influenced by the long-term pumping at well H-19. Hence, some historic maps may not represent natural Culebra flow directions or gradients, and appropriateness of the RCRA monitoring network cannot be definitively evaluated using these data.~~

L-3b(1) Detection Monitoring ~~P~~Well Construction Specification

~~L-3b(1)(i) WQSP-1~~

Diagrams of the six DMP wells are shown in Figures L-7 through L-12. Detailed descriptions of geology and construction methods may be found in DOE 1995.

The six WQSP Culebra wells ~~Well WQSP-1 was~~ were drilled between September 13 and ~~16~~October 26, 1994~~, to a~~. The total depth of ~~737 ft (225 m) bgs~~each well is shown in Table L-5. The ~~borehole was~~wells were drilled through the Culebra and ~~extends 15 ft (5 m)~~ into the ~~unnamed lower member of the Rustler~~Los Medaños as shown in Table L-5. The wells ~~was~~ were drilled to ~~a depth of 693 ft (211 m) bgs using~~the top of the Culebra using compressed air as the drilling fluid~~. The interval from 693 to 737 ft (225 to 211 m) bgs (the total depth) was drilled using air mist with a foaming agent as the drilling fluid. WQSP-1 was drilled to 695.6 ft (212 m) bgs using~~ and a 9⅞-in. drill bit. The wells were then ~~and was~~ cored ~~from 695.6 to 737 ft (212 to 225 m) bgs~~ using a 5¼-in. core bit to cut 4-in.- (0.1-m) diameter core to total depth. See Table L-5 for the drilling and coring intervals for each well. After coring, ~~WQSP-1~~ WQSP wells were ~~was~~ reamed to 9⅞-in. (0.3 m) in diameter to total depth. ~~WQSP-1 was~~After reaming, wells were cased from the surface to ~~737 ft (224.6 m) bgs~~total depth with 5-in. (0.1-m) (0.28-in. [0.7-centimeter (cm)] wall) blank fiberglass casing with in-line 5-in.- (0.1-m) diameter fiberglass 0.02-in. (0.1-cm) slotted screen across the Culebra interval ~~from 702 to 727 ft (214 to 222 m) bgs~~as shown in Table L-5. The annulus between the borehole wall and the casing/screen is packed with sand ~~from 640 to 651 ft (195 to 198 m) bgs~~ and with 8/16 Brady gravel ~~from 651 to 737 ft (198 to 225 m) bgs.~~ as indicated in Table L-5. ~~Based on core log results, the Culebra is located from 699 to 722 ft (213 to 220 m) bgs (see Figure L-10).~~

~~L-3b(1)(ii) WQSP-2~~

~~Well WQSP-2 was drilled between September 6 and 12, 1994, to a total depth of 846 ft (257.9 m) bgs. The borehole was drilled through the Culebra and extends 12.3 ft (3.7 m) into the unnamed lower member of the Rustler. The well was drilled to a depth of 800 ft (244 m) bgs with a 9⅞-in. drill bit using compressed air as the drilling fluid. The interval from 800 to 846 ft (244 to 258 m) bgs (the total depth) was drilled with a 5¼-in. core bit to cut 4-in.- (0.1-m) diameter core using air mist with a foaming agent as the drilling fluid. After coring, WQSP-2 was reamed to 9⅞-in. (0.3 m) in diameter to total depth. WQSP-2 was cased from the surface to 846 ft (258 m) bgs with 5-in. (0.1-m) (0.28-in. [0.7-cm] wall) blank fiberglass casing with in-line 5-in.- (0.1-m) diameter fiberglass 0.02-in. (0.1-cm) slotted screen across the Culebra interval from 811 to 836 ft (247 to 255 m) bgs. The annulus between the borehole wall and the casing/screen is packed with sand from 790 to 793 ft (241 to 242 m) bgs and with 8/16 Brady gravel from 793 to 846 ft (242 to 258 m) bgs. Based on core log results, the Culebra is located from 810.1 to 833.7 ft (247 to 254 m) bgs (see Figure L-11).~~

~~L-3b(1)(iii) WQSP-3~~

~~Well WQSP-3 was drilled between October 21 and 26, 1994, to a total depth of 880 ft (268 m) bgs. The borehole was drilled through the Culebra and extends 10 ft (3.1 m) into the unnamed~~

~~lower member of the Rustler. The well was drilled to a depth of 880 ft (268 m) bgs using compressed air as the drilling fluid. The borehole was cleaned using air mist with a foaming agent. WQSP-3 was drilled to 833 ft (254 m) bgs using a 9⅞ in. drill bit and was cored from 833 to 879 ft (254 to 268 m) bgs using a 5¼ in. core bit to cut 4 in. (0.1 m) diameter core. After coring, WQSP-3 was reamed to 9⅞ in. (0.3 m) in diameter to total depth of 880 ft (268 m) bgs. WQSP-3 was cased from the surface to 880 ft (268 m) bgs with 5 in. (0.1 m) (0.28 in. [0.7 cm] wall) blank fiberglass casing with in-line 5 in. (0.1 m) diameter fiberglass 0.02 in. (0.1 cm) slotted screen across the Culebra interval from 844 to 869 ft (257 to 265 m) bgs. The annulus between the borehole wall and the casing/screen is packed with sand from 827 to 830 ft (252 to 253 m) bgs and with 8/16 Brady gravel from 830 to 880 ft (253 to 268 m) bgs. Based on core log results, the Culebra is located from 844 to 870 ft (257 to 265 m) bgs (see Figure L-12).~~

~~L-3b(1)(iv) WQSP-4~~

~~Well WQSP-4 was drilled between October 5 and 10, 1994, to a total depth of 800 ft (244 m) bgs. The borehole was drilled through the Culebra and extends 9.2 ft (2.8 m) into the unnamed lower member of the Rustler. The well was drilled to a depth of 740 ft (226 m) bgs with a 9⅞ in. drill bit using compressed air as the drilling fluid. The interval from 740.5 to 798 ft (225.7 to 243 m) bgs was cored with a 5¼ in. (0.13 m) core bit to cut 4 in. (0.1 m) diameter core using air mist with a foaming agent as the drilling fluid. After coring, WQSP-4 was reamed to 9⅞ in. (0.3 m) in diameter to total depth of 800 ft (244 m) bgs. WQSP-4 was cased from the surface to 800 ft (244 m) bgs with 5 in. (0.1 m) (0.28 in. [0.7 cm] wall) blank fiberglass casing with in-line 5 in. (0.1 m) diameter fiberglass 0.02 in. (0.1 cm) slotted screen across the Culebra interval from 764 to 789 ft (233 to 241 m) bgs. The annulus between the borehole wall and the casing/screen is packed with sand from 752 to 755 ft (229 to 230 m) bgs and with 8/16 Brady gravel from 755 to 800 ft (230 to 244 m) bgs. Based on core log results, the Culebra is located from 766 to 790.8 ft (233 to 241 m) bgs (see Figure L-13).~~

~~L-3b(1)(v) WQSP-5~~

~~Well WQSP-5 was drilled between October 12 and 19, 1994, to a total depth of 681 ft (208 m) bgs. The borehole was drilled through the Culebra and extends into the unnamed lower member of the Rustler. The well was drilled to a depth of 676 ft (206 m) bgs using compressed air as the drilling fluid. The borehole was cleaned using air mist with a foaming agent. WQSP-5 was drilled to 648 ft (198 m) bgs using a 9⅞ in. drill bit and was cored from 648 to 676 ft (198 to 206 m) bgs using a 5¼ in. core bit to cut 4 in. (0.1 m) diameter core. After coring, WQSP-5 was reamed to 9⅞ in. (0.3 m) in diameter to total depth of 681 ft (208 m) bgs. WQSP-5 was cased from the surface to 681 ft (208 m) bgs with 5 in. (0.1 m) (0.28 in. [0.7 cm] wall) blank fiberglass casing with in-line 5 in. (0.1 m) diameter fiberglass 0.02 in. (0.1 cm) slotted screen across the Culebra interval from 646 to 671 ft (197 to 205 m) bgs. The annulus between the borehole wall and the casing/screen is packed with sand from 623 to 626 ft (190 to 191 m) bgs and with 8/16 Brady gravel from 626 to 681 ft (191 to 208 m) bgs. Based on core log results, the Culebra is located from 648 to 674.4 ft (198 to 205.6 m) bgs (see Figure L-14).~~

~~L-3b(1)(vi) WQSP-6~~

~~Well WQSP-6 was drilled between September 26 and October 3, 1994, to a total depth of 616.6 ft (187.9 m) bgs. The borehole was drilled through the Culebra and extends 9.7 ft (3 m) into the unnamed lower member of the Rustler. The well was drilled to a depth of 367 ft (112 m) bgs using compressed air as the drilling fluid. The interval from 367 to 616 ft (112 to 188 m) bgs (the total depth) was drilled using brine as the drilling fluid. WQSP-6 was drilled to 568 ft (173 m) 4-~~

~~in. (0.1 m) ft bgs using a 9⅞ in. drill bit and was cored from 568 to 616 ft (173 to 188 m) bgs using a 5¼ in. core bit to cut 4 in. (0.1 m) diameter core. After coring, WQSP-6 was reamed to 9⅞ in. (0.3 m) in diameter to total depth of 616.6 ft (188 m) bgs. WQSP-6 was cased from the surface to 616.6 ft (188 m) bgs with 5 in. (0.1 m) (0.28 in. [0.7 cm] wall) blank fiberglass casing with in-line 5 in. (0.1 m) diameter fiberglass 0.02 in. (0.1 cm) slotted screen across the Culebra interval from 581 to 606 ft (177 to 185 m) bgs. The annulus between the borehole wall and the casing/screen is packed with sand from 567 to 570 ft (173 to 173.7 m) bgs and with 8/16 Brady gravel from 570 to 616.6 ft (174 to 188 m) bgs. Based on core log results, the Culebra is located from 582 to 606.9 ft (177 to 185 m) bgs (see Figure L-15).~~

L-4 Monitoring Program Description

The WIPP DMP has been designed to meet the ~~ground-water~~groundwater monitoring requirements of 20.4.1.500 NMAC (incorporating 40 CFR §§264.90 through 264.101). The following sections of the monitoring plan specify the components of the DMP.

L-4a Monitoring Frequency

~~The seven RCRA monitoring wells have been sampled on a semiannual basis since their installation in 1995 to establish background ground-water quality in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §§264.97 and 264.98). This has included at least two full rounds of 20.4.1.500 NMAC (Incorporating 40 CFR §264) Appendix IX analysis for samples from each of the proposed RCRA detection monitoring wells. In addition, ground-water samples were collected from the DMP wells (from March 1997 until waste emplacement) at a frequency of four sample replicates collected semiannually from each well for the indicator parameters of pH, specific conductance (**SC**), total organic carbon (**TOC**), and total organic halogen (**TOX**) to further establish background ground-water quality until detection monitoring in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.98) becomes applicable. A total of four rounds of Appendix IX analysis will be conducted for samples from each well for use in background ground-water quality determinations.~~

~~Detection monitoring will start when the Permittees emplace waste and continue through the post-closure phase as required by 20.4.1.500 NMAC (incorporating 40 CFR §264.90[c]). During detection monitoring, one sample and one sample duplicate will be collected semiannually from each well in the RCRA detection monitoring network. As shown in Table L-2, the DMP will continue to collect ground-water quality samples for all seven wells on a semiannual basis during the life of the DMP. 20.4.1.500 NMAC (incorporating 40 CFR §264.97[g][2]) provides that an alternate sampling frequency to that provided in 20.4.1.500 NMAC (incorporating 40 CFR §264.98) may be proposed by the Permittees. Given the nature and rate of ground-water flow in the area surrounding WIPP, collecting and analyzing one sample semiannually will be protective of human health and the environment because any hazardous constituent leaving the underground disposal facility will not have the potential to migrate beyond the ground-water monitoring network in a one-year time frame. Ground-water flow characteristics are presented in detail in Addendum L1, Section L1-2a of the Amended Renewal Application (DOE, 2009).~~

~~Ground-water~~Groundwater surface elevations will be monitored in each of the ~~seven~~ six ~~DMP~~ DMWs ~~wells~~ on a monthly basis. The ~~ground-water~~groundwater surface elevation in each ~~DMP~~ DMW ~~well~~ will also be measured prior to each annual sampling event. ~~Ground-water~~Groundwater surface elevation measurements in the ~~other~~ WLMP wells ~~existing WQSP well sites~~ will also be monitored on a monthly basis when accessible ~~to supplement the area water-level database and to help define regional changes in ground-water flow directions and~~

~~gradients~~. The characteristics of the ~~RCRA DMP~~DMW (sampling frequency, location) will be evaluated if significant changes are observed in the ~~ground-water~~groundwater flow direction or gradient. ~~If any change occurs which could affect the ability of the DMP to fulfill the requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264 Subpart F), the Permittees shall promptly notify NMED in writing and apply for a permit modification, if appropriate.~~

L-4b Analytical Parameters and Hazardous Constituents

The parameters listed in Part 5, Table 5.4.a and hazardous constituents listed in Part 5, Table 5.4.b ~~analytes of interest~~ are measured ~~to establish~~ as part of the DMP. ~~background ground-water quality prior to emplacement of waste include all indicator parameters and all other parameters listed in 20.4.1.500 NMAC (incorporating 40 CFR §264) Appendix IX. Field measurements of pH, SC, temperature, chloride, Eh, total iron, and alkalinity are also measured during background sampling.~~

~~The DMP was initiated upon waste emplacement, at which time the semiannual samples will be analyzed for the parameters listed in Table L-3. Parameters to be analyzed by the contract laboratory such as specific conductance, total dissolved solids, total suspended solids, density, pH, total organic carbon, and total organic halogens were included as indicator parameters because of their universal commonality to ground water. Parameters such as chloride, alkalinity, calcium, magnesium, and potassium were included as matrix specific general indicator parameters. Calcium, magnesium, potassium, chloride, and iron may be deleted during detection monitoring, with prior approval of NMED. Organic and inorganic compounds on the right hand side of Table L-3 were chosen because they will occur in the waste to be disposed at the WIPP facility.~~ Additional ~~parameters~~ constituents may be identified through changes to the list of hazardous waste numbers authorized for disposal at the WIPP facility. ~~the tentatively identified compound (TIC) process specified in the Waste Analysis Plan, Permit Attachment C.~~ If ~~compounds~~ constituents are identified, these will be added to ~~the DMP list~~Part 5, Table 5.4.b, unless the Permittees provide justification for their omission (e.g., constituent not in 40 CFR §264 Appendix IX), and this omission is approved by NMED.

L-4c ~~Ground-water~~Groundwater Surface Elevation Measurement, Sample Collection and Laboratory Analysis

~~Ground-water~~Groundwater surface elevations will be measured in each ~~well~~DMW prior to ~~ground-water~~groundwater sample collection. ~~Ground-water~~Groundwater will be extracted using serial and final sampling methods. Serial samples will be collected until ~~ground-water~~groundwater field indicator parameters stabilize, after which the final sample for complete analysis will be collected. Final samples will then be analyzed for the ~~DMP analytical suite~~ parameters and constituents in Part 5, Tables 5.4.a and 5.4.b.

L-4c(1) ~~Ground-water~~Groundwater Surface Elevation Monitoring Methodology

The WIPP ~~ground-water~~groundwater level monitoring program (**WLMP**) activities are conducted in accordance with the WIPP facility SOPs listed in Table L-3. ~~is a subprogram of the DMP. The quality assurance activities of the WLMP are in strict accordance with WP 13-1, and the quality assurance implementing procedure specific to ground-water surface elevation monitoring is~~

~~WIPP Procedure WP 02-EM1014[2]. Current versions of both WP 13-1 and WP 02-EM1014 are maintained in the WIPP Operating Record.~~

~~Ground-water surface elevation monitoring is in progress now and will continue through the post-closure care period specified in Permit Part 7. This section of the plan addresses the activities of the WLMP during the preoperational and operational phases of WIPP.~~

~~Collection of ground-water surface elevation data is required by 20.4.1.500 NMAC (incorporating 40 CFR §264.97(f)). These data also provide:~~

- ~~Data collection as required by the Environmental Monitoring Plan.~~
- ~~A means to fulfill commitments made in the Final Environmental Impact Statement (**FEIS**).~~
- ~~A means to comply with future ground-water inventory and monitoring regulations.~~
- ~~Input for making land-use decisions, (i.e., designing long-term active and passive institutional controls for the site).~~
- ~~Assistance in understanding any changes to readings from the water-pressure transducers installed in each of the shafts to monitor water conditions behind the liners.~~
- ~~An understanding of whether or not the horizontal and vertical gradients of flow are changing over time.~~

~~The objective of the WLMP is to extend the documented record of ground-water surface elevation fluctuations in the Culebra and Magenta members of the Rustler in the vicinity of the WIPP facility and to meet the requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264.97(f)). Ground-water surface elevation data will be collected from each well of the RCRA DMP. Ground-water surface elevation data will also be collected from other Culebra wells, as well as monitoring wells completed in other water-bearing zones overlying and underlying the WIPP repository horizon (see Figure L-18) when access to those zones is possible. This includes, but is not limited to, the Bell Canyon, the Forty-niner, the contact zone between the Rustler and Salado, and the Dewey Lake.~~

Groundwater surface elevation measurements will be taken monthly at each of the six DMWs and prior to the annual sampling event. Additionally, ~~Ground-water~~groundwater surface elevation measurements will be taken monthly in the other Culebra wells as listed in Table L-4, ~~at least one accessible completed interval at each available well pad~~when accessible. ~~At well pads with two or more wells completed in the same interval, quarterly measurements will be taken in the redundant wells (w~~Well locations are shown in Figure L-~~18~~14~~)~~. ~~Ground-water surface elevation measurements will be taken monthly at each of the seven DMP wells, as well as prior to each sampling event.~~ If a cumulative ~~ground-water~~groundwater surface elevation change of more than 2 feet is detected in any DMP well over the course of one year which is not

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~~[2] WP 02-EM1014 "Groundwater Level Measurements" is a technical procedure that specifies the steps followed by Environmental Monitoring (**EM**) personnel for making manual ground-water level measurements in ground-water wells in the vicinity of the WIPP facility. The procedure provides general instructions including prerequisites, safety precautions, performance frequency, quality assurance, and records. Specific instructions are included for using the water level measurement electrical conductance probe and data management.~~

attributable to site tests or natural stabilization of the site hydrologic system, the Permittees will notify NMED in writing and discuss the origin of the changes in the ~~report~~ Annual Culebra Groundwater Report specified in Permit Part 5. Abnormal, unexplained changes in ~~ground-water~~groundwater surface elevation ~~may~~ will be evaluated to determine if they indicate changes in site recharge/discharge which could affect the assumptions regarding ~~DMP~~ WQSP well placement and constitute new information as specified in 20.4.1.900 NMAC (incorporating 40 CFR §270.41(a)(2)).

~~Ground-water~~Groundwater surface elevation monitoring will continue through the post-closure care period specified in Permit Part 7. The Permittees may temporarily increase the frequency of monitoring to effectively document naturally occurring or artificial perturbations that may be imposed on the hydrologic systems at any point in time. This will be conducted in selected key wells by increasing the frequency of the manual ~~ground-water~~groundwater surface elevation measurements or by monitoring water pressures with the aid of electronic pressure transducers and remote data-logging systems. The Permittees will include such additional data in the reports specified in Section L-5c.

Interpretation of ~~ground-water~~groundwater surface elevation measurements and corresponding fluctuations over time is complicated at the WIPP facility by spatial variation in fluid density ~~both vertically in well bores and areally from well to well~~. To monitor the hydraulic gradients of the hydrologic flow systems ~~at WIPP~~ accurately, actual ~~ground-water~~groundwater surface elevation measurements will be monitored at the frequencies specified in Table L-2, and the Culebra groundwater densities of the fluids in the wells listed in Table L-4 ~~bores~~ will be measured annually. ~~When both of these parameters are known, equivalent freshwater heads will be calculated. The concept of freshwater head is discussed in Lusczynski (1961).~~

~~A discussion explaining the calculation of freshwater heads from mid-formation depth at WIPP can be found in Haug, et al. (1987). Freshwater heads are useful in identifying hydraulic gradients in aquifers of variable density such as those existing at the WIPP site. Freshwater head at a given point is defined as the height of a column of freshwater that will balance the existing pressure at that point (Lusczynski, 1961).~~

Measured Culebra ~~ground-~~water surface elevation data can be converted to equivalent freshwater head from knowledge of the density of the borehole fluid, using the following formula.

$$p = \rho_g \gamma h$$

where

p = freshwater head (~~pressure~~length of freshwater head)

γ~~ρ~~ = average specific gravity of the borehole fluid (unitless ratio of borehole density to density of fresh water)

ρ_g = freshwater density (mass/volume)

h = fluid column height above the datum (length)

If the freshwater density is assumed to be 1.000 gram per cubic centimeter (g/cm^3), then the equivalent freshwater head is equal to the fluid column height times the average borehole fluid specific gravity. ~~density (expressed as specific gravity).~~

Density measurements are made annually. Density for the DMWs will be expressed as specific gravity as measured in the field during sampling events using a hydrometer. Freshwater head for other Culebra wells will be calculated as described above from fluid density measurements obtained using pressure transducers.

L-4c(1)(i) Field Methods and Data Collection Requirements

To obtain an accurate ~~ground-water~~groundwater surface elevation measurement, a calibrated water-level measuring device will be lowered into a test well and the depth to water recorded from a known reference point. ~~When using an electrical conductance probe, the depth to water will be determined by reading the appropriate measurement markings on the embossed measuring tape when the alarm is activated at the surface. WIPP Procedure WP 02-EM1014~~ An SOP will be used when making water-level measurements for this program. The SOP will specify ~~specifies~~ the methods to be used in obtaining groundwater-level measurements, and provide general instructions including prerequisites, safety precautions, performance frequency, quality assurance, data management, and records. ~~A current revision of this procedure will be maintained in the WIPP Operating Record.~~

L-4c(1)(ii) ~~Ground-water~~Groundwater Surface Elevation Records and Document Control

~~All i~~Incoming data will be processed in a ~~timely~~ manner ~~to~~ that ~~assure~~ensures data integrity. The data management process for ~~ground-water~~groundwater surface elevation measurements will begin with completion of the field data sheets. Date, time, tape measurement, equipment identification number, calibration due date, initial of the field personnel, and equipment/comments will be recorded on the field data sheets. If, for some unexpected reason, a measurement is not possible (~~i.e.~~e.g., a test is under way that blocks entry to the well bore), then a notation as to why the measurement was not taken will be recorded in the comment column. Personnel will also use the comment column to report any security observations (i.e., well lock missing).

Data recorded on the field data sheets and submitted by field personnel will be subject to ~~guidelines outlined in~~ applicable SOPs ~~WIPP Procedures WP 02-EM3001[3] and WP 02-EM1014[4]~~ (see Table L-3). ~~Current copies of these procedures are maintained within the WIPP Operating Record.~~ These procedures specify the processes for administering and managing such data. The data will be entered onto a computerized work sheet. The work sheet program ~~will~~ calculates ~~ground-water~~groundwater surface elevation in both feet and meters relative to the top of the casing and also relative to mean sea level. The work sheet ~~will also adjust~~program adjusts ~~ground-water~~groundwater surface elevations to equivalent freshwater heads.

A check print will be made of the work sheet printout. The check print will be used to verify that data taken in the field was properly reported on the database printout. A minimum of 10 percent

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~~[3] WP 02-EM3001 "Administrative Processes for Environmental Monitoring Programs" is a management control procedure to provide the administrative guidance to be used by Environmental Monitoring (EM) personnel to maintain quality control (QC) associated with EM sampling activities and to assure that data acquired under the WIPP Environmental Monitoring Program are valid. The precautions and limitations portion of this procedure assure that only qualified personnel acquire samples under the EM program, that cross contamination of sampling equipment is prevented, and that sample hold times are not exceeded. The Performance portion of the procedure provides step-by-step instructions for Quality Assurance/Quality Control (QA/QC) implementation, the use of data sheets and sample tracking logbooks, sample tacking from collection to submittal, and actions to take if sample results indicate the potential for exceeding a regulatory limit.~~

~~[4] WP 02-EM1014 "Groundwater Level Measurement", is a technical procedure which lists the equipment required and the operational checks necessary to perform groundwater level measurements. This procedure as well as WP 02-EM3001 also provides information on performing validation and verification of laboratory data.~~

of the spreadsheet calculations will be randomly verified on the check print to ensure that calculations are being performed correctly. If errors are found, the work sheet will be corrected. ~~The data contained on the computerized work sheet will be translated into a database file. A printout will be made of the database file. The data each month will then be compiled into report format and transmitted to the appropriate agencies as requested by the Permittees. Ground-water~~Groundwater surface elevation data and equivalent freshwater heads for ~~all~~ the Culebra wells in Table L-4 will be transmitted to NMED ~~one month~~in May and November ~~after data are collected~~. Semi-annual groundwater reports will also include annotated hydrographs and trend analysis.

~~A computerized database file will be maintained for all ground-water surface elevation data. Monthly and quarterly data will be appended into a yearly file. Upon verification that the yearly database is free of errors, it will be appended into the project database file. A printed copy of the current project database (through December of the preceding year) will be kept in the Environment, Safety and Health Department (**ES&H**) EM fire resistant storage area.~~

L-4c(2) ~~Ground-water~~Groundwater Sampling

L-4c(2)(i) ~~Ground-water~~Groundwater Pumping and Sampling Systems

~~The water-bearing units at WIPP are highly variable in their ability to yield water to monitoring wells. The Culebra, the most transmissive hydrologic unit in the WIPP area, exhibits transmissivities that range many orders of magnitude across the site area and is the primary focus of the DMP.~~

The ~~ground-water~~groundwater pumping and sampling systems used to collect a ~~ground-water~~groundwater sample from the ~~seven~~ six ~~new DMP~~ DMWs ~~wells~~ will provide continuous and adequate production of water so that a representative ~~ground-water~~groundwater sample can be obtained. ~~The wells used for ground-water quality sampling vary in yield, depth, and pumping lift. These factors affect the duration of pumping as well as the equipment required at each well.~~

The type of pumping and sampling system to be used in a well depends primarily on the aquifer characteristics of the Culebra and well construction. The ~~DMP wells~~DMWs are ~~will be~~ individually equipped with dedicated submersible pumping assemblies. Each well has a specific type of submersible pump, matched to the ability of the well to yield water during pumping. The down-hole submersible pumps are ~~will be~~ controlled by a variable electronic flow controller to match the production capacity of the formation at each well.

~~The electronic flow controller allows personnel collecting samples to control the rate of discharge during well purging to minimize the potential for loss of volatiles from the sample.~~ As recommended in the "RCRA Ground-Water Monitoring Technical Enforcement Guidance Document" (EPA, 1986) the wells will be purged ~~a minimum of~~no more than three well bore volumes or until field parameters have stabilized, whichever occurs first. ~~at a rate that will minimize the agitation of recharge water. This will be accomplished by monitoring formation pressure and matching the rate of discharge from the well as nearly as possible to the rate of recharge to the well. WIPP Procedure WP 02-EM1002[5] specifies the methods used for~~

~~[5] WP 02-EM1002 "Electric Submersible Pump Monitoring System Installation and Operation" is a technical procedure that provides step-by-step instructions for acquiring ground-water samples using electric submersible pumps (ESPs). The procedure addresses the equipment in general, lists precautions and limitations which assure that only qualified individuals operate the equipment,~~

~~controlling flow rates and monitoring formation pressure. A current version of this document will be maintained in the WIPP Operating Record.~~ Well purging will be performed in accordance with an SOP ~~requirements will be used~~ in conjunction with serial sampling to determine when the ~~ground-water~~groundwater chemistry stabilizes and is therefore representative of undisturbed ~~ground-water~~groundwater.

The ~~DMP wells~~DMWs are ~~will be~~ cased and screened through the production interval with materials that do not yield contamination to the aquifer or allow the production interval to collapse under stress (high epoxy fiberglass). ~~Details of well construction are presented in Section L-3b(1).~~ An electric, submersible pump installation without the use of a packer is ~~will be~~ used in this instance. The largest amount of discharge from the submersible pump ~~will~~ takes place from a discharge pipe. In addition to this main discharge pipe a dedicated ~~Teflon®~~-sample line, running parallel to the discharge pipe, is ~~will also be~~ used. The sampling line is manufactured from a chemically inert material. ~~Flow through the pipe will be regulated on the surface by a flow control valve and/or variable speed drive controller.~~ Cumulative flow ~~will be~~is measured using a totalizing flow meter. Flow from the discharge pipe ~~will be~~is routed to a discharge tank for disposal.

The dedicated ~~Teflon®~~-sampling line ~~will be~~is used to collect the water sample that will undergo analysis. By using a dedicated ~~Teflon®~~-sample line, the water will not be contaminated by the metal discharge pipe. The sample line will branch from the main discharge pipe a few inches above the pump. Flow from the sample line will be routed into the sample collection area. Flow through the sample collection line ~~will be~~is regulated by a flow-control valve. The sample line ~~will be~~is insulated at the surface to minimize temperature fluctuations.

~~Pressure Monitoring Systems~~

~~The DMP wells do not require the installation of a packer because sample biases due to well construction deficiencies are not present. However, pressures will be monitored using down hole automatic air line bubblers in the formation to maintain the water level above the pump intake. Pressure transducers may be used in line with bubblers to provide continual electronic monitoring through data acquisition systems. WIPP Procedure WP 02-EM1002 provides instructions for monitoring formation pressure using automatic airline bubblers in conjunction with pressure transducers and data acquisition systems. A current version of this document will be maintained in the WIPP Operating Record.~~

~~The mobile field laboratory provides a work place for conducting field sampling and analyses. The laboratory will be positioned near the wellhead, will be climate controlled, and will contain the necessary equipment, reagents, glassware, and deionized water for conducting the various field analyses.~~

~~Sampling Overview~~

~~Two types of water samples will be collected: serial samples and final samples. Serial samples will be taken at regular intervals and analyzed in the mobile field laboratory for various physical and chemical parameters (called field indicator parameters). The serial sample data will be used~~

~~prerequisite actions which assure the correct installation and operation. The procedure details how to install the various subsystems such as the surface discharge and pressure monitoring system and the pressure monitoring bubbler and how to start up and shut down the ESP.~~

~~to determine whether the sample is representative of undisturbed ground water as a direct function of the stabilization of field indicator parameters and the volume of the water being pumped from the well. Interpretation of the serial sampling data will enable the Team Leader (see Section L-7) to determine when conditions representative of undisturbed ground water are attained in the pumped ground water.~~

~~Final samples will be collected when the serially sampled field indicator parameters have stabilized and are therefore representative of undisturbed ground water.~~

L-4c(2)(ii) Serial Samples

Serial sampling is the collection of sequential samples for the purpose of determining when the ~~ground water~~groundwater chemistry stabilizes and is therefore representative of undisturbed ~~ground water~~groundwater. The Permittees' SOP for serial sampling will provide criteria for determining when a final sample should be taken. ~~will consider a serial sample representative of undisturbed ground water when the majority of field indicator parameter measurements have stabilized within ±5 percent of the average of analytical results for the field indicator parameter from the background ground-water quality for each DMP well. Nonstabilization of one or two field indicator parameters attributable to matrix interferences, instrument drift, or other unforeseen reasons will not preclude the collection of final samples, provided the volume of purged water exceeds three well bore volumes.~~ Each DMW will be purged to no more than three well bore volumes, or until field parameters stabilize, whichever occurs first. Well stabilization occurs when the field-analyzed parameters are within ± 5% of three consecutive measurements. A well bore volume is defined as the volume of water from static water level to the bottom of the well sump. Serial samples will be analyzed in the mobile field laboratory for field indicator parameters. The Permittees will ~~report, in the operating record, any final samples collected when field indicator parameters were not stabilized, and will~~ provide an explanation of why the sample was collected when field indicator parameters were not stabilized and place that explanation in the WIPP Operating Record.

Serial samples will be collected and analyzed to detect and monitor the chemical variation of the ~~ground water~~groundwater as a function of the volume of water pumped. Once serial sampling begins, the frequency at which serial samples are collected and analyzed will be left to the discretion of the ~~Team Leader (see Section L-7)~~Permittees, but will be performed a minimum of three times during a sampling round.

The Permittees will use appropriate field methods to identify stabilization of the following field indicator parameters: ~~chloride, divalent cations (hardness), alkalinity, total iron,~~ pH, ~~Eh,~~ temperature, specific conductance, and specific gravity.

~~Protocols for collection of serial samples are specified in WIPP Procedure WP 02-EM1006[6]. Analysis of serial samples are specified in WIPP Procedure WP 02-EM1005[7]. Current versions of these procedures will be maintained in the WIPP Operating Record.~~

~~[6] WP 02-EM1006 "Final Sample and Serial Sample Collection" is a technical procedure that provides step-by-step instructions for acquiring ground-water samples from the WQSP wells and from privately-owned wells in the vicinity of WIPP. The procedure addresses the equipment in general, lists precautions and limitations which assure that only qualified individuals operate the equipment, and prerequisite actions which assure the data quality. The procedure addresses collection of samples from private wells, collection of serial ground-water samples, the collection of final samples for submittal to the laboratory, and data review by the monitoring task leader.~~

The three field indicator parameters of temperature, ~~Eh~~specific conductance, and pH will be determined by either an "in-line" technique, using a self-contained flow cell, or an "off-line" technique, in which the samples will be collected from a ~~Teflon®~~sample line at atmospheric pressure. ~~The iron, divalent cation, chloride, alkalinity, s~~Specific conductance~~,~~ and specific gravity samples will be collected from the ~~Teflon®~~-sample line at atmospheric pressure. Because of the lack of sophisticated weights and measures equipment available for field density assessments, field density evaluations will be expressed in terms of specific gravity, which is a unitless measure. Density is expressed as unit weight per unit volume.

New polyethylene containers, that are certified clean by the laboratory, will be used to collect the serial samples from the ~~Teflon®~~-sample line. Serial sampling water collected for solute and specific conductance determinations will be filtered through a 0.45 micrometers (µm) membrane filter using a stainless-steel, in-line filter holder. Serial samples collected in laboratory-certified clean containers do not require rinsing prior to sample collection. ~~Filtered water will be used to rinse the sample bottle prior to serial sample collection.~~ Unfiltered ~~ground water~~groundwater will be used when determining temperature, pH, ~~Eh~~specific conductance, and specific gravity. Sample bottles will be properly identified and labeled.

Samples collected will immediately be analyzed for pH and specific conductance (**SC**) as these parameters are most sensitive to changes in ambient temperature.~~The filtered sample collected for solute analyses will be immediately analyzed for iron and alkalinity because these two solution parameters are extremely sensitive to changes in the ambient water sample pressure and temperature. A sample and duplicate of filtered water will be collected and analyzed for solute parameters (alkalinity, chloride, divalent cations, and iron).~~ Temperature, pH, and ~~Eh~~specific conductance, when not measured in a flow cell, will be measured at the approximate time of serial sample collection. These samples will be collected from the unfiltered sample line.

~~Samples to be analyzed for chloride and divalent cations (after preservation with nitric acid and stored at 4°C) may be stored for one week prior to analysis with confidence that the analytical results will not be altered.~~

Upon completion of the collection of the last serial sample suite, the serial sample bottles accrued throughout the duration of the pumping of the well will be discarded. No serial sample bottles will be reused for sampling purposes of any sort. However, serial samples may be stored for a period of time depending upon the need. ~~WIPP Procedure WP 02-EM1006~~Standard Operating Procedures (see Table L-3) define~~s~~ the protocols for the collection of final and serial samples and analysis. ~~WIPP Procedure WP 02-EM1005 defines the protocols for serial sample analysis. Current versions of these procedures will be maintained in the WIPP Operating Record.~~

~~During the first two years of DMP well serial sampling, the first sample will be analyzed as soon as possible after the pump is turned on and daily thereafter for a period of four days or until the field indicator parameters (chloride, divalent cations, alkalinity, and iron) stabilize. Eh, pH, and SC will be continually monitored by using a flow cell with ion-specific electrodes and a real-time~~

~~[7] WP 02-EM1005 "Groundwater Serial Sample Analysis" is a technical procedure that provides step-by-step instructions for on site analysis of ground water to determine ground-water stability prior tot he collection of final samples for analysis. The procedure addresses the equipment in general, lists precautions and limitations which assure that only qualified individuals operate the equipment, prerequisite actions which assure data quality. The procedure addresses the field measurement of Eh, pH, temperature, specific gravity, specific conductance, alkalinity, chloride, divalent cation, and total iron as indicators of ground-water stability.~~

~~readout. When detection monitoring begins, the serial sampling process may be modified and the decision to collect final samples would then be based on the number of well bore volumes purged and results of the analysis of chloride, temperature, specific gravity, pH, Eh, and SC. Removal of serial sampling from the DMP will be accomplished through a permit modification and a modification to this plan.~~

L-4c(2)(iii) Final Samples

The final sample will be collected once the measured field indicator parameters have stabilized (refer to Section L-4(c)(2)(ii)). A serial sample will also be collected and analyzed for each day of final sampling to ensure that samples collected for laboratory analysis are still representative of stable conditions. Sample preservation, handling, and transportation methods will maintain the integrity and representativeness of the final samples.

Prior to collecting the final samples, the collection team shall consider the analyses to be performed so that proper shipping or storage containers can be assembled. Table L-~~4~~6 presents the sample containers, volumes, and holding times for laboratory samples collected as part of the DMP; however, the analytical laboratory may request sample containers, volumes, and holding times that are different, when appropriate.

The monitoring system will use dedicated pumping systems and sample collection lines from the sampled formation to the well head. ~~Non-dedicated sample collection lines from the well head to the sample collection area will be discarded after each use.~~

Sample integrity will be ensured through appropriate decontamination procedures. Laboratory glassware will be washed after each use with a solution of nonphosphorus detergent and deionized (**DI**) water and rinsed in DI water. Sample containers will be new, certified clean containers that will be discarded after one use. ~~Ground-water~~Groundwater surface elevation measurement devices will be rinsed with fresh water after each use. Non-dedicated sample collection manifold assemblies will be rinsed in accordance with SOPs ~~with two gallons of fresh water, then rinsed with five gallons of 5 percent nitric acid solution and rinsed with five gallons of DI water~~ after each use. The exposed ends will be capped off during storage. Prior to the next use of the sampling manifold, it will be rinsed a second time with DI water and a ~~blank~~ rinsate blank sample will be collected to verify ~~decontamination~~cleanliness.

Water samples will be collected at atmospheric pressure using either the filtered or unfiltered ~~Teflon®~~-sampling lines ~~branching from the main sample line~~. Detailed protocols, in the form of ~~procedures~~SOPs (see Table L-3) define how~~, assure that~~ final samples will be collected in a consistent and repeatable fashion~~. WIPP Procedure WP 02-EM1006 defines the requirements for collection of final samples~~ for analyses. ~~A current version of this procedure will be maintained in the WIPP Operating Record.~~

Final samples will be collected in the appropriate type of container for the specific analysis to be performed. The samples will be collected in new and unused glass and plastic containers (refer to Table L-~~4~~6; however, the analytical laboratory may request sample containers, volumes, and holding times that are different, when appropriate). For each parameter analyzed, a sufficient volume of sample will be collected to satisfy the volume requirements of the analytical laboratory (as specified by laboratory ~~Standard Operating Procedures~~ [SOPs]). This includes an additional volume of sample water necessary for maintaining quality control standards. All final samples will be treated, handled, and preserved as required for the specific type of analysis to be performed. Details about sample containers, preservation, and volumes required for

individual types of analyses are found in the applicable ~~procedures~~ SOPs generated, approved, and maintained by the ~~contract~~ analytical laboratory.

~~Before the final sample is taken, all plastic and glass containers will be rinsed with the pumped ground water, either filtered or unfiltered, dependent upon analysis protocol. When the rinsing procedure is completed the final sample will be collected.~~

Final samples will be sent to the analytical ~~contract~~ laboratories and analyzed for parameters and hazardous constituents specified in Part 5, Tables 5.4.a and 5.4.b. ~~general chemistry, radionuclides, metals, and selected VOCs that are specific to the waste anticipated to arrive at WIPP. Table L-3 presents the specific analytes for the DMP.~~

Duplicates of the final sample will be provided to WIPP Project oversight agencies ~~as~~ when requested ~~by the Permittees or NMED~~.

~~Resulting w~~Wastes resulting from the sampling and field analysis of groundwater are disposed of in accordance with the WIPP SOPs (see Table L-3). ~~Procedure WP 02-RC.01[8]. A current version of this procedure will be maintained in the WIPP Operating Record.~~

L-4c(2)(iv) Sample Preservation, Tracking, Packaging, and Transportation

Many of the chemical constituents measured by the DMP are not chemically stable and require preservation and special handling techniques. Samples requiring acidification will be treated ~~with either high purity hydrochloric acid, nitric acid, or sulfuric acid (ULTREX or equivalent), depending upon the standard method of treatment required for the particular parameter suite or~~ as requested by the ~~contract~~ analytical laboratory ~~SOPs (see Table L-4)~~.

The ~~contract~~ analytical laboratory receiving the samples will ~~use procedures that~~ prescribe the type and amount of preservative, the container material type, ~~and~~ the required sample volumes that shall be collected, and the shipping requirements. This information will be recorded on the Final Sample Checklist for use by field personnel when final samples are being collected. The Permittees will follow the EPA "RCRA Ground-Water Monitoring Technical Enforcement Guidance Document," Table 4-1 (EPA, 1986), ~~if~~ when laboratory SOPs do not specify sample container, volume, or preservation requirements. WIPP SOPs (see Table L-3) provide instructions to ensure proper sample preservation and shipping.

The sample tracking system at the WIPP facility ~~will use~~uses uniquely numbered chain of custody ~~(CofC) Forms and~~ / request for analysis ~~(RFA) Forms~~ (CofC/RFA) forms. The primary consideration for storage or transportation is that samples shall be analyzed within the prescribed holding times for the constituents ~~parameters~~ of interest. WIPP ~~Procedure WP 02-EM3001~~SOPs (see Table L-3) provide~~s~~ instructions to ensure proper sample tracking protocol. ~~A current revision of this procedure will be maintained within the WIPP Operating Record.~~

~~Insulated shipping containers packaged with crushed ice or reusable ice packs will be used to keep the samples cool during transport to the contract laboratory. Holding times for specific~~

~~[8] WP 02-RC.01 "Site-Generated, Non-Radioactive Hazardous Waste Management Plan" is a step-by-step procedure that defines site-generate non-radioactive hazardous waste (SGNRHW) and lists responsibilities of waste management organizations including the generator, waste handlers, sampling personnel, safety personnel, and compliance personnel. In addition, the procedure defines training requirements, container marking requirements, spill response, and list prohibitions. A Section of the procedure is focused on waste management practices including the management in satellite accumulation areas, the hazardous waste staging area for materials awaiting analysis, the establishment of accumulation times, and hazardous waste disposal.~~

~~analytical parameters require samples to be shipped by express air freight. The coolers will be packaged to meet Department of Transportation and International Air Transportation Association commercial carrier regulations.~~

L-4c(2)(v) Sample Documentation and Custody

To ensure the integrity of samples from the time of collection through reporting date, sample collection, handling, and custody shall be documented. Sample custody and documentation procedures for ~~EM~~ sampling and analysis activities are detailed in WIPP facility ~~Procedure WP 02-EM3001~~SOPs (see Table L-3). ~~These procedures will be strictly followed throughout the course of each sample collection and analysis event. A current revision of this procedure will be maintained in the WIPP Operating Record.~~

Standardized forms used to document samples ~~will~~ include sample identification numbers, sample labels, custody tape, the sample tracking ~~log books~~data, and the ~~request for analysis/chain of custody (RFA and CofC~~CofC/RFA~~)~~ form. An example form is shown in Figure L-13. ~~The forms are briefly defined in the following subsections.~~

~~All sample documentation will be completed for each sample and reviewed by the Team Leader or his/her designee for completeness and accuracy.~~

Sample Numbers and Labels

A unique sample identification number will be assigned to each sample sent to the laboratory for analysis. ~~The Team Leader (see Section L-7) will assign the numbers prior to sample collection.~~ The sample identification numbers will be used to track the sample from the time of collection through data reporting. Every sample container sent to the laboratory for analysis will be identified with a label affixed to it. Sample label information will be completed in ~~permanent,~~ indelible ink and will contain the following information: sample identification number with sample matrix type; sample location; analysis requested; time and date of collection; preservative(s), if any; and the sampler's name or initials.

Custody Seals

Custody seals will be used to detect unauthorized sample tampering from collection through analysis. ~~The~~ For example, custody seals ~~will be~~that are adhesive-backed strips ~~that~~ are destroyed when removed or when the container is opened. The seal will be dated, initialed, and affixed to the sample container in such a manner that it is necessary to break the seal to open the container. Seals will be affixed to sample containers in the field immediately after collection. Upon receipt at the laboratory, the laboratory custodian will inspect the seal for integrity; a broken seal will invalidate the sample.

Sample Identification and Tracking ~~Logbook~~

~~A s~~Sample tracking ~~logbook (STLB)~~ information will be completed for each sample collected. ~~form will be completed for each sample collected.~~ The sample tracking information~~STLB will~~ includes the following information: ~~C of C~~ CofC/RFA form number; ~~RFA No.;~~ date sample(s) were sent to the lab; laboratory name; acknowledgment of receipt or comments; well name and round number. Sample codes will indicate the well location; the geologic formation where the water was collected from, the sampling round number; and the sample number. The code is broken down as follows:

WQ6[1]C[2]R2[3]N1[4]

[1] Well identification (e.g., WQSP-6 in this case)
[2] Geologic formation (e.g., the Culebra in this case)
[3] Sample round no. (Round 2)
[4] Sample no. (N1)

To distinguish duplicate samples from other samples, a "D" is added as the last digit to signify a duplicate. ~~STLB~~ Sample tracking information will be completed in the field by the sampling team. ~~and checked by the Team Leader. When samples are shipped, the STLB will remain in the custody of the EM Section for sample tracking purposes.~~

Sample tracking is monitored and documented with the CofC/RFA form and the shipping airbill. Both of these documents are included in the data packets. Receipt at the analytical laboratory may be monitored, if necessary, via the shipper's website tracking application. Samples are considered complete when a copy of the original CofC/RFA form is merged with the Field Lab copy of the same document.

~~Request for Analysis and~~ Chain of Custody and Request for Analysis

An ~~RFA and CofC~~CofC/RFA form will be completed during or immediately following sample collection and will accompany the sample through analysis and disposal. ~~An example of the RFA and CofC form is presented in Figures L-17a and L-17b.~~ The ~~RFA and CofC~~CofC/RFA form will be signed and dated each time the sample custody is transferred. A sample will be considered to be in a person's custody if: the sample is in his/her physical possession; the sample is in his/her unobstructed view; and/or the sample is placed, by the last person in possession of it, in a secured area with restricted access. During shipment, the carrier's air bill number serves as custody verification. Upon receipt of the samples at the analytical laboratory, the laboratory sample custodian acknowledges possession of the samples by signing and dating the ~~RFA and CofC~~CofC/RFA form. The completed original (top page) of the ~~RFA and CofC~~CofC/RFA form will be returned to the ~~Team Leader~~Permittees with the laboratory analytical report and becomes part of the permanent record of the sampling event. The ~~RFA and CofC~~CofC/RFA form also contains specific instructions to the analytical laboratory for sample analysis, potential hazards, and disposal instructions.

L-4c(3) Laboratory Analysis

Analysis of samples will be performed ~~by~~ using ~~a commercial laboratory. M~~methods ~~will be specified in procurement documents and will be~~ selected to be consistent with EPA guidance found in ~~recommended procedures in~~ SW 846 (EPA, 1996). Additional detail on analytical techniques and methods will be given in laboratory SOPs. In Part 5, Tables 5.4.a and 5.4.b ~~L-3~~ presents the analytical parameters and constituents for the WIPP DMP.

~~The Permittees will establish the criteria for laboratory selection, including the stipulation that the laboratory follow the procedures specified in SW 846 and that the laboratory follow EPA protocols.~~ The analytical ~~selected~~ laboratory shall demonstrate, through laboratory SOPs, that it will follow appropriate protocols such as EPA SW 846. ~~requirements and the requirements specified by the EPA protocols.~~ The analytical laboratory shall also provide documentation to the Permittees describing the sensitivity of laboratory instrumentation. This documentation will be retained in the WIPP facility ~~o~~Operating ~~r~~Record. ~~and will be available for review upon request by NMED.~~ Instrumentation sensitivity needs to be considered because of regulatory

requirements governing constituent concentrations in ~~ground-water~~groundwater and the complexity of brines associated with the ~~WIPP repository~~Culebra groundwater.

~~Once the initial qualification criteria, as specified above, have been met, the Permittees will select a laboratory based upon competitive bid. The selected laboratory will perform analytical work for the Permittees for a predetermined period of time, as specified in the contract between the Permittees and the selected laboratory. As this period of performance comes to an end, a new laboratory selection/competitive bid process will be initiated by the Permittees. The same or a different laboratory may be selected for the new contract period.~~ The laboratory will maintain documentation of sample handling and custody, analytical results, and internal quality control (**QC**) data. Additionally, the laboratory will analyze QC samples in accordance with this plan and its own internal QC program for indicators of analytical accuracy and precision. Data generated outside of laboratory acceptance limits will trigger an evaluation and, if appropriate, corrective action as directed by the Permittees. The laboratory will report the results of the environmental sample and QC sample analyses and any necessary corrective actions that were performed. In the event that more than one analytical laboratory is used (e.g., for different analyses), each one will have the responsibilities specified above. ~~The~~ A copy of the laboratory SOPs ~~for the laboratory currently under contract~~ will be maintained ~~in a file~~ in WIPP facility files and will be available for inspection by the NMED.~~the operating record by the Permittees. The Permittees will provide NMED with an initial set of applicable laboratory SOPs for information purposes, and provide NMED with any updated SOPs on an annual basis.~~

Data validation will be performed ~~on behalf of the Permittees by the Management and Operating Contractor (**MOC**) Environmental Monitoring (**EM**). Data validation results are~~ and reported in the Annual Culebra Groundwater Report and will be maintained in the WIPP facility Operating Record. ~~documented on an Approval/Variation Request (**AR/VR**) form (Procedure WP 15-PC3041). If no discrepancies are found in the data, the AR/VR form will be signed and the approved box will be checked. If however, discrepancies are found, the AR/VR form will be signed and the disapproved or approved on condition box will be checked and the form will be returned to the team leader accompanied by an attached report discussing the data validation results, any anomalies, and resolutions. Copies of the data validation report will be distributed to the EM Manager, QA Manager, the Team Leader, and the Contract Administrator. Copies of the data validation report will be kept on file in the EM records section for review upon request by NMED.~~

L-4d Calibration

L-4d(1) Sampling and Groundwater Elevation Monitoring Equipment Calibration ~~Requirements~~

The equipment used to collect data for ~~the WQSP and~~ this DMP will be calibrated in accordance with SOPs~~maintenance administrative procedures specified below~~. The Permittees ~~EM Section~~ will be responsible for calibrating needed equipment on schedule~~, in accordance with written procedures. The EM Section will also be responsible~~ and for maintaining current calibration records for each piece of equipment.

L-4d(2) ~~Ground-water~~Groundwater Surface Elevation Monitoring Equipment Calibration Requirements

The equipment used in taking ~~ground-water~~groundwater surface elevation measurements will be maintained in accordance with WIPP facility SOPs (see Table L-3). ~~Procedure WP 10-~~

~~AD3029[9] A current revision of this procedure will be maintained in the WIPP Operating Record.~~ The ~~EM Section~~Permittees will be responsible for ensuring ~~calibrating the needed~~ equipment is calibrated on schedule in accordance with ~~written procedures~~SOPs. The ~~EM Section~~Permittees will also be responsible for maintaining copies of records of the most recent ~~current~~ calibration ~~records~~ for each piece of equipment.

L-4e Statistical Analysis of Laboratory Analytical Data

~~As required by 20.4.1.500 NMAC (incorporating 40 CFR §§264.97 and 264.98), data collected to establish background ground-water quality and~~Analytical data collected as part of the DMP will be evaluated using appropriate statistical techniques. The following specifies the statistical analysis to be performed by the Permittees~~DMP. Statistical analysis of DMP data will conform to EPA guidance "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities"~~ (EPA, ~~1989~~2009), ~~and "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance" (EPA, 1992).~~

L-4e(1) Temporal and Spatial Analysis

~~Environmental parameters vary with space and time. The effect of one or both of these two factors on the expected value of a point measurement will be statistically evaluated through spatial analysis and time series analysis. These methods often require extensive sampling efforts that may exceed the practical limits of the DMP sampling procedures.~~

~~Spatial analysis may have limited use DMP during the operational period, although the effect of spatial auto-correlation on the interpretation of the data will be considered for each parameter. Spatial variability will be accounted for by the use of predetermined key sampling locations. Data analysis will be performed on a location-specific basis, or data from different locations will be combined only when the data are statistically homogeneous. Statistical homogeneity will be determined by evaluating mean values and variances from the residuals from the individual well data.~~

~~Time series analysis plays a more important role in data analysis for the DMP. Parameters will be reported as time series, either in tabular form or as time plots. For key time series parameters, these plots will be in the form of control charts on which control levels will be identified based on preoperational database, fixed standards, control location databases, or other standards for comparison. Where significant seasonal changes in the expected value of the parameter are identified in the preoperational database or in the control locations, corrections in the control levels which reflect the seasonal change will be made and documented.~~

Temporal and spatial analyses of the data were completed as part of establishing the water quality baseline (Crawley and Nagy, 1998; IT, 2000). As a result, the Permittees determined to evaluate changes relative to baseline on an individual location basis and to report the concentrations of constituents as a time series, either in tabular form or as time plots. No

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~~[9] WP 10-AD3029 "Calibration and Control of Monitoring and Data Collection Equipment" provides the step-by-step protocols for the establishment and maintenance of a master database of monitoring and data collection (**M&DC**) equipment, the recall process for equipment needing calibration, the performance of calibrations, the management of calibration results to determine the adequacy of recall frequencies, functional testing of M&DC equipment, and reporting including out-of-tolerance reporting and expired calibration reporting. In addition, the procedure provides step-by-step process for the storage of calibrated M&DC equipment and the use of rental equipment.~~

particular seasonal variations have been noted in the concentrations of groundwater samples collected during the spring and autumn; therefore, continuing temporal analysis is not required.

The analytical results for constituents will be reported as time series, either in tabular form or as time plots or both, and compared to the 95th percentile values or reporting limits identified in Part 5, Table 5.6.

L-4e(2) Distributions and Descriptive Statistics

~~For data sets which include more than ten data points that are homogeneous in space and time (including seasonal homogeneity) and have less than ten percent missing data, a test for conformance to the normal distribution will be performed. The test for normality of the data will be performed in accordance with the methodologies presented in "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance" (EPA, 1992).~~

~~If normality is not met, the data will be log-transformed (or transformed using a suitable mathematical transformation, e.g., square root) and retested for normality. If the transformed data fit a normal distribution, the original data will be accepted as having lognormal or an otherwise mathematically transformed normal distribution. If normality is still not found, two courses may be taken. One will be to continue to test the fit to standard families of distributions, such as the gamma, beta, and Weibull, with proper modifications to subsequent analyses based on these results. The other course will be to use nonparametric methods of data analysis.~~

~~For data sets smaller than ten, but homogeneous and complete, the lognormal distribution will be assumed. Data sets with more than ten percent missing data will be analyzed using nonparametric methods. Nonhomogeneous data sets will be subdivided into homogeneous sets and each of these analyzed individually.~~

~~Descriptive statistics will be calculated for each homogeneous data set. At a minimum, these include a central value and a range of variation. The central value is the arithmetic mean of the untransformed data if the data are not censored at either end. If the data are censored, either a trimmed mean or the median will be used as the central value (which may be within the censored range). If the data set is greater than ten and is uncensored, the standard deviation will be calculated and used as a basis for the reported range in variation. If these criteria are not met, the range between the 0.25 and 0.75 cartelist will be used.~~

Techniques were established to compare detection monitoring data generated during the baseline studies. A 95th upper tolerance limit value (**UTLV**) or 95th percentile was determined from those data sets where target analytes were measured at concentrations above the method detection limits. The UTLV is provided for normal or lognormal distributions and a 95th percentile confidence interval is provided for data sets that are nonparametric or have greater than 15 percent non-detects. For analytes with only a few detects (greater than 95 percent non-detects), an accurate 95th percentile cannot be calculated. For these analytes, the maximum detected concentration is used as the baseline value. For the analytes that are non-detect in all the samples, the method reporting limit was used as the baseline value.

L-4e(3) Action Levels~~Data Anomalies~~

~~Data anomalies include data points reported as being below the limit of detection (LD) or otherwise censored over a specific range of values, missing data points occurring randomly in the data set, and outliers that cannot be ascribed to a known source of variation.~~

~~Whenever possible, sample values which are reported below detection limits will be incorporated into the database as sample values measured at one-half the detection limit for statistical analysis. When values are not available, alternative methods of analysis, as specified in previous sections, will be used. In particular, the use of nonparametric statistics will be required.~~

~~Missing data points comprising less than 10 percent of the data set do not significantly affect data analyses. Results based on data in which more than 10 percent is missing will be identified as such at the time of reporting. Consideration of the potential effect of missing data shall be made when the majority of the data are missing from a discrete time span.~~

Using baseline distributions, actions levels were identified in accordance with methodologies described in the baseline documents. Action levels are based on the 95th percentile or reporting limits identified in the baseline. If the groundwater concentration of a constituent identified in Part 5, Table 5.6 is found to exceed an action level, a test for outliers is performed in accordance with the ~~Formal testing for outliers will only be done in accordance with EPA guidance. The~~ methodologies specified in ~~Section 8.2 of the~~ "Statistical Analysis of Ground-~~W~~water Monitoring Data at RCRA Facilities" (EPA, ~~1989~~2009) ~~will be used to check for outliers~~.

~~If an outside source of variation is not identified to account for outliers in a data set, it will be included in the data set and all subsequent analyses. If the inclusion of such outliers is found to affect the final results of the analyses significantly, both results (with and without outliers) will be reported.~~

L-4e(4) Comparisons and Reporting

Prior to TRU mixed waste receipt, measurements were made of each background ~~ground-water~~groundwater quality constituent specified in Part 5, Table ~~L-3~~5.4.b at every ~~DMP ground-water~~detection monitoring well during each of the ten background sampling events (with the exceptions of trans-1,2-dichloroethylene and vanadium that were added after TRU mixed waste disposal began). ~~If any background ground-water quality parameter or constituent has not been measured prior to waste receipt, measurements will be made for those parameters or constituents in hydraulically upgradient DMP ground-water monitoring wells for a sequence of four sampling events. Following completion of the four sampling events, the arithmetic mean and variance shall then be calculated by the field supervisor or designee for each well.~~ These measurements ~~will then~~ serve as a ~~background value~~ statistical baseline (Part 5, Table 5.6) ~~against which~~ that is ~~statistical values~~ used for evaluating the significance of the results of subsequent sampling events during detection monitoring ~~will be compared~~. Time-trend control charts with associated screening values for each constituent are used for this evaluation. ~~Statistical analysis and comparison will be accomplished using one of the five statistical tests specified in~~ The Permittees will compare the results from groundwater constituents of ongoing semi-annual groundwater sample analysis to these baseline values in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.~~98~~97(h)(4)~~, which may include Cochran's Approximation to the Behrens-Fisher students' t-test at the 0.01 level of significance (described in Appendix IV to 20.4.1.500 NMAC (incorporating 40 CFR §264)~~. If the comparisons show that

a constituent statistically exceeds the baseline ~~a significant increase~~ at any ~~monitoring site~~of the DMWs (as defined in 20.4.1.500 NMAC (incorporating 40 CFR §264.98(f))), the well shall be resampled and an analysis performed as soon as possible, in accordance with 20.4.1.500 NMAC (incorporating 40 CFR §264.98(g)(~~2~~3)). The results of the statistical comparison will be reported annually to ~~in~~ the NMED in the Annual Culebra ~~Site Environmental~~ Groundwater Report ~~(ASER)~~ in November, ~~and will be reported to NMED~~ as required under 20.4.1.500 NMAC (incorporating 40 CFR §264.98(g)) ~~in October~~.

L-5 Reporting

L-5a Laboratory Data Reports

Laboratory data will be provided in electronic and hard copy reports to the Permittees~~.~~ ~~Laboratory data reports will be forwarded to the Team Leader (see Section L-7) and NMED~~ and will contain the following information for each analytical report:

- A brief narrative summarizing laboratory analyses performed, date of issue, deviations from the analytical method, technical problems affecting data quality, laboratory quality checks, corrective actions (if any), and the project manager's signature approving issuance of the data report.
- Header information for each analytical data summary sheet including: sample number and corresponding laboratory identification number; sample matrix; date of collection, receipt, preparation and analysis; and analyst's name.
- Parameter and constituent~~Analytical parameter~~, analytical results, reporting units, reporting limit, analytical method used.
- Results of QC sample analyses for all concurrently analyzed QC samples.

All analytical results will be provided to NMED as specified in the Permit Part 5.

L-5b Statistical Analysis and Reporting of Results

Analytical results for constituents from ~~semi-~~annual ~~ground-water~~groundwater sampling activities will be compared and interpreted by the ~~Team Leader~~Permittees through generation of statistical analyses as specified in Section L-4e. The ~~Team Leader~~Permittees will perform statistical analyses; the results will be included in the Annual Culebra Groundwater Report ~~ASER~~ in summary form, and will also be provided to NMED as specified in Permit Part 5.

L-5c Semi-Annual Groundwater Surface Elevation Report and Annual Culebra ~~Site Environmental~~Groundwater Report

Data collected from this DMP will be reported to NMED as specified in Permit Part 5 in the Annual Culebra Groundwater Report~~, and to the EM Manager and NMED in the ASER~~. The ~~ASER~~ report will include all applicable information that may affect the comparison of background ~~ground-water~~groundwater quality and ~~ground-water~~groundwater surface elevation data through time. This information will include but is not limited to:

- DMW and WLMP ~~W~~well configuration changes that may have occurred from the time of the last measurement (i.e., plug installation and removal, packer removal and

reinstallation, or both; and the type and quantity of fluids that may have been introduced into the test wells).

- ~~Any p~~Pumping activities that may have taken place since publication of the last annual report (i.e., related to ~~ground-water~~groundwater quality sampling, hydraulic testing, and shaft installation or grouting~~activities~~) that may have taken place since the last annual groundwater report.

- A discussion of the origins of abnormal unexpected changes in the groundwater surface elevation, which is not attributable to site tests or natural stabilization of the site hydrologic system that exceeds 2 ft in a DMP well over the course of the period covered by the Annual Culebra Groundwater Report (this may indicate changes in recharge/discharge which would affect the assumptions regarding DMP well placement and constitute new information as specified in 20.4.1.900 NMAC (incorporating 40 CFR §270.41(a)(2)).

- The results of the annual measurements of densities.

- Annotated hydrographs.

- Groundwater flow rate and direction.

- Potentiometric surface map generated using the following steps:

  - Examine hydrographs to identify month having the largest number of Culebra water levels available with the fewest wells affected by pumping or other anthropogenic events.

  - Convert water levels from subject month to equivalent freshwater heads using fluid densities appropriate to the date.

  - Fit trend surface through freshwater heads.

  - Extrapolate the trend surface to the boundaries of the model domain used for the current Performance Assessment Baseline Calculations (**PABCs**) and define initial fixed-head boundary conditions based on the trend surface.

  - Using the ensemble-average Culebra transmissivity field used for the current PABC, optimize the model boundary heads to improve the fit of the model to the freshwater heads at the wells using optimization software interactively with MODFLOW.

  - Run MODFLOW with optimal boundary conditions fit.

  - Contour MODFLOW head results on WIPP site.

  - Compute particle path and travel time from the Waste Handling Shaft to the LWA Boundary.

  - Data analysis that will accompany the potentiometric surface map will include:

    - Measured versus modeled scatter plot diagram

- Frequency of modeled head residuals
- Modeled residual freshwater head at each well
- Explanations for modeled misfit residuals greater than 16.4 feet (5 meters).
- Semi-annual groundwater surface elevation results will be reported as specified in Permit Part 5, Condition 5.10.2.2.

- ~~Radionuclide-specific data collected during the previous year.~~

The DMP data used in generating the ~~ASER~~ Annual Culebra Groundwater Report will be maintained as part of the WIPP facility ~~o~~Operating ~~r~~Record and will be provided to NMED for review as specified in the permit.

L-6 Records Management

Records generated during ~~ground-water~~groundwater sampling and water level ~~ground-water surface elevation~~ monitoring ~~events~~ will be maintained in either ~~the form~~ project files ~~in the EM section~~at the Permitees facility or the Operating Record. Project ~~records~~ files will include, but are not limited to:

- Sampling and Analysis Plans (**SAP**)
- SOPs
- Field Data Entry Sheets
- ~~STLBs~~
- CofC/RFA ~~and CofC~~ forms
- ~~Contract~~ Analytical Laboratory Data Reports
- Variance Logs and Nonconformance Reports
- Corrective Action Reports.

~~These and all raw analytical records~~ Detection Monitoring Program monitoring, testing, and analytical data ~~generated in conjunction with ground-water sampling~~ and ~~ground-water surface elevation~~ WLMP data~~monitoring~~ will be ~~stored in fire resistant cabinets~~maintained in the WIPP facility Operating Record. ~~in the EM section according to the Records Inventory and Disposition Schedule (**RIDS**) and will be made available for inspection upon request. The following records will be transmitted to the Permittees' Project Records Services (**PRS**) for long-term storage in accordance with the RIDS:~~

- ~~Instrument maintenance and calibration records~~
- ~~QC sample data~~
- ~~Control charts and calculation~~
- ~~Sample tracking and control documentation~~
- ~~Raw analytical results.~~

~~L-7 Project Organization and Responsibilities~~

~~L-7a Environmental Monitoring Manager~~

~~The EM Manager will be responsible for the overall design and implementation of the DMP. The EM Manager will develop and approve specific procedures all DMP activities, and will review and approve programmatic reports. The EM Manager will provide oversight of appropriate levels of cooperation and consultation between the EM Section and the State of New Mexico regarding environmental monitoring and will revise the QA section of the DMP, if necessary, and submit revisions as permit modifications as specified in 20.4.1.900 NMAC (incorporating 40 CFR §270.42).~~

~~The EM Manager and staff will be responsible for achieving and maintaining quality in the DMP. All DMP data will be reviewed and approved by the EM Manager, or designee, prior to release.~~

~~The EM Manager will establish minimum qualification criteria and training requirements for all DMP personnel. The EM Manager will assure that position descriptions for assigned DMP personnel are adequately prepared. The EM Manager and/or Team Leader will assure that training is performed on an individual basis to maintain an acceptable level of proficiency by all new or temporary DMP staff and by all permanent GWSP staff. The EM Manager will assure that documents detailing all staff training are current and properly filed. Copies of training records will be on file for the Permittees in the MOC Technical Training Section.~~

~~The EM Manager will appoint a DMP Team Leader and Field Team, and assign the following responsibilities specified below.~~

~~L-7b – Team Leader~~

~~The Team Leader will coordinate and oversee field sampling activities, ensuring that sampling and associated procedures will be followed and that QA/QC and safety guidelines will be met. The Team Leader will direct the DMP per written approved procedures, and initiate the review of programmatic plans and procedures. The Team Leader will review and evaluate sample data, prepare and review programmatic reports, and assure that appropriate samples will be collected and analyzed. The Team Leader will assure that adequate technical support is provided to the Quality Assurance (QA) Department, when required during audits of vendor facilities. Any nonconformances or project changes will be immediately communicated to the Team Leader.~~

~~L-7c – Field Team~~

~~The field team members will consist of one or more scientists, engineers, or technicians, who will be responsible for sample collection, handling, shipping, and preparation and maintenance of appropriate data sheets, and completion of sample tracking documentation under the direction of the Team Leader, in accordance with this DMP and associated field procedures. The field team will inspect, maintain, and ensure proper calibration of equipment prior to use at each site, while ensuring that site health and safety requirements will be met at all times. The field team will communicate any nonconformances, malfunctions, or project changes to the Team Leader immediately.~~

~~L-7d – Safety Manager~~

~~The Safety Manager will be responsible for ensuring that the necessary requirements for the health and safety of personnel associated with sampling and analysis activities are met. The cognizant manager will be responsible for ensuring that field team members operate in a safe manner and personnel have appropriate training. The Safety Manager will ensure that periodic~~

~~health and safety assessments are conducted and that the cognizant manager will initiate corrective actions where deficiencies are identified.~~

~~L-7e Analytical Laboratory Management~~

~~Sample collection containers supplied by the laboratory will be certified as clean by either the laboratory or their supplier. The Permittees will supply containers for radiological samples. The analytical laboratory will be responsible for performing analyses in accordance with this DMP Plan and regulatory requirements. The laboratory will maintain documentation of sample handling and custody, analytical results, and internal QC data. Additionally, the laboratory will analyze QC samples in accordance with this plan and its own internal QC program for indicators of analytical accuracy and precision. Data generated outside laboratory acceptance limits will trigger an investigation and, if appropriate, corrective action, as directed by the EM Manager. The laboratory will report the results of the environmental sample and QC sample analyses and any necessary corrective actions that were performed. In the event that more than one analytical laboratory is used (e.g., for different analyses), each one will have the responsibilities specified above.~~

~~L-7f Quality Assurance (QA) Manager~~

~~The QA Manager will provide independent oversight of the DMP, via the assigned cognizant QA engineer, to verify that quality objectives are defined and achieved. The QA Manager will ensure objective, independent assessments of the DMP quality performance and the quality performance of the contract analytical laboratory. The QA Manager has been delegated authority on behalf of the Permittees by the MOC General Manager and will have access to work areas, identify quality problems, initiate or recommend corrective actions, verify implementation of corrective actions, and ensure that work will be controlled or stopped until adequate disposition of an unsatisfactory condition has been implemented.~~

L-7~~8~~ Quality Assurance Requirements

~~Specific~~ Quality Assurance (**QA**) ~~requirements for WIPP are defined in WIPP document WP 13-1. A current revision of this document will be maintained in the WIPP Operating Record. R~~requirements specific to the DMP are presented in this section.

L-~~8a~~7a ~~QA Program—Overview~~ Data Quality Objectives and Quality Assurance Objectives

~~The QA program was developed to assure that integrity and quality will be maintained for all samples collected and that equipment and records will be maintained in accordance with EPA guidance. The QA Program identifies data quality objectives (**DQO**), processes for assuring sample quality, and processes for generating and maintaining quality records.~~

L-~~8b~~7a(1) Data Quality Objectives

Data Quality Objectives (**DQOs**) are qualitative and quantitative statements that specify the quality of data required to support project decisions. DQOs have been ~~will be~~ established to ensure that the data collected will be of a sufficient and known quality for their intended uses. The overall DQOs for this DMP are shown in the following sections.~~project will be to collect accurate and defensible data of known quality that will be sufficient to assess the concentrations of constituents in the ground water underlying the WIPP area. The data generated thus far by the DMP has been used to establish background ground-water quality. For the purpose of this~~

~~DMP, DQOs for measurement data will be specified in terms of accuracy, precision, completeness, representativeness, and comparability. Measurements of data quality in terms of accuracy and precision will be derived from the analysis of QC samples generated in the field and laboratory. Appropriate QC procedures will be used so that known and acceptable levels of accuracy and precision will be maintained for each data set. This section defines the acceptance criteria for each QC analysis performed. The following subsections define each DQO.~~

L-7a(1)(i) Detection Monitoring Program

Collect accurate and defensible data of known quality that will be sufficient to assess the concentrations of constituents in the groundwater underlying the WIPP area.

L-7a(1)(ii) Water Level Monitoring Program

Collect accurate and defensible data of known quality that will be sufficient to assess the groundwater flow direction and rate at the WIPP facility.

L-7a(2) Quality Assurance Objectives

Quality Assurance Objectives (**QAOs**) for measurement data have been specified in terms of accuracy, precision, completeness, representativeness, and comparability.

L-~~8b~~7a(~~1~~2)(i) Accuracy

Accuracy is the closeness of agreement between a measurement and an accepted reference value. When applied to a set of observed values, accuracy is a combination of a random component and a common systematic error (bias) component. Measurements for accuracy will include analysis of calibration standards, laboratory control samples, matrix spike samples, and surrogate spike recoveries~~samples~~. The bias component of accuracy is expressed as percent recovery (%R). Percent recovery is expressed as follows:

$$\%R = \frac{(measured\ \ sample\ \ concentration)}{true\ \ concentration} \times 100$$

L-~~8b~~7a(~~1~~2)(i)(A) Accuracy Objectives for Field Measurements

Field measurements will include pH, SC, temperature, ~~Eh~~specific conductance, specific gravity and static ~~ground-water~~groundwater surface elevation. Field measurement accuracy will be determined using calibration ~~check~~ standards. Thermometers used for field measurements will be calibrated to the National Institute for Standards and Technology (**NIST**) traceable standard on an annual basis to ~~assure~~ensure accuracy. Accuracy of ~~ground-water~~groundwater surface elevation measurements will be checked before each measurement period by verifying calibration of the device within the specified schedule. WIPP document WP 13-1 outlines the basic requirements for field equipment use and calibration. WIPP SOPs ~~Procedure WP 10-AD3029~~ contain~~s~~ instructions that outline protocols for maintaining current calibration of ~~ground-water~~groundwater surface elevation measurement instrumentation. ~~A current revision of this document or procedure will be maintained in the WIPP Operating Record.~~

L-~~8b~~7a(~~1~~2)(ii)(B) Accuracy Objectives for Laboratory Measurements

Analytical system accuracy will be quantified using the following laboratory accuracy QC checks: calibration standards, laboratory control samples (**LCS**), laboratory blanks, matrix and surrogate spike recoveries ~~samples~~. Single LCSs and matrix spike and surrogate spike sample analyses will be expressed as %R. Laboratory analytical accuracy is parameter dependent and will be prescribed in the laboratory SOP.

L-~~8b~~7a(2)(ii) Precision

Precision is the agreement among a set of replicate measurements without assumption or knowledge of the true value. Precision data will be derived from duplicate field and laboratory measurements. Precision will be expressed as relative percent difference (**RPD**), which is calculated as follows:

$$RPD = \frac{|(measured\ value\ sample\ 1 - measured\ value\ sample\ 2)|}{average\ of\ measured\ samples\ 1 + 2} \times 100$$

L-~~8b~~7a(2)(ii)(A) Precision Objectives for Field Measurements

~~Precision of field measurements of water quality parameters will meet or exceed required reporting levels.~~ Specific conductance (**SC**), pH, temperature, and ~~optionally Eh~~ will be measured during well purging and after sampling. SC measurements will be precise to ±10%, pH to 0.10 standard unit, specific gravity to 0.01 by hydrometer, ~~and~~ temperature to 0.10 degrees Celsius (°C), and SC~~Eh~~ to 10 millivolts (mV). Water-level measurement will be precise to ±0.01 ft. The precision of water density measurements, when measured in the field using down hole instrumentation, will be determined on a well-by-well basis and will result in no more than ±2 ft of error in the derived fresh-water head.

L-~~8b~~7a(2)(ii)(B) Precision Objectives for Laboratory Measurements

~~Precision of laboratory analyses will be assessed by performing the same analyses twice on LCSs with each analytical batch assessed at a minimum frequency of 1 in 20 ground-water samples for nonradiological parameters and 1 in 10 for radiological parameters. The laboratory will determine analytical precision control limits by performing replicate analyses of control samples. Precision measurements will be expressed as RPD.~~ Precision of laboratory analyses will be determined by analyzing a LCS and a lab control sample duplicate (**LCSD**) or by analyzing one of the field samples in duplicate depending on the requirements of the particular standard method. The precision is measured as the RPD of the recoveries for the spiked LCS/LCSD pair or the RPD of the duplicate sample analysis results. Laboratory analytical precision is also parameter dependent and will be prescribed in laboratory SOPs.

L-~~8b~~7a(~~3~~2)(iii) Contamination

In addition to measurements of precision and bias, QC checks for contamination will be performed. QC samples including trip blanks, field blanks, and method blanks will be analyzed to assess and document contamination attributable to sample collection equipment, sample handling and shipping, and laboratory reagents and glassware. Trip blanks will be used to assess volatile organic compound (**VOC**) sample contamination during shipment and handling and will be collected and analyzed at a frequency of 1 sample per sample shipment. Field blanks will be used to assess field sample collection methods and will be collected and analyzed at a minimum frequency of one sample per 20 samples (five percent of the samples collected).

Method blanks will be used to assess contamination resulting from the analytical process and will be analyzed at a minimum frequency of one sample per 20 samples, or five percent of the samples collected. Evaluation of sample blanks will be performed following U.S. EPA "National Functional Guidelines for Organic Data Review" (EPA, ~~1991~~1999) and "National Functional Guidelines for Evaluating Inorganics Analyses" (EPA, ~~1988~~2004). Only method blanks will be analyzed via wet chemistry methods. The criteria for evaluating method blanks will be established as follows: If method blank results exceed method reporting limits, then that value will become the detection limit for the sample batch. Detection of analytes of interest in method blank samples may be used to disqualify some samples, requiring resampling and additional analyses on a case-by-case basis.

L-~~8b~~7a(~~4~~2)(iv) Completeness

Completeness is a measure of the amount of usable valid data resulting from a data collection activity, given the sample design and analysis. Completeness may be affected by unexpected conditions that may occur during the data collection process.

Occurrences that reduce the amount of data collected include sample container breakage during sample shipment or in the laboratory and data generated while the laboratory was operating outside prescribed QC limits. All attempts will be made to minimize data loss and to recover lost data whenever possible. The completeness objective for analysis of Part 5, Table 5.4.a parameters ~~noncritical measurements (i.e., field measurements)~~ will be 90 percent and 100 percent analysis of Part 5, Table 5.4.b hazardous constituents~~for critical measurements (i.e., compliance data)~~. If the completeness objective for Part 5, Table 5.4.b constituents is not met, the ~~WIPP EM Manager~~Permittees will determine ~~on behalf of the Permittees~~ the need for resampling on a case-by-case basis. Numerical expression of the completeness (**%C**) of data is as follows:

$$\%C = \frac{number\ of\ accepted\ samples}{total\ number\ of\ samples\ collected} \times 100$$

L-~~8b~~7a(~~5~~2)(v) Representativeness

Representativeness is the degree to which sample analyses accurately and precisely represent the media they are intended to represent. Data representativeness for this DMP will be accomplished through implementing approved sampling procedures and the use of validated analytical methods. Sampling procedures will be designed to minimize factors affecting the integrity of the samples. ~~Ground-water~~Groundwater samples will only be collected after well purging criteria have been met. The analytical methods selected will be those that will most accurately and precisely represent the true concentration of analytes of interest.

For water levels and density, representativeness is a qualitative term that describes the extent to which a sampling design adequately reflects the environmental conditions of a site. The SOPs for measurement ensure that samples are representative of site conditions.

L-~~8b~~7a(~~6~~2)(vi) Comparability

Comparability is the extent to which one data set can be compared to another. Comparability will be achieved through reporting data in consistent units and collection and analysis of samples using consistent methodology. Aqueous samples will consistently be reported in units of measures dictated by the analytical method. Units of measure include:

- Milligrams per liter (mg/L) for alkalinity, inorganic compounds and metals
- Micrograms per liter (µg/L) for VOCs and semivolatile organic compounds (**SVOCs**).

Culebra ~~Ground-water~~groundwater surface elevation measurements will be expressed as equivalent freshwater elevation in feet above mean sea level.

L-~~8c~~7b Design Control

The approved ~~ground-water monitoring system was~~ design~~ed~~ for the DMP is specified in this Permit. Modifications to the DMP will be processed in accordance with ~~and will be maintained to meet specifications established in~~ 20.4.1.~~500~~ 900 NMAC (incorporating 40 CFR §§~~264 Subpart F~~270.42~~ and 264.601 through 264.603~~).

L-~~8d~~7c Instructions, Procedures, and Drawings

~~Provisions and responsibilities for t~~The preparation and use of instructions and procedures at the WIPP facility are outlined in WIPP document WP 13-1 (see Table L-3). ~~Any a~~Activities performed for the DMP ~~ground-water monitoring~~ that may affect ~~ground-water~~groundwater data quality will be performed in accordance with ~~documented and~~ approved procedures which comply with the Permit ~~and the requirements of 20.4.1.500 NMAC (incorporating 40 CFR §264 Subpart F)~~.

~~Technical procedures, as specified elsewhere in this DMP, have been developed for each quality-affecting function performed for ground-water monitoring. The technical procedures unique to the DMP will be controlled by the ES&H at WIPP. The procedures are sufficiently detailed and include, when applicable, quantitative or qualitative acceptance criteria.~~

~~Procedures were prepared in accordance with requirements in WIPP document WP 13-1. A current revision of this document will be maintained in the WIPP Operating Record.~~

L-~~8e~~7d Document Control

Permittees ~~Document controls~~ will ensure that the latest approved versions of ~~procedures~~ SOPs will be used in performing ~~ground-water~~groundwater monitoring functions and that obsolete materials will be adequately identified or removed from work areas.

~~L-8f Control of Work Processes~~

~~Process control requirements, defined in WIPP document WP 13-1 are met, and will continue to be met, for this DMP. A current revision of this document will be maintained in the WIPP Operating Record.~~

L-~~8g~~7e Inspection and Surveillance

Inspection and surveillance activities will be conducted as outlined in WIPP document WP 13-1 (see Table L-3). The ~~QA Department~~Permittees will be responsible for performing the applicable SOPs. ~~inspections and surveillance on the scope of work. EM section personnel will be responsible for performance checks as defined in applicable procedures and determined for the Permittees by MOC metrology laboratory personnel. Performance checks for the DMP will determine the acceptability of purchased items and assess degradation that occurs during use. A current revision of this document will be maintained in the WIPP Operating Record.~~

L-~~8h~~7f Control of Monitoring and Data Collection Equipment

WIPP document WP 13-1 (see Table L-3) outlines the basic requirements for control and calibrating monitoring and data collection (**M&DC**) equipment. M&DC equipment shall be properly controlled, calibrated, and maintained according to WIPP facility SOPs (see Table L-3) ~~Procedure WP 10-AD3029~~ to ensure continued accuracy of ~~ground-water~~groundwater monitoring data. Results of calibrations, maintenance, and repair will be documented. Calibration records will identify the reference standard and the relationship to national standards or nationally accepted measurement systems. Records will be maintained to track uses of M&DC equipment. If M&DC equipment is found to be out of tolerance, the equipment will be tagged and it will not be used until corrections are made. ~~A current revision of this document or procedure will be maintained in the WIPP Operating Record.~~

L-~~8i~~7g Control of Nonconforming Conditions

In accordance with ~~WIPP document~~ WP 13-1 (see Table L-3), ~~specifies the system used at WIPP for ensuring that appropriate measures are established to control nonconforming conditions. Nonconforming conditions connected to the DMP will be identified in and controlled by documented procedures. E~~equipment that does not conform to specified requirements will be controlled to prevent use. The disposition of defective items will be documented on records traceable to the affected items. Prior to final disposition, faulty items will be tagged and segregated. Repaired equipment will be subject to the original acceptance inspections and tests prior to use. ~~A current revision of this document will be maintained in the WIPP Operating Record.~~

L-~~8j~~7h Corrective Action

Requirements for the development and implementation of a system to determine, document, and initiate appropriate corrective actions after encountering conditions adverse to quality at WIPP are outlined in WIPP document WP 13-1 (see Table L-3). Conditions adverse to acceptable quality will be documented and reported in accordance with corrective action procedures and corrected as soon as practical. Immediate action will be taken to control work performed under conditions adverse to acceptable quality and its results to prevent quality degradation. ~~A current revision of this document will be maintained in the WIPP Operating Record.~~

L-~~8k~~7i Quality Assurance Records

WIPP document WP 13-1 (see Table L-3) outlines the policy that will be used at WIPP regarding identification, preparation, collection, storage, maintenance, disposition, and permanent storage of QA records. ~~A current revision of this document will be maintained in the WIPP Operating Record.~~

Records to be generated in the DMP will be specified by procedure. QA and RCRA operating records will be identified. This will be the basis for the labeling of records as "QA" or "RCRA operating record" on the Environmental Monitoring Records Inventory and Disposition Schedule~~EM RIDS~~.

~~QA records will document the results of the DMP implementing procedures and will be sufficient to demonstrate that all quality-related aspects are valid. The records will be identifiable, legible, and retrievable.~~

L-98 References

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TABLES

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Table L-1
Hydrological Parameters for Rock Units aAbove the Salado at WIPP

Unit		Hydraulic Conductivity	Storage ~~Coefficient~~ Storage	~~Transmissivity~~	~~Permeability~~	Thickness	Hydraulic Gradient
Santa Rosa		2×10^{-8} to 2×10^{-6} m/s (1) (2)	~~Specific capacity 0.029 to 0.041 ℓ/s/m~~	~~6×10^{-7} to 6×10^{-5} m²/s (3)~~	~~10^{-10} m²~~	0 to 91 m	0.001 (5)
Dewey Lake		10^{-8} m/s	Specific storage 1×10^{-5} (1/m) (2)	~~2.8×10^{-6} to 2.8×10^{-4} m²/s (4)~~	~~5.01×10^{-17} m²~~	152 m	0.001 (5)
Rustler	Forty-niner	1×10^{-13} to 1×10^{-11} m/s (anhydrite) 1×10^{-9} m/s (mudstone) (2)	Specific storage 1×10^{-5} (1/m) (2)	~~8×10^{-8} to 8×10^{-9} m²/s~~	~~0 m²~~	13 to 23 m	NA (6)
	Magenta	$1 \times 10^{-8.5}$ to $1 \times 10^{-6.5}$ m/s (2)	Specific storage 1×10^{-5} (1/m) (2)	~~4×10^{-4} to 1×10^{-9} m²/s~~	~~6.31×10^{-14} m²~~	7 to 8.5 m	3 to 6
	Tamarisk	1×10^{-13} to 1×10^{-11} m/s (anhydrite) 1×10^{-9} m/s (mudstone) (2)	Specific storage 1×10^{-5} (1/m) (2)	~~$<2.7 \times 10^{-11}$ m²/s~~	~~0 m²~~	26 to 56 m	NA (6)
	Culebra	$1 \times 10^{-7.5}$ to $1 \times 10^{-5.5}$ m/s (2)	Specific storage 1×10^{-5} (1/m) (2)	~~1×10^{-3} to 1×10^{-129} m²/s~~	~~2.1×10^{-14} m²~~	4 to 11.6 m	0.003 to 0.007 (5)
	~~Unnamed lower member~~Los Medaños	6×10^{-15} to 1×10^{-13} m/s 1.5×10^{-11} to 1.2×10^{-11} m/s (basal interval)	Specific storage 1×10^{-5} (1/m) (2)	~~2.9×10^{-10} to 2.2×10^{-13} m²/s 2.9×10^{-10} to 2.4×10^{-10} m²/s (basal interval)~~	~~0 m²~~	29 to 38 m	NA (6)

~~Matrix characteristics relevant to fluid flow include values used in this table such as permeability, hydraulic conductivity, gradient, etc.)~~

~~Table Notes:~~

~~(1) The Santa Rosa Formation is not present in the western portion of the WIPP site. It was combined with the Dewey Lake Red Beds in three-dimensional regional groundwater flow modeling (Corbet and Knupp, 1996), and the range of values entered here are those used in that study for the Dewey Lake/Triassic hydrostratigraphic unit.~~

~~(2) Values or ranges of values given for these entries are the values used in three-dimensional regional groundwater flow modeling (Corbet and Knupp, 1996). Values are estimated based on literature values for similar rock types, adjusted to be consistent with site-specific data where available. Ranges of values include spatial variation over the WIPP site and differences in values used in different simulations to test model sensitivity to the parameter.~~

~~(3) The range of values given here for transmissivity of the Santa Rosa is estimated for the center of the site. Transmissivity is the product of the thickness of the productive interval times its hydraulic conductivity. Thickness of the Santa Rosa is estimated to be 30 meters at the center of the WIPP site, and the range of derived transmissivities are based on the range of hydraulic conductivity values used by Corbet and Knupp (1996) for the combined Dewey Lake/Triassic unit.~~

~~(4) The range of values given here by transmissivity of the Dewey Lake is estimated for the center of the site. Transmissivity is the product of the thickness of the productive interval times its hydraulic conductivity. Thickness of the Dewey Lake is estimated to be 140 meters at the center of the WIPP site, and the range of derived transmissivities are based on the range of hydraulic conductivity values used by Corbet and Knupp (1996) for the combined Dewey Lake/Triassic unit.~~

~~(5) Hydraulic gradient is a dimensionless term describing change in the elevation of hydraulic head divided by change in horizontal distance. Values given in these entries are determined from potentiometric surfaces. The range of values given for the Culebra reflects the highest and lowest gradients observed within the WIPP site boundary. Values for the Dewey Lake and Santa Rosa are assumed to be the same as the gradient determined from the water table. Note that the Santa Rosa Formation is absent or above the water table in most of the controlled area, and that the concept of a horizontal hydraulic gradient is not meaningful for these regions.~~

~~(6) Flow in units of very low hydraulic conductivity is slow, and primarily vertical. The concept of a horizontal hydraulic gradient is not applicable.~~

~~Sources: Beauheim, 1986; Domenico and Schwartz, 1990; Domski, Upton, and Beauheim, 1996; Earlough, 1977.~~

Table L-2
WIPP ~~Ground-water~~Groundwater Detection Monitoring Program Sample Collection and ~~Ground-water~~Groundwater Surface Elevation Measurement Frequency

Installation	Frequency
~~Ground-water~~Groundwater Quality Sampling	
~~DMP monitoring wells~~DMWs	~~Semia~~Annually
~~All other WIPP surveillance wells~~	~~On special request only~~
~~Ground-water~~Groundwater Surface Elevation Monitoring	
~~DMP monitoring wells~~DMWs	Monthly and prior to sampling events
WLMP Wells (see Table L-4) ~~All other WIPP surveillance well sites~~	Monthly
~~Redundant wells at all other WIPP surveillance well sites~~	~~Quarterly~~

~~**Table L-3**~~
~~**Analytical Parameter List for the WIPP Detection Monitoring Program**~~

~~Background Ground-water Quality~~	~~Operational Detection Monitoring Ground-water Quality~~
~~Indicator Parameters~~ ~~pH, SC, TOC, TOH, TDS, TSS, density~~ ~~Parameters Listed in~~ ~~20.4.1.500 NMAC (incorporating 40 CFR §264) Appendix IX, Calcium, Magnesium, Potassium~~ ~~Field Analyses~~ ~~pH, SC, temperature, chloride, Eh, alkalinity, total Fe, specific gravity~~	~~Indicator Parameters~~ ~~pH, SC, TOC, TOH, TDS, TSS, density~~ ~~Hazardous Constituents~~ ~~Organic~~ ~~Chloroform~~ ~~1,2-dichloroethane~~ ~~Carbon tetrachloride~~ ~~Chlorobenzene~~ ~~1,1-dichloroethylene~~ ~~1,1-dichloroethane~~ ~~Methylene chloride~~ ~~1,1,2,2-tetrachloroethane~~ ~~Toluene~~ ~~1,1,1-trichloroethane~~ ~~Cresols~~ ~~1,4-dichlorobenzene~~ ~~1,2-dichlorobenzene~~ ~~trans-1,2-dichloroethylene~~ ~~2,4-dinitrophenol~~ ~~2,4-dinitrotoluene~~ ~~Hexachloroethane~~ ~~Hexachlorobenzene~~ ~~Isobutanol~~ ~~Methyl ethyl ketone~~ ~~Pentachlorophenol~~ ~~Pyridine~~ ~~Tetrachloroethylene~~ ~~1,1,2 Trichloroethane~~ ~~Trichloroethylene~~ ~~Trichlorofluoromethane~~ ~~Xylenes~~ ~~Nitrobenzene~~ ~~Vinyl Chloride~~ ~~Metals~~ ~~Arsenic~~ ~~Barium~~ ~~Cadmium~~ ~~Chromium~~ ~~Lead~~ ~~Mercury~~ ~~Selenium~~ ~~Silver~~ ~~Antimony~~ ~~Calcium~~ ~~Beryllium~~ ~~Magnesium~~ ~~Nickel~~ ~~Potassium~~ ~~Thallium~~ ~~Vanadium~~ ~~Field Analyses~~ ~~pH, SC, temperature, chloride, Eh, alkalinity, total Fe, specific gravity~~

~~Note: Because of the lack of sophisticated weights and measures equipment available for field density assessment, field density evaluations are expressed in terms of specific gravity, which is a unitless measure.~~

Table L-3
Standard Operating Procedures Applicable to the DMP

Number	Title/Description
WP 02-EM1005	Groundwater Serial Sample Analysis: This procedure provides general instructions necessary to perform field analyses of serial samples in support of the DMP. Serial samples are collected and analyzed at the field laboratory for field indicators. Serial sample results help determine if pumped groundwater is representative of undisturbed groundwater within the formation.
WP 02-EM1006	Final and Serial Sample Collection: This procedure describes the steps for collecting groundwater samples from the DMWs near the WIPP. Serial samples are collected and analyzed at the Field Laboratory until stabilization of the field parameters occurs. Final samples for Resource Conservation and Recovery Act (RCRA) analyses are collected and analyzed by a contract laboratory.
WP 02-EM1014	Groundwater Level Measurement: This document describes the method used for groundwater level measurements in support of groundwater monitoring at the WIPP using a portable electronic water-level probe.
WP 02-EM1021	Pressure Density Survey: This procedure defines the field methodology used to determine the average density of fluid standing in the well bores of groundwater-level monitoring wells. The data derived from the survey are used to calculate equivalent freshwater heads at non-detection monitoring wells. Because most pressure densities are obtained by Sandia National Laboratories via pressure transducers installed in wells, this procedure is used to obtain pressure densities at wells not equipped with fixed transducers.
WP 02-EM1026	Water Level Data Handling and Reporting: This procedure provides instructions on handling water level data collected at the WIPP site. Data are collected and recorded on field forms in accordance with WP 02-EM1014. This procedure is initiated when WIPP wells in the water surveillance program have been measured for a given month.
WP 02-EM3001	Administrative Processes for Environmental Monitoring and Hydrology Programs: This procedure provides the administrative guidance environmental monitoring personnel use to maintain quality control associated with environmental monitoring sampling and reporting activities. This administrative procedure does not pertain to volatile organic compound (VOC) monitoring, with the exception of Section 5.0 which pertains to the regulatory reporting review process.
WP 02-EM3003	Data Validation and Verification of RCRA Constituents: This procedure provides instructions on performing verification and validation of laboratory data containing the analytical results of groundwater monitoring samples. This procedure is applied only to the non-radiological analyses results for compliance data associated with the groundwater monitoring sampling at the WIPP site. The data reviewed for this procedure includes general chemistry parameters and RCRA constituents.
WP-02-RC.01	Hazardous and Universal Waste Management Plan: This plan describes the responsibilities and handling requirements for hazardous and universal wastes generated at the WIPP. It is meant to ensure that these wastes are properly handled, accumulated, and transported to an approved Treatment, Storage, Disposal Facility (TSDF) in accordance with applicable state and federal regulations, U.S. Department of Energy (DOE) Orders, and Washington TRU Solutions LLC (WTS) policies and procedures. This plan implements applicable sections of 20.4.1.100-1102 New Mexico Administrative Code (NMAC), *Hazardous Waste Management* (incorporating 40 *Code of Federal Regulations* [CFR] Parts 260-268 and 273).
WP 10-AD3029	Calibration and Control of Monitoring and Data Collection Equipment: This procedure provides direction for the control and calibration of Monitoring and Data Collection (M&DC) equipment at the WIPP, and ensures traceability to NIST (National Institute of Standards and Technology) standards, international standards, or intrinsic standards. This procedure also establishes requirements and responsibilities for identifying recall equipment, and for obtaining calibration services for WIPP M&DC equipment.
WP 13-1	Washington TRU Solutions LLC Quality Assurance Program Description: This document establishes the minimum quality requirements for WTS personnel and guidance for the development and implementation of QA programs by WTS organizations at WIPP.

Table L-4
January 2011 Culebra WLMP

WELL ID	WELL ID	WELL ID
AEC-7	H-17	SNL-15
C-2737	H-19 pad*	SNL-16
ERDA-9	I-461	SNL-17
H-02b2	SNL-01	SNL-18
H-03b2	SNL-02	SNL-19
H-04bR	SNL-03	WQSP-1
H-05b	SNL-05	WQSP-2
H-06bR	SNL-06	WQSP-3
H-07b1	SNL-08	WQSP-4
H-9bR	SNL-09	WQSP-5
H-10c	SNL-10	WQSP-6
H-11b4	SNL-12	WIPP-11
H-12	SNL-13	WIPP-13
H-15R	SNL-14	WIPP-19
H-16		

*H-19b0 monthly

Table L-5
Details of Construction for the Six Culebra Detection Monitoring Wells

NAME (Figure)	DATE DRILLED	TOTAL DEPTH feet (meters) bgs	DEPTH INTO LOS MEDAÑOS feet (meters)	DRILLING DEPTHS feet (meters) bgs		CASING feet (meters) bgs		PACKING feet (meters) bgs		CULEBRA INTERVAL feet (meters) bgs
				WITH AIR	CORING	DEPTH FOR 5 in. CASING	INTERVAL FOR SLOTTED SCREEN	SAND PACK INTERVAL	BRADY GRAVEL PACK INTERVAL	
WQSP-1 Figure L-7	September 13 and 16, 1994	737 (225)	15 (5)	693 (211)	695.6 to 737 (211 to 224.6)	737 (224.6)	702 to 727 (214 to 222)	640 to 651 (195 to 198)	651 to 737 (198 to 224.6)	699 to 722 (213 to 221)
WQSP-2 Figure L-8	September 6 and 12, 1994	846 (257.9)	12.3 (3.7)	800 (244)	800 to 846 (244 to 258)	846 (258)	811 to 836 (247 to 255)	790 to 793 (241 to 242)	793 to 846 (242 to 258)	810.1 to 833.7 (247 to 254)
WQSP-3 Figure L-9	October 21 and 26, 1994	880 (268)	10 (3.1)	880 (268)	833 to 879 (254 to 268)	880 (268)	844 to 869 (257 to 265)	827 to 830 (252 to 253)	830 to 880 (253 to 268)	844 to 870 (257 to 265)
WQSP-4 Figure L-10	October 5 and 10, 1994,	800 (244)	9.2 (2.8)	740 (226)	740.5 to 798 (225.7 to 243)	800 (244)	764 to 789 (233 to 241)	752 to 755 (229 to 230)	755 to 800 (230 to 244)	766 to 790.8 (233 to 241)
WQSP-5 Figure L-11	October 12 and 19, 1994,	681 (208)	2.0(0.61)	676 (206)	648 to 676 (198 to 206)	681 (208)	646 to 671 (197 to 205)	623 to 626 (190 to 191)	626 to 681 (191 to 208)	648 to 674.4 (198 to 205.6)
WQSP-6 Figure L-12	September 26 and October 3, 1994	616.6 (187.9)	9.7 (3)	367 (112)	367 to 616 (112 to 188)	616.6 (188)	581 to 606 (177 to 185)	567 to 570 (173 to 173.7)	570 to 616.6 (174 to 188)	582 to 606.9 (177 to 185)

Table L-46
Suggested Analytical Parameter and Sample Requirements

(10) PARAMETERS	(12) NO. OF BOTTLES	(13) VOLUME	(14) TYPE	(15) ACID WASH	(16) SAMPLE FILTER	(17) PRESERVATIVE	(18) HOLDING TIME
Indicator[1] Parameters:							
• pH	-	25 ml[2]	Glass	Field determined	No?	Field determined	None
• SC	-	100 ml[2]	Glass	Field determined	No	Field determined	None
• TOC	4	15 ml[2]	Glass	yes	No	HCl	28 days[2]
• ~~TOX~~	~~3~~	~~250 ml~~	~~Glass~~	~~yes~~	~~No~~	~~H_2SO_4, pH<2~~	~~7 days[2]~~
General Chemistry	1	1 Liter	Plastic	Yes	No	HNO_3,4pH<2	not specified in DMP
Phenolics	1	1 Liter	Amber Glass	Yes	No	H_2SO_4, pH<2	not specified in DMP
Metals/Cations	2	1 Liter	Plastic	Yes	No	HNO_3, pH<2	6 months[2,3]
VOC	4	40 ml	Glass	No	No	HCL, ph<2	14 days[2]
VOC (Purgable)	2	40 ml	Glass	No	No	HCL, ph<2	14 days[2]
VOC (Non-Purgable)	2	40 ml	Glass	No	No	HCL, ph<2	14 days[2]
BN/As	1	½ Gallon	Amber Glass	Yes	No	None	
TCLP	1	1 Liter	Plastic	Yes	No	HNO_3, pH<2	7 days[2]
Cyanide (Total)	1	1 Liter	Plastic	Yes	No	NaOH, pH>12	14 days[2]
Sulfide	1	250 ml	Amber Glass	Yes	No	NaOH + Zn Acetate	28 days[2]
Radionuclides	1	1 Gallon	Plastic Cube	Yes	Yes	HNO_3, pH<2	6 months[2]

1 = RCRA Detection Monitoring Analytes

2 = As specified in Table 4-1 of the RCRA TEGD

3 = Reduced holding time of 1 week for WIPP-specific Divalent cation 2 samples noted in the GMD

Note: Unless otherwise indicated, data are from DOE Procedure WP 02-EM1006 methods and are provided as information only.

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FIGURES

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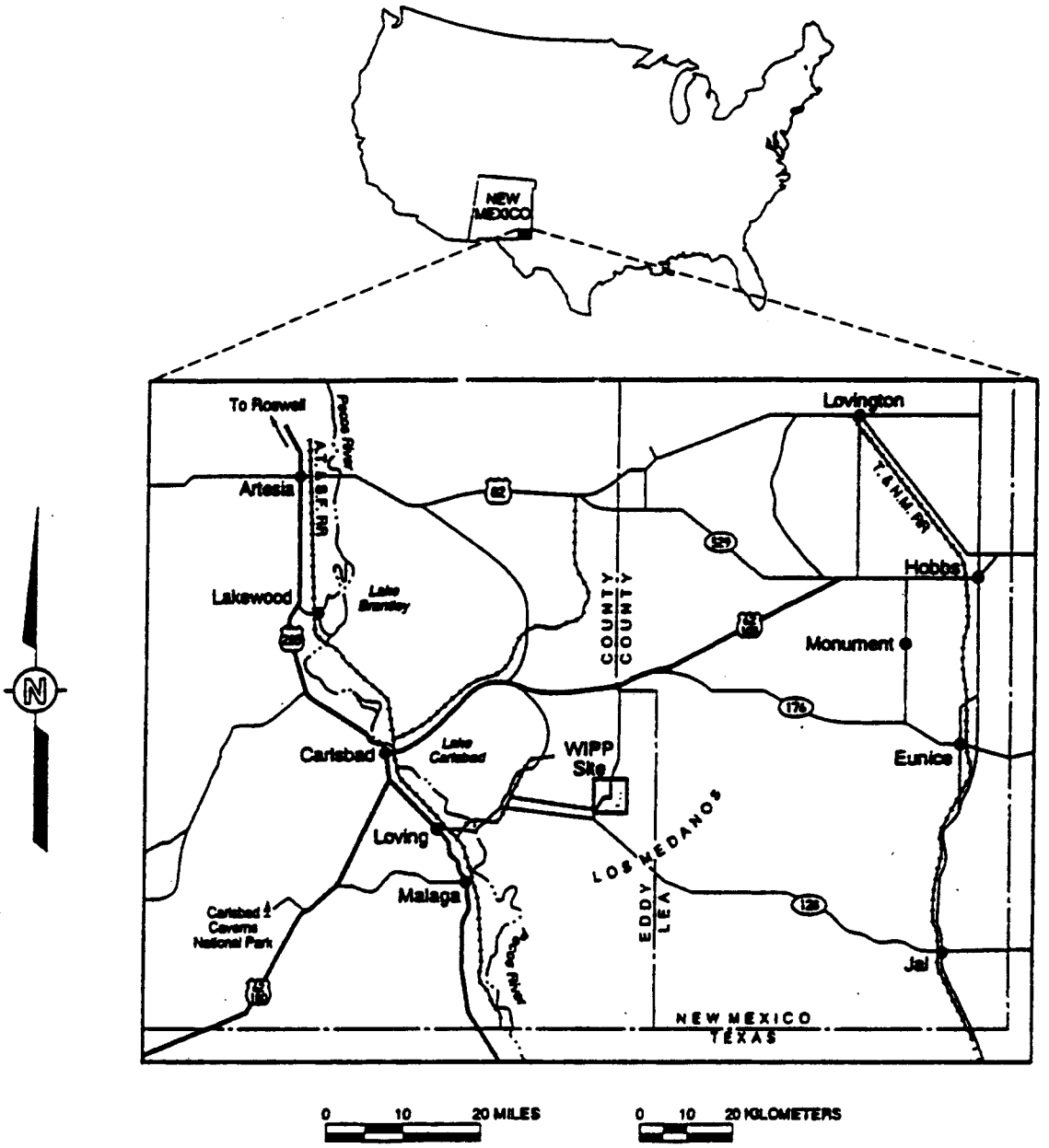
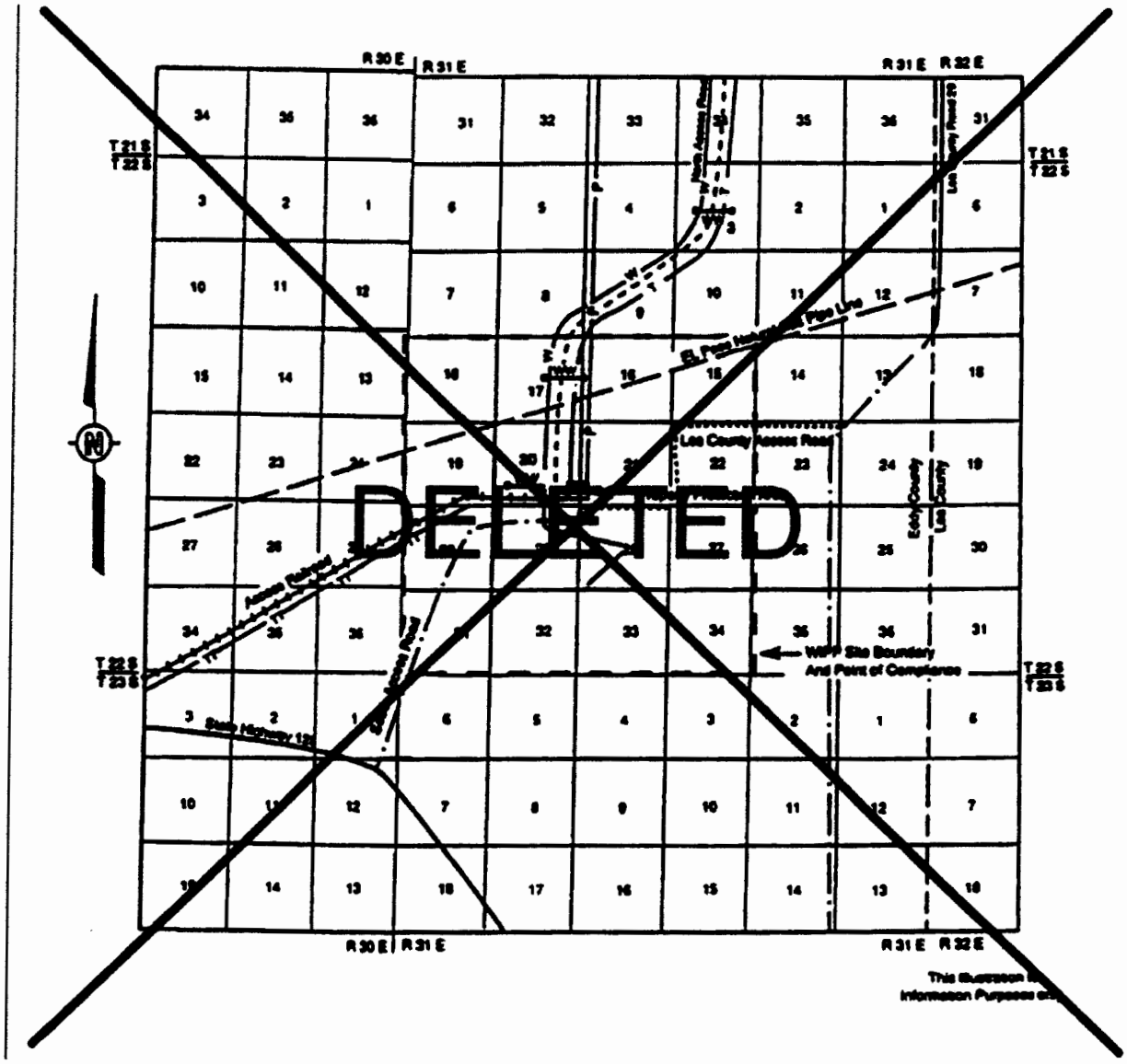


Figure L-1
General Location of the WIPP Facility



~~Figure L-2~~
~~WIPP Facility Boundaries Showing 16-Square-Mile Land Withdrawal Boundary~~

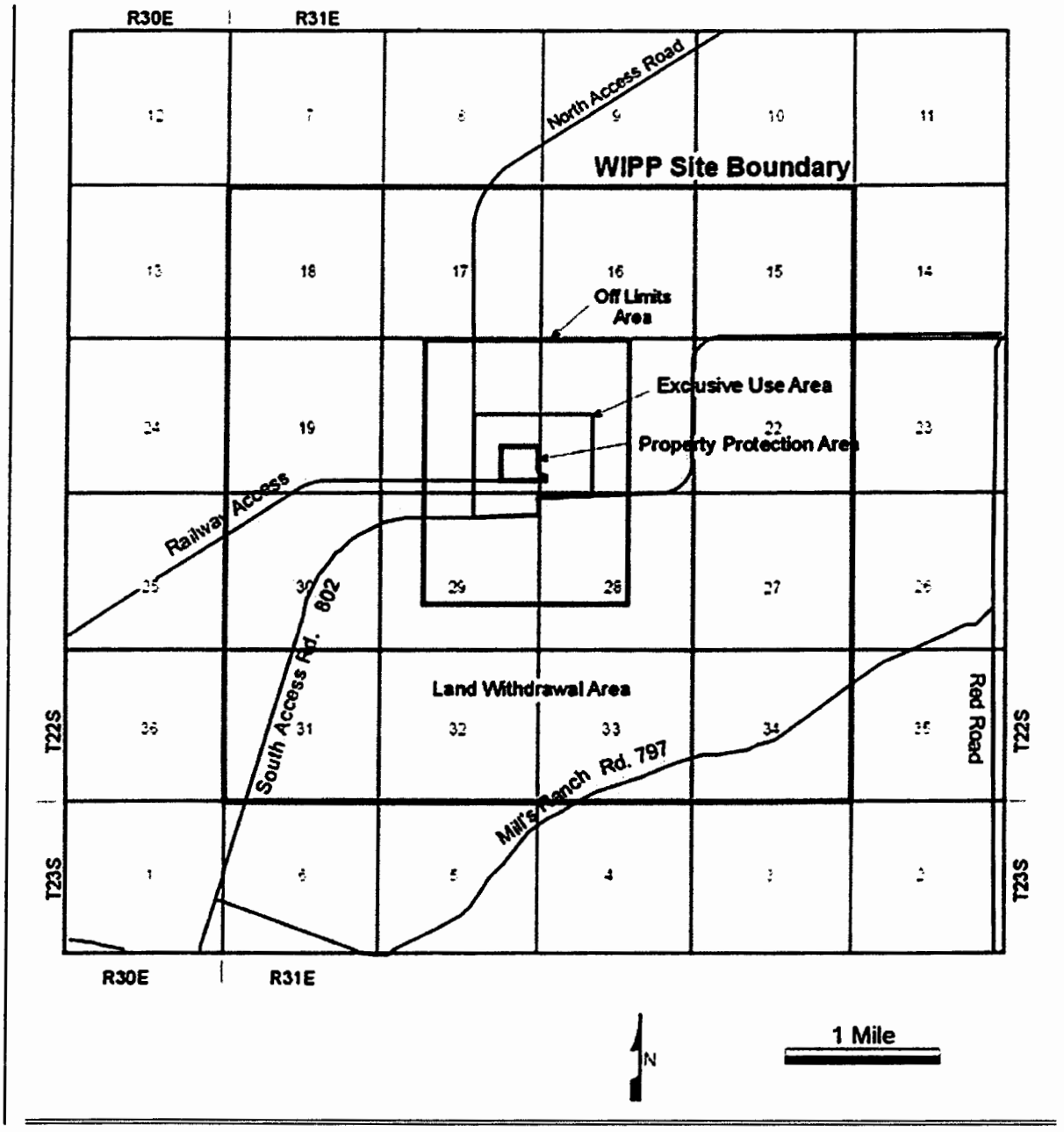
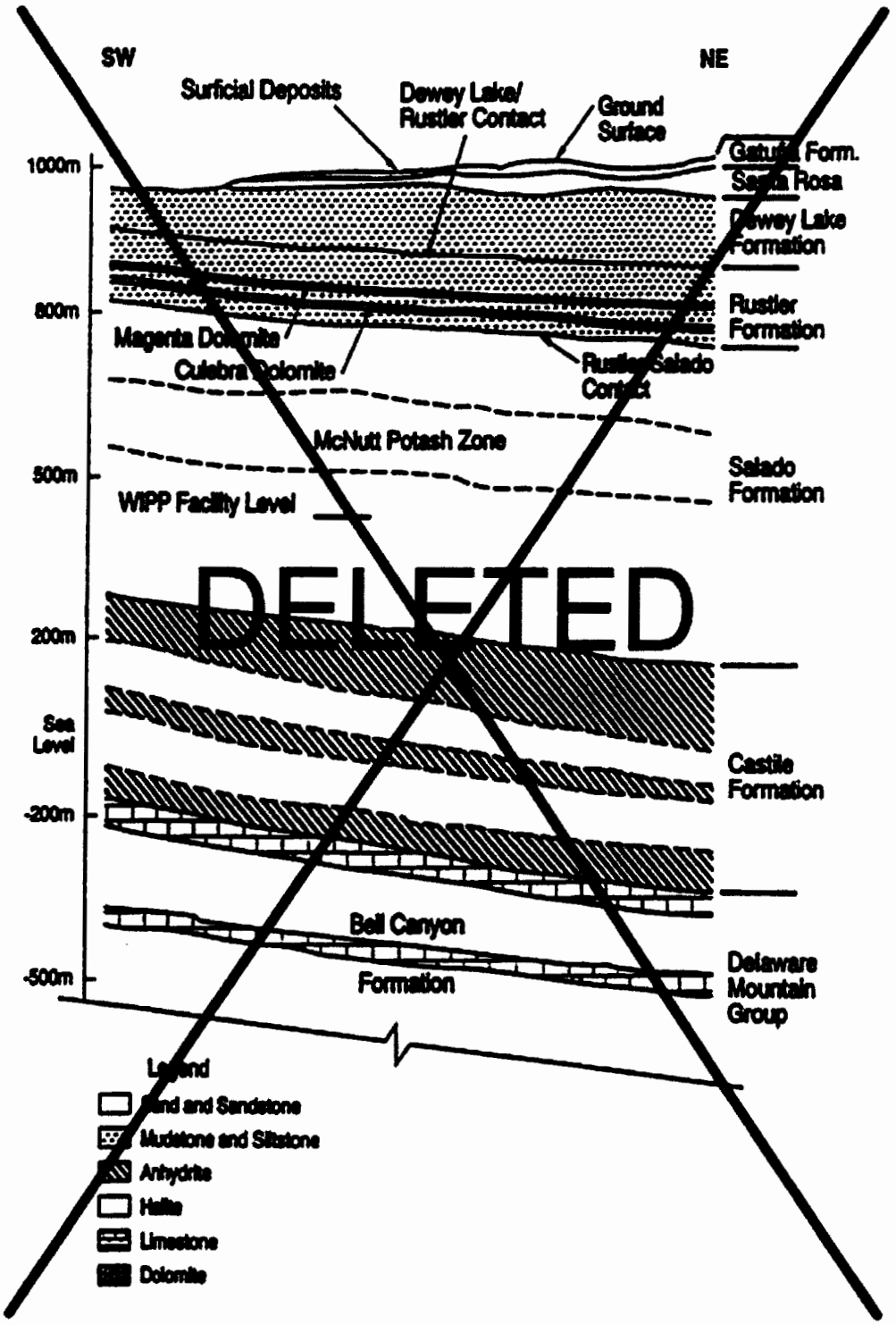


Figure L-2
WIPP Facility Boundaries Showing 16-Square-Mile Land Withdrawal Boundary

SYSTEM	SERIES	GROUP	FORMATION	MEMBER
RECENT	RECENT		SURFICIAL DEPOSITS	
QUATERNARY	PLEISTOCENE		MESCALERO CALICHE	
			GATUNA	
TERTIARY	MID-PLIOCENE		OGALLALA	
TRIASSIC		DOCKUM	SANTA ROSA	
PERMIAN	OCHOAN		DEWEY LAKE	
			RUSTLER	Forty-niner
				Magenta
				Tamarisk
				Culebra
				~~Unnamed~~Los Medaños
			SALADO	Upper
				McNutt Potash
				Lower
			CASTILE	
	GUADALUPIAN	DELAWARE MOUNTAIN	BELL CANYON	
			CHERRY CANYON	
			BRUSHY CANYON	

Figure L-3
Site Geologic Column



~~Figure L-4~~
~~Generalized Stratigraphic Cross Section above Bell Canyon Formation at WIPP Site~~

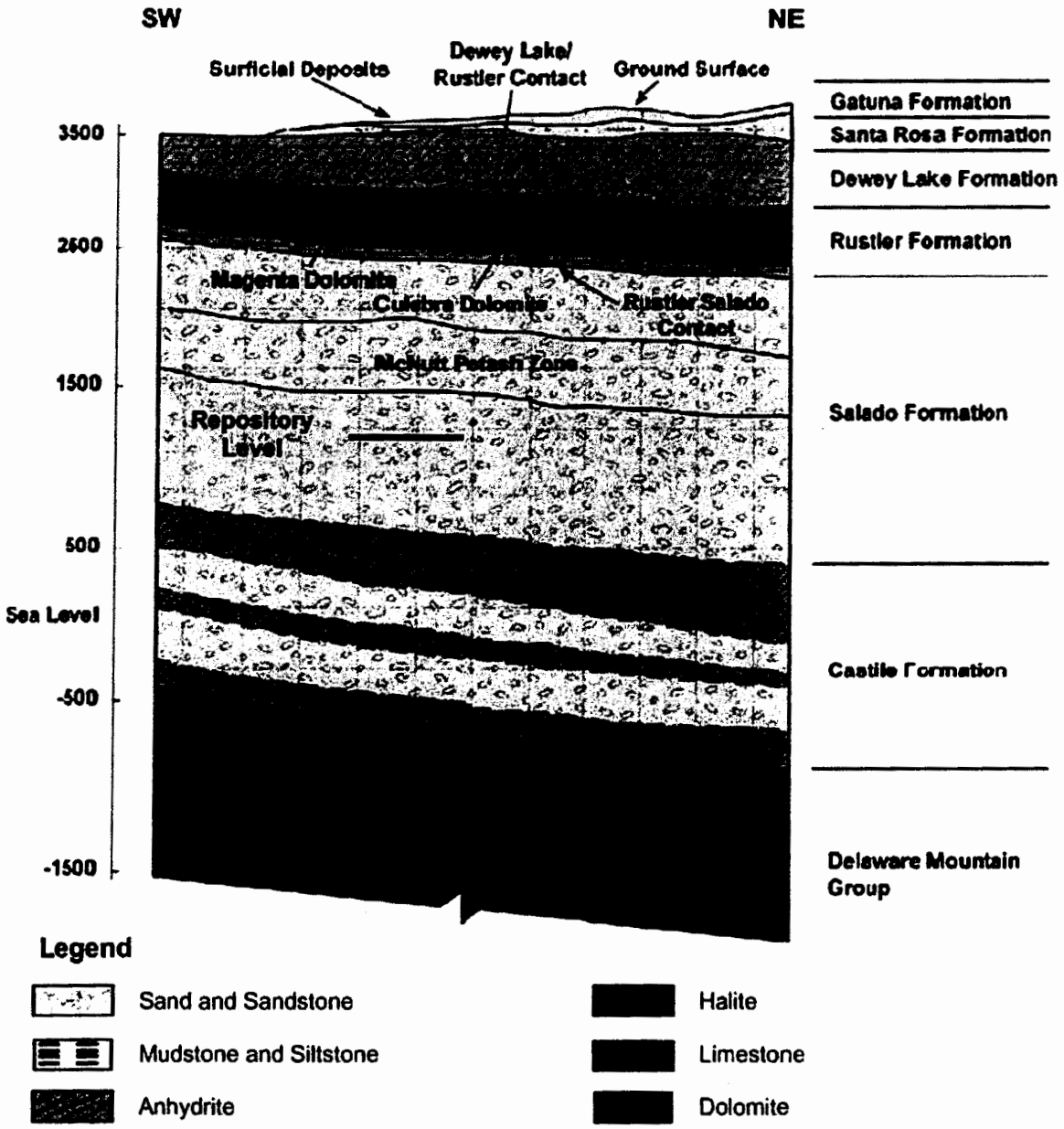
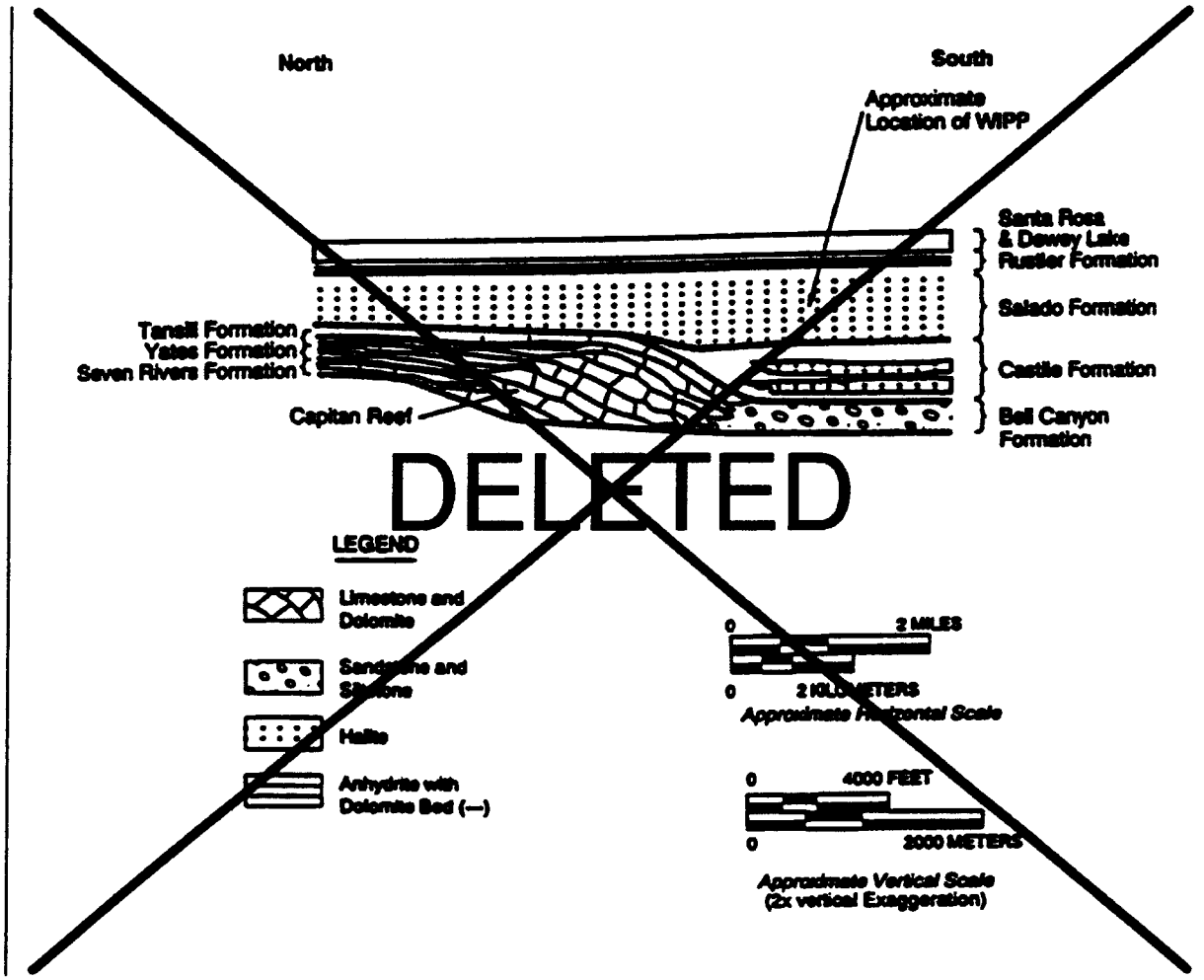


Figure L-4
Generalized Stratigraphic Cross Section above Bell Canyon Formation at WIPP Site



~~Figure L-5~~
~~Schematic North-South Cross Section Through the North Delaware Basin~~

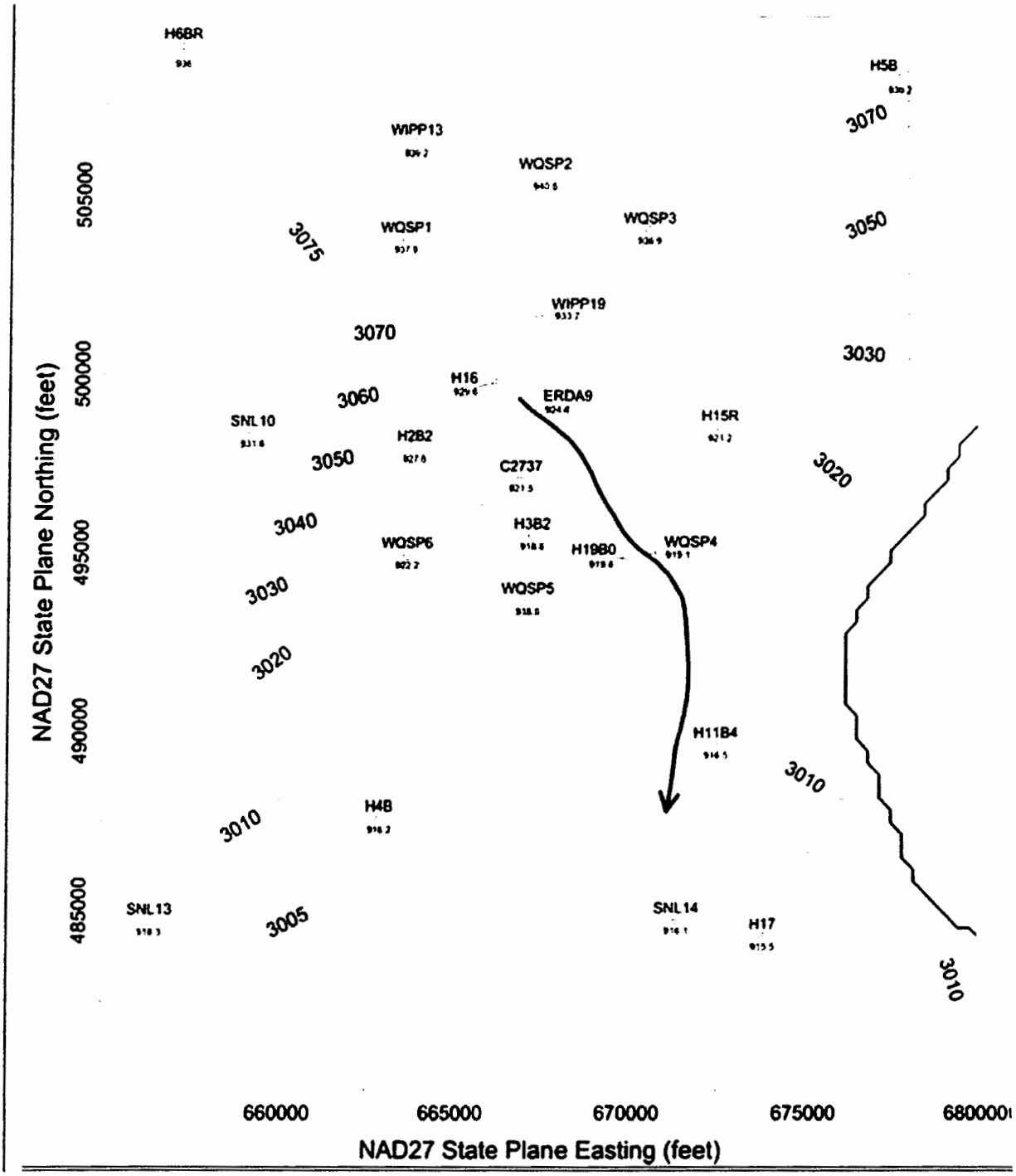
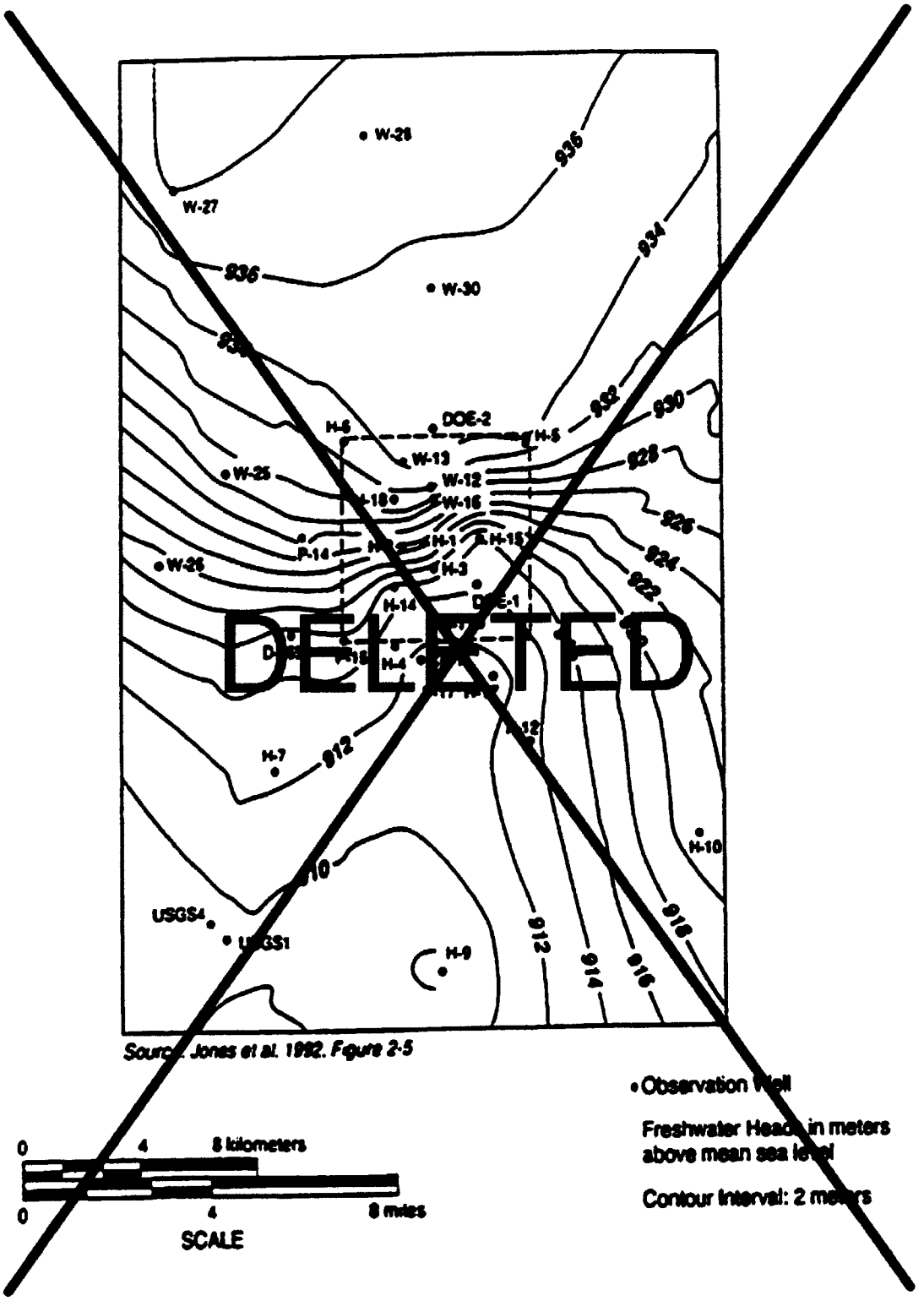


Figure L-5
Culebra Freshwater-Head Potentiometric Surface



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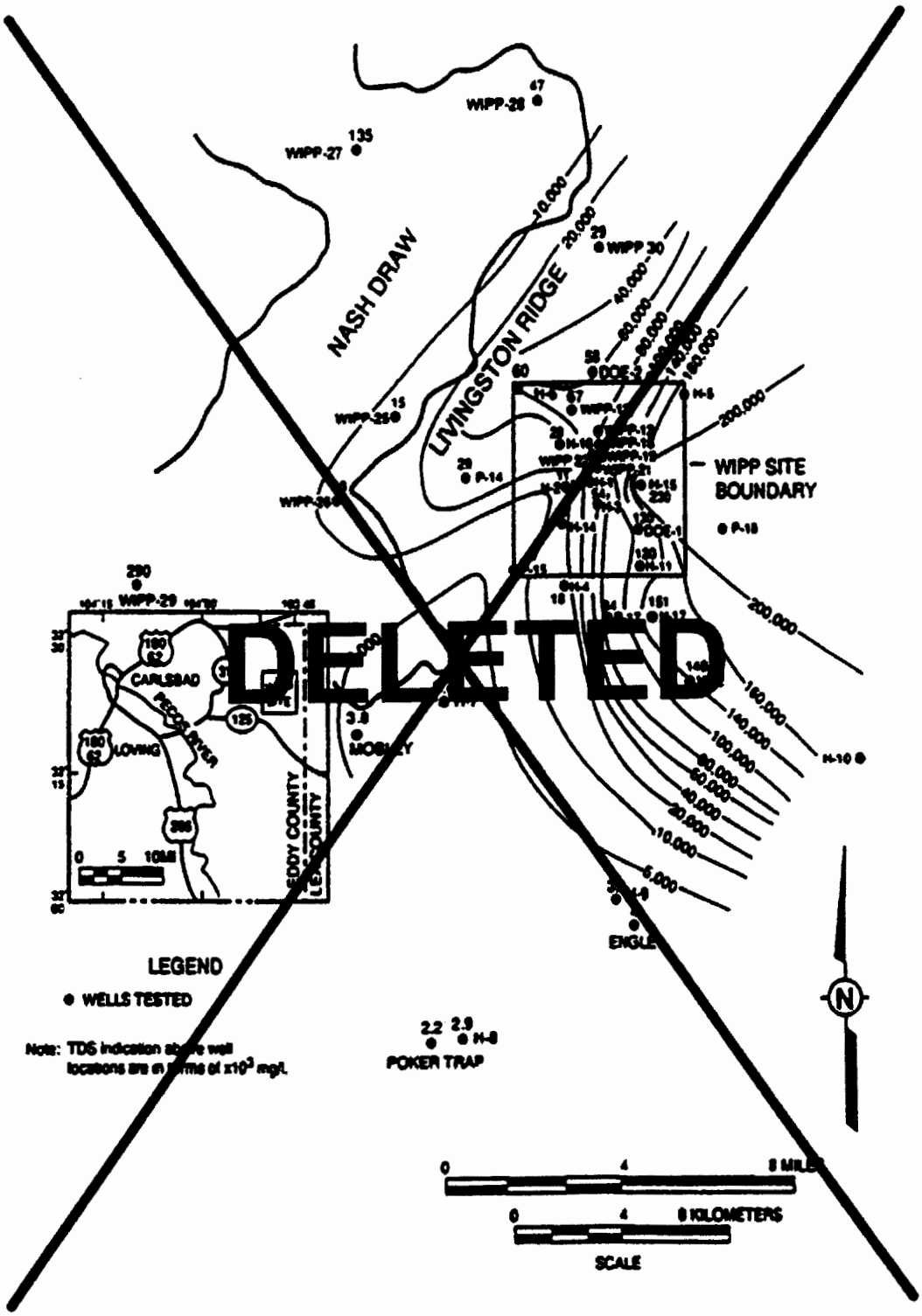
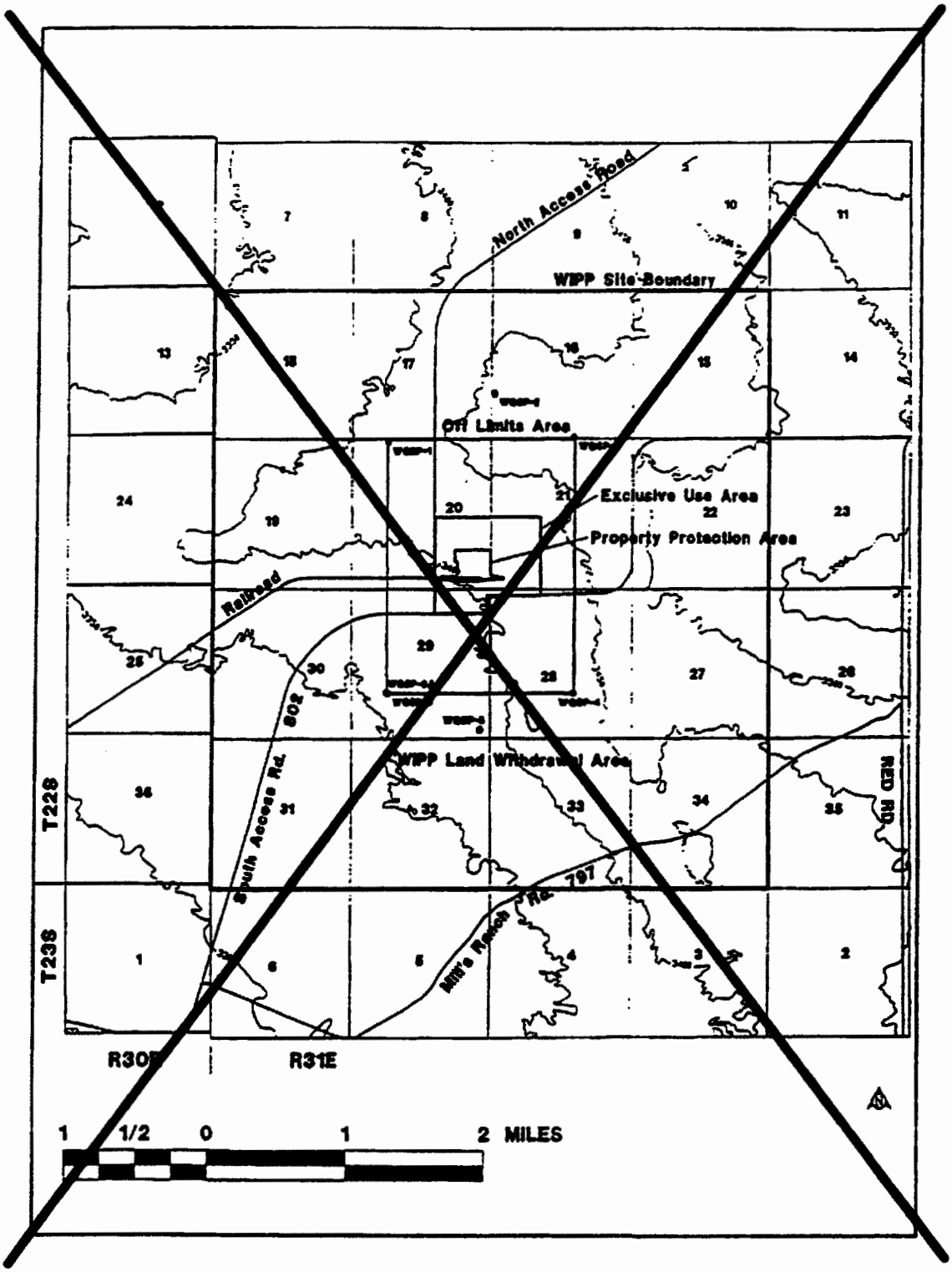
~~Figure L-6~~
~~Culebra Freshwater-Head Contour Surface~~



~~Figure L-7~~
~~Total Dissolved Solids Distribution in the Culebra~~



~~Figure L-8~~
~~WQSP Monitor Well Locations~~

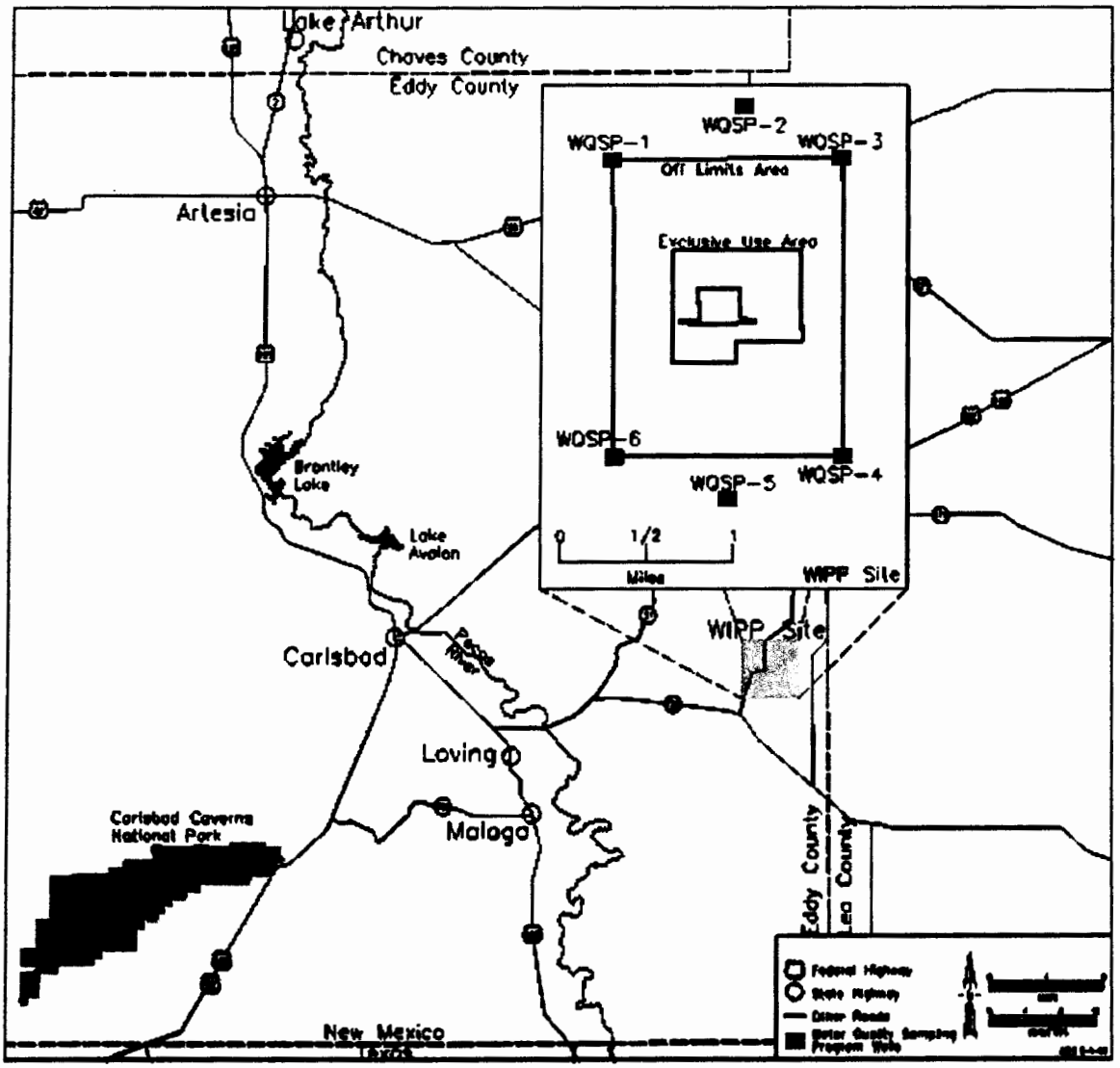
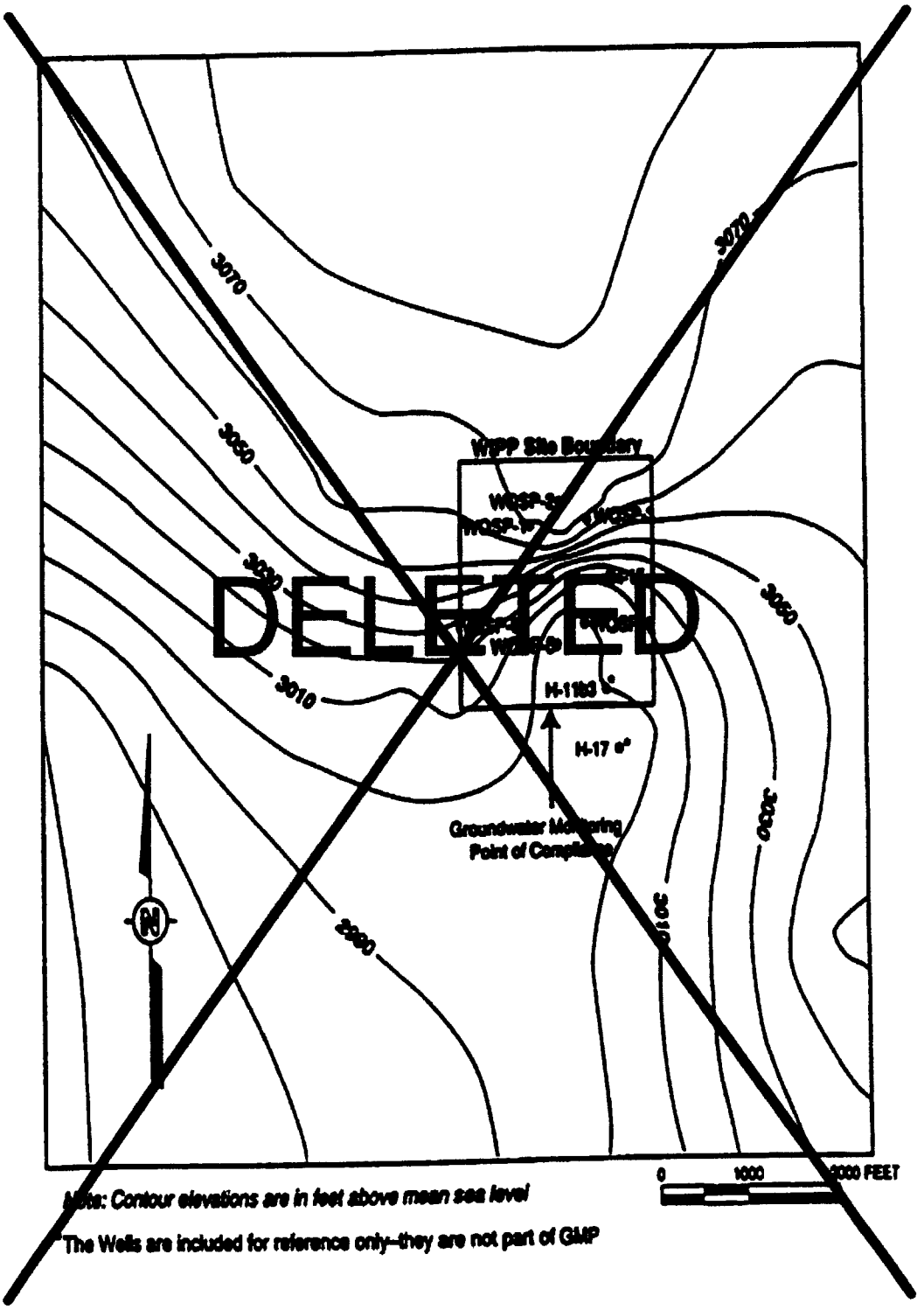


Figure L-~~8~~6
~~WQSP~~ Detection Monitoring Well Locations



~~Figure L-9~~
~~WIPP DMP Monitor Well Locations and Potentiometric Surface of the Culebra Near the WIPP Site as of 12/96 (adjusted to equivalent freshwater head)~~

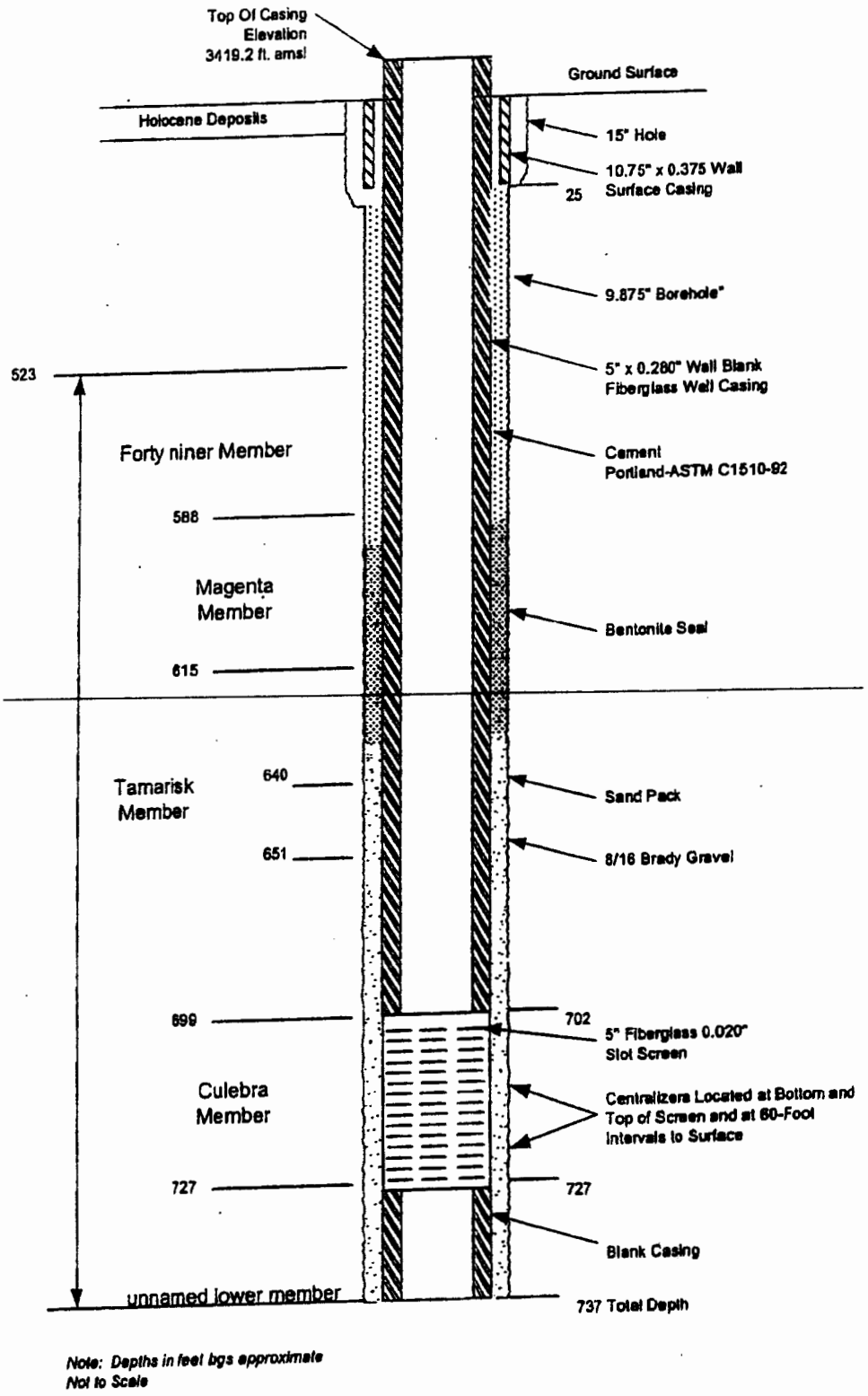


Figure L-~~10~~7
As-Built Configuration of Well WQSP-1

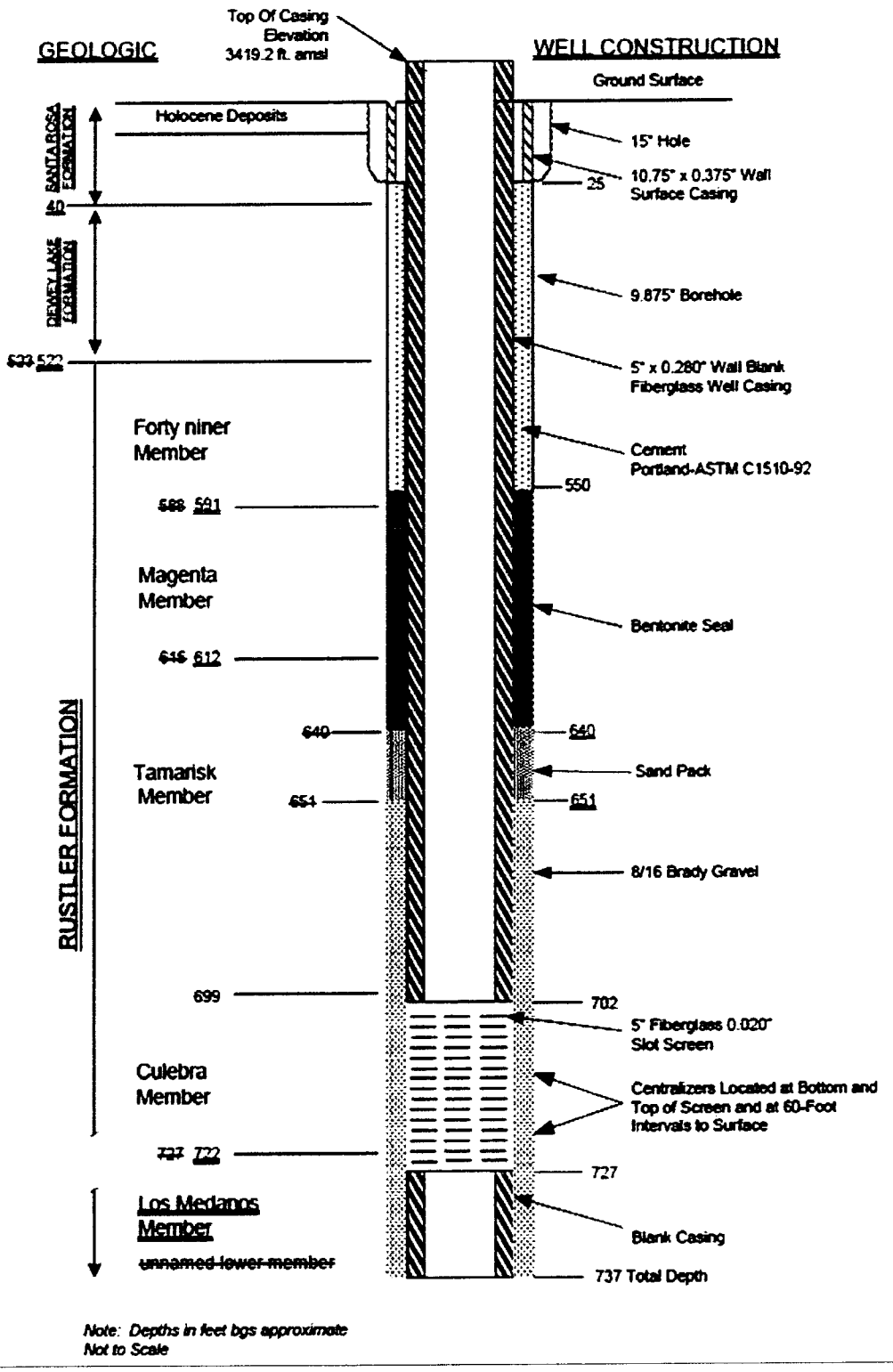
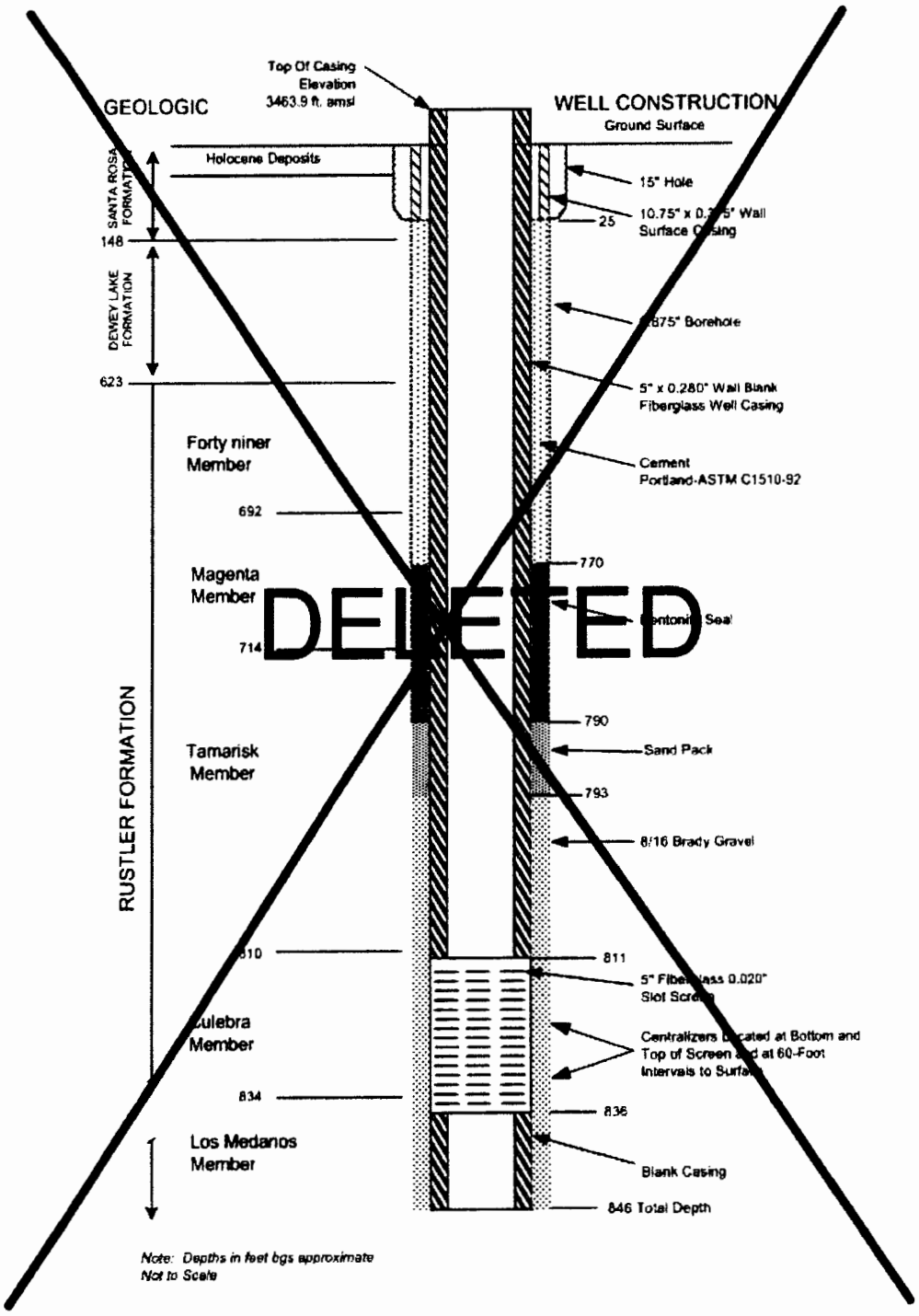


Figure L-~~10~~7
As-Built Configuration of Well WQSP-1



~~Figure L-11~~
~~As-Built Configuration of Well WQSP-2~~

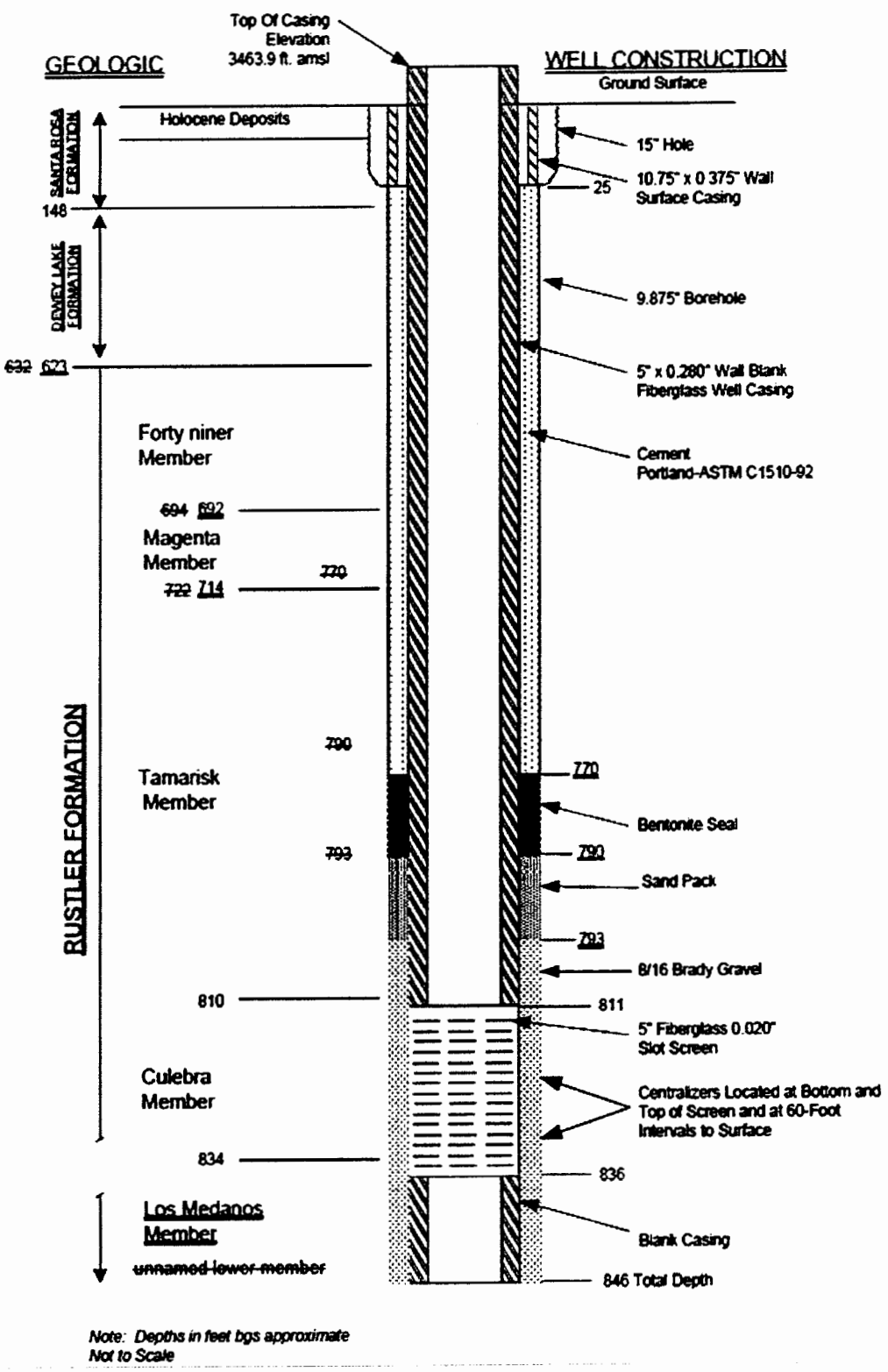
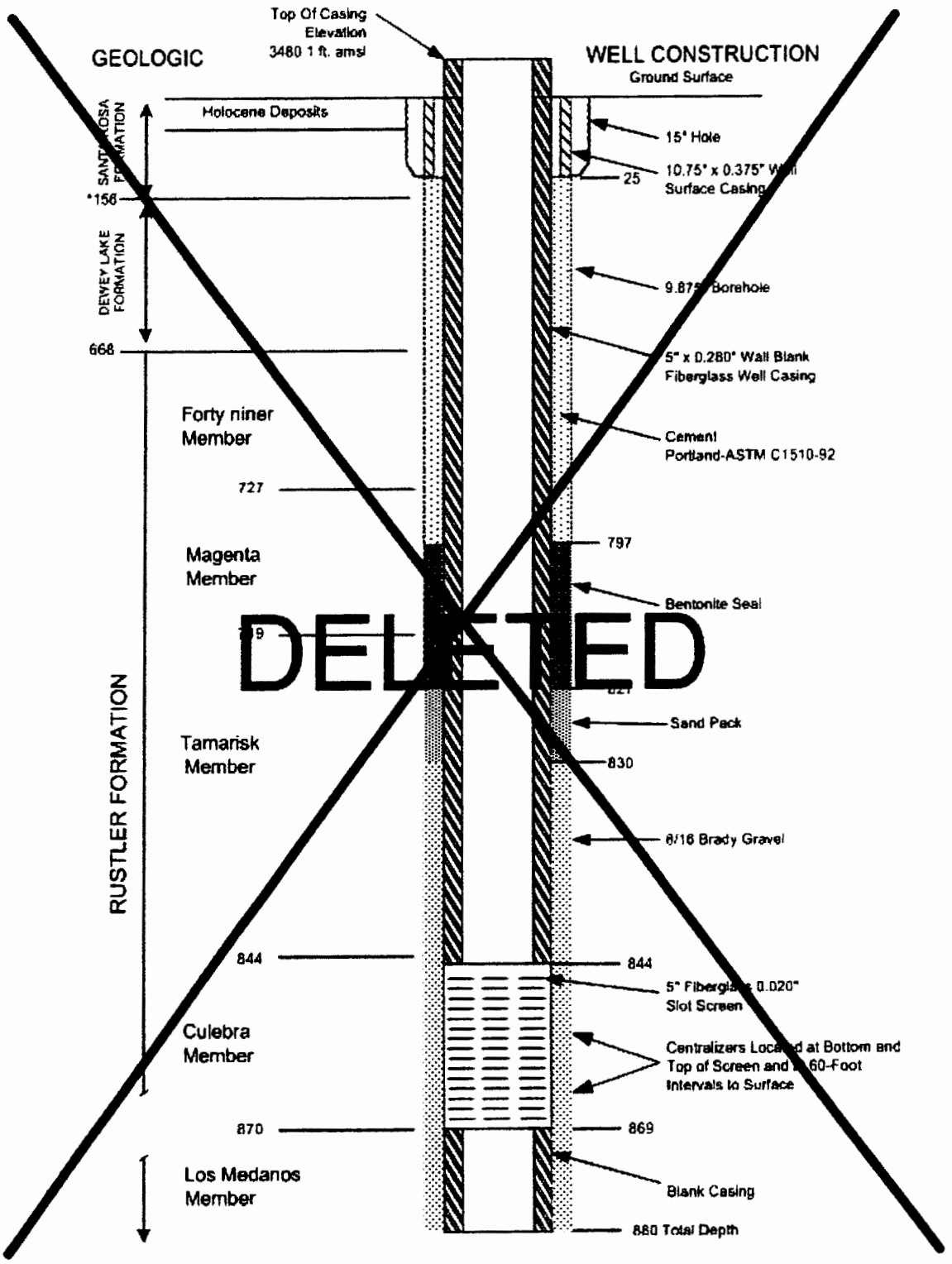


Figure L-~~118~~8
As-Built Configuration of Well WQSP-2



Note: Depths in feet bgs approximate
Not to Scale

**from DOE/WIPP-95-2154*

~~**Figure L-12**~~
~~**As-Built Configuration of Well WQSP-3**~~

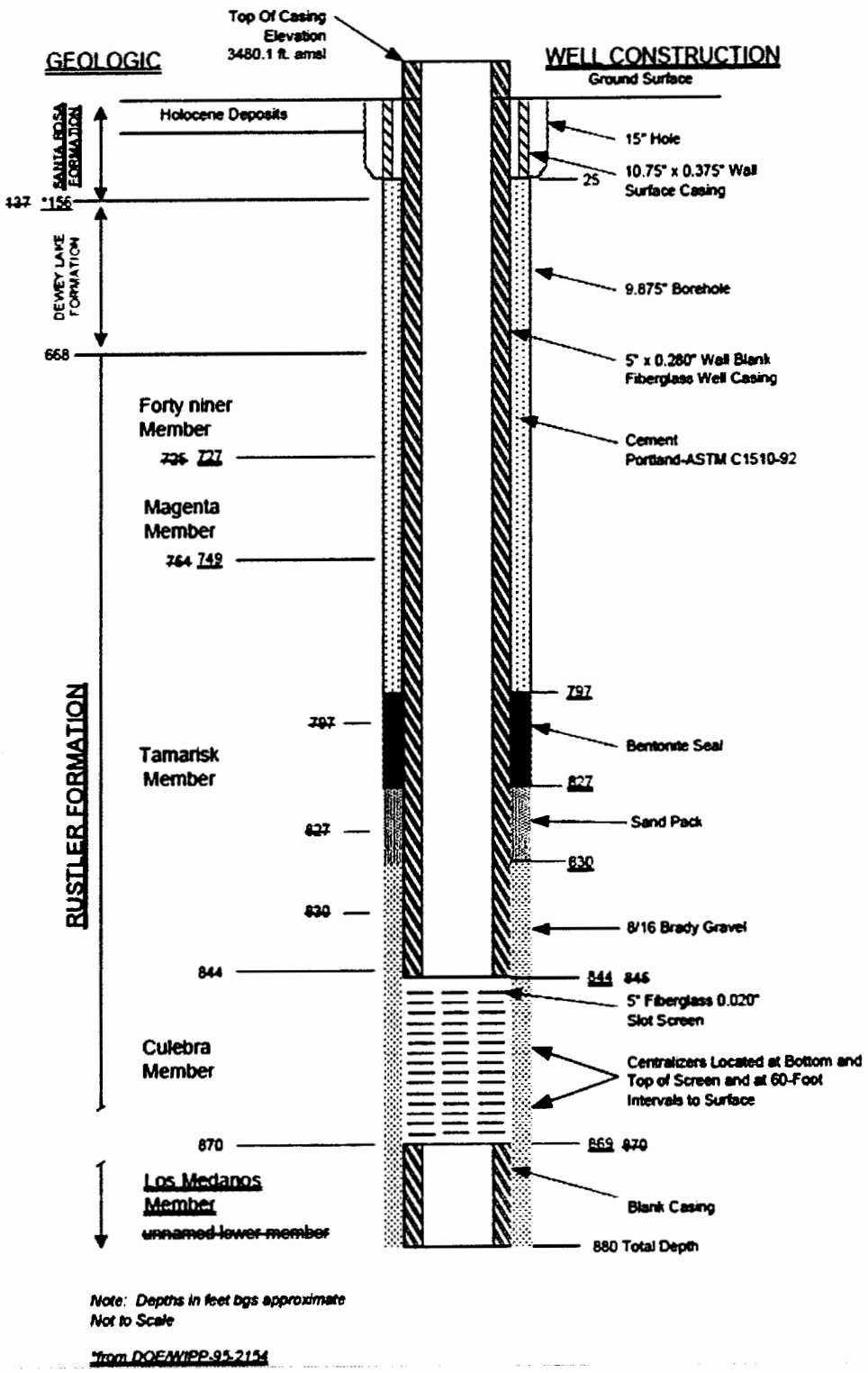
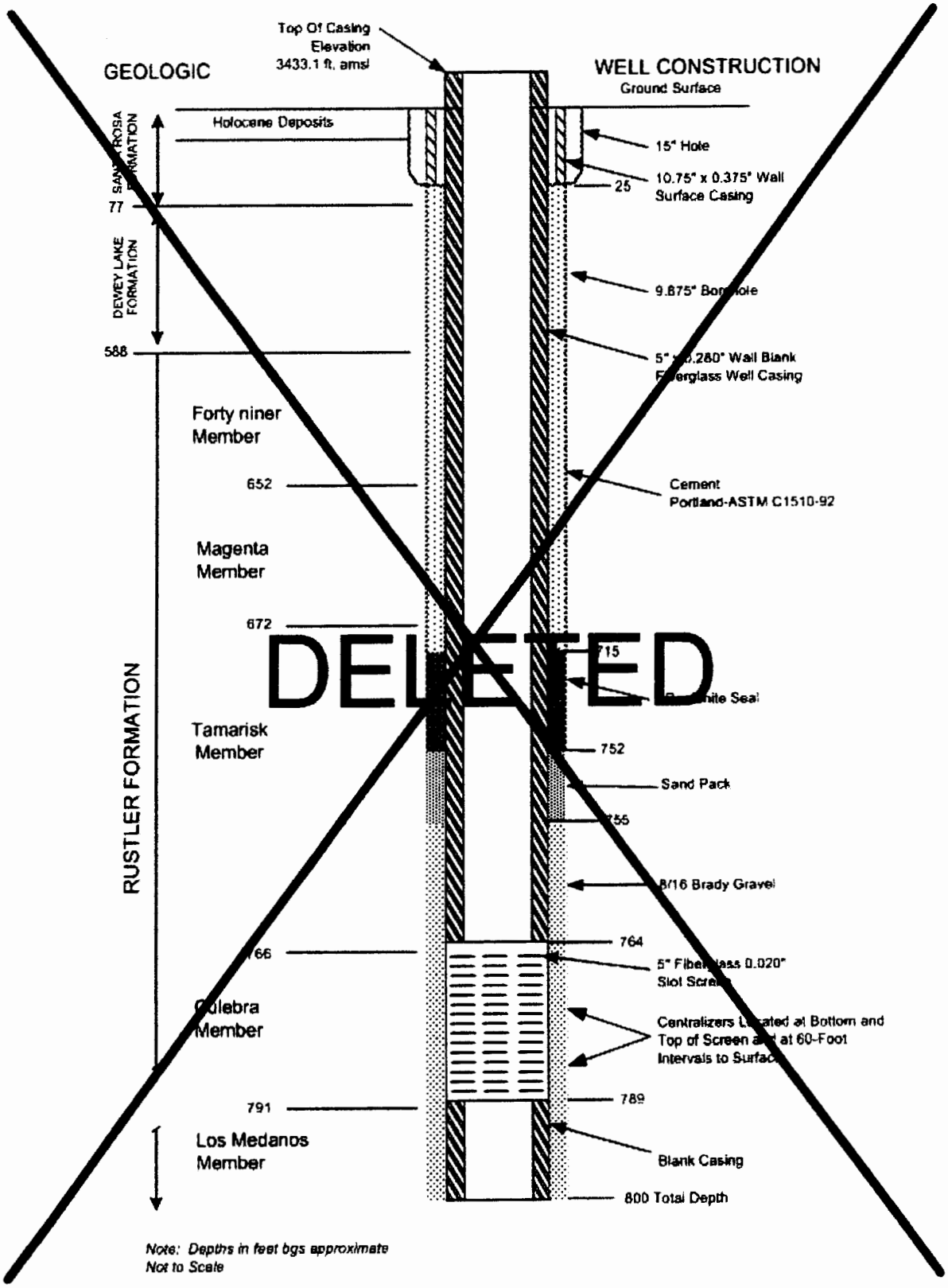


Figure L-~~129~~
As-Built Configuration of Well WQSP-3



DELETED

~~Figure L-13~~
~~As-Built Configuration of Well WQSP-4~~

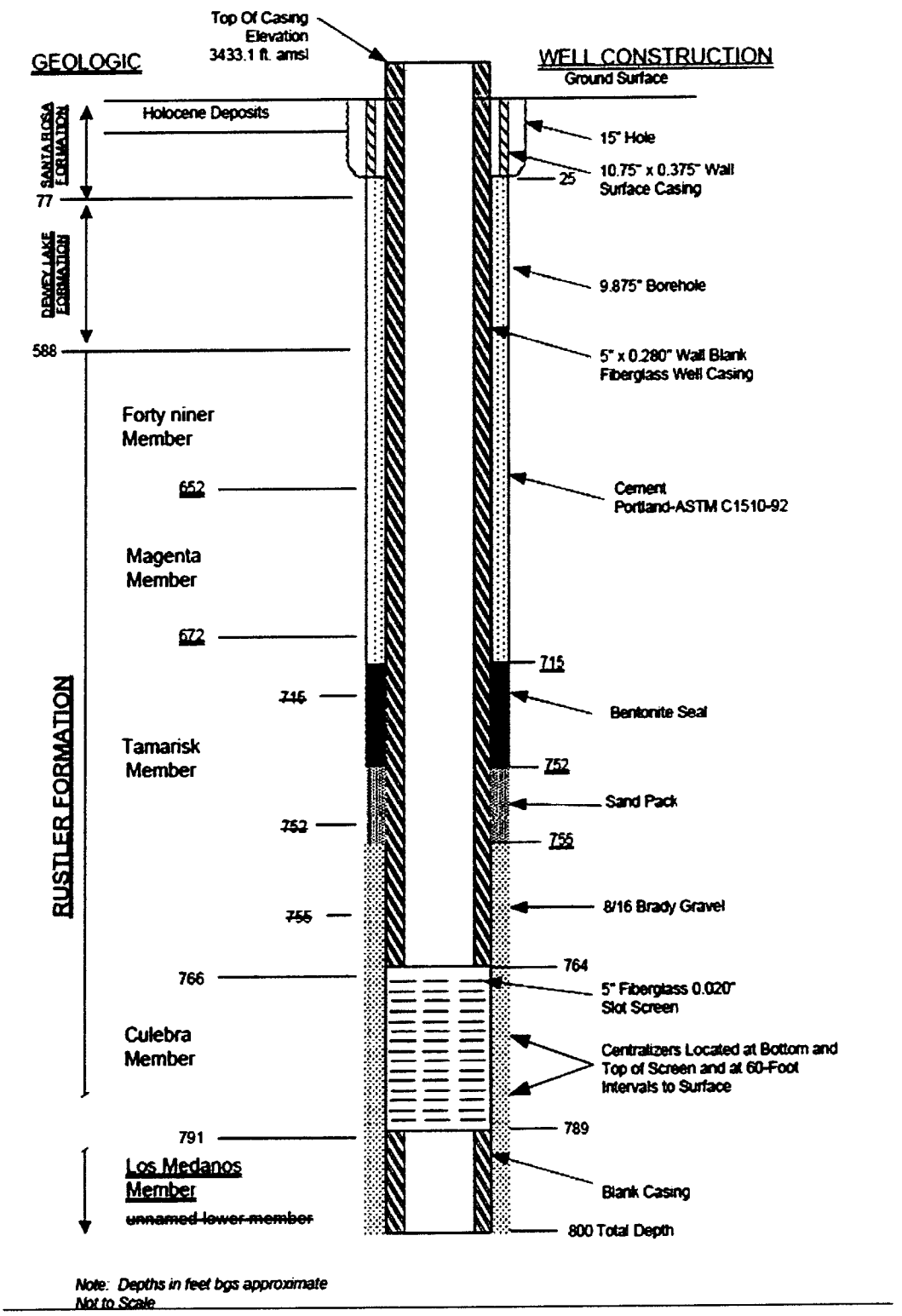
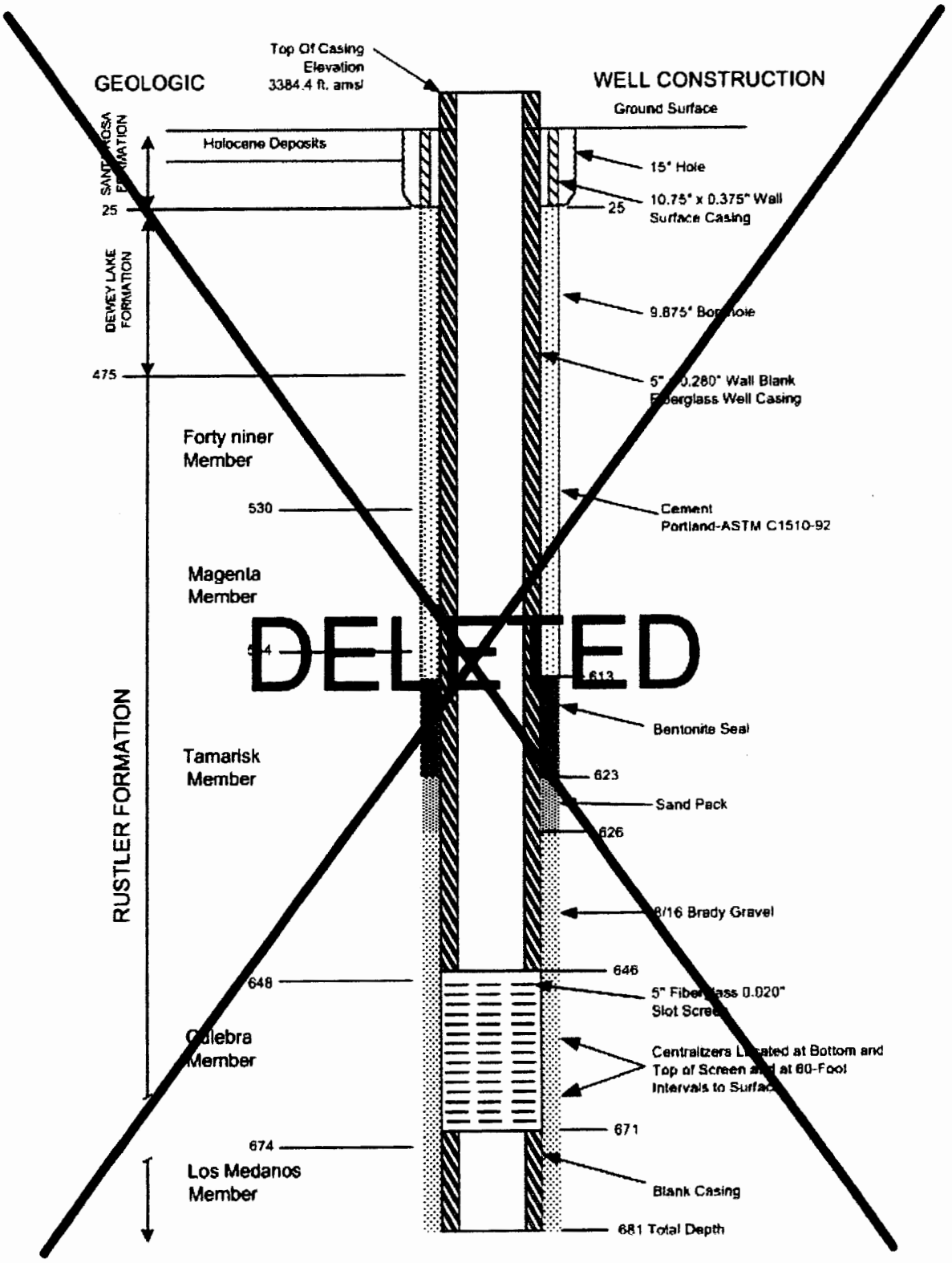


Figure L-~~13~~10
As-Built Configuration of Well WQSP-4



Note: Depths in feet bgs approximate
Not to Scale

~~**Figure L-14**~~
~~**As-Built Configuration of Well WQSP-5**~~

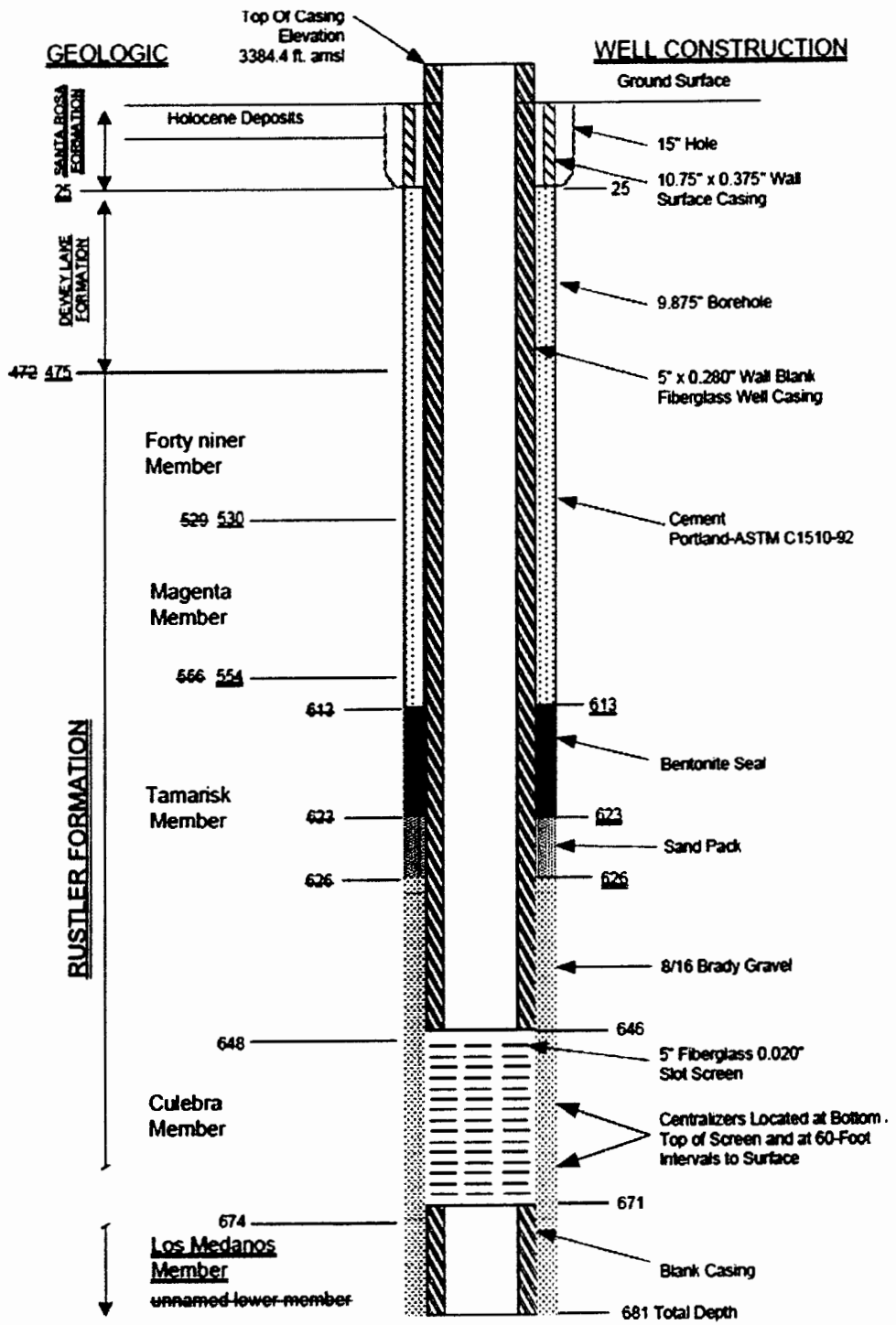
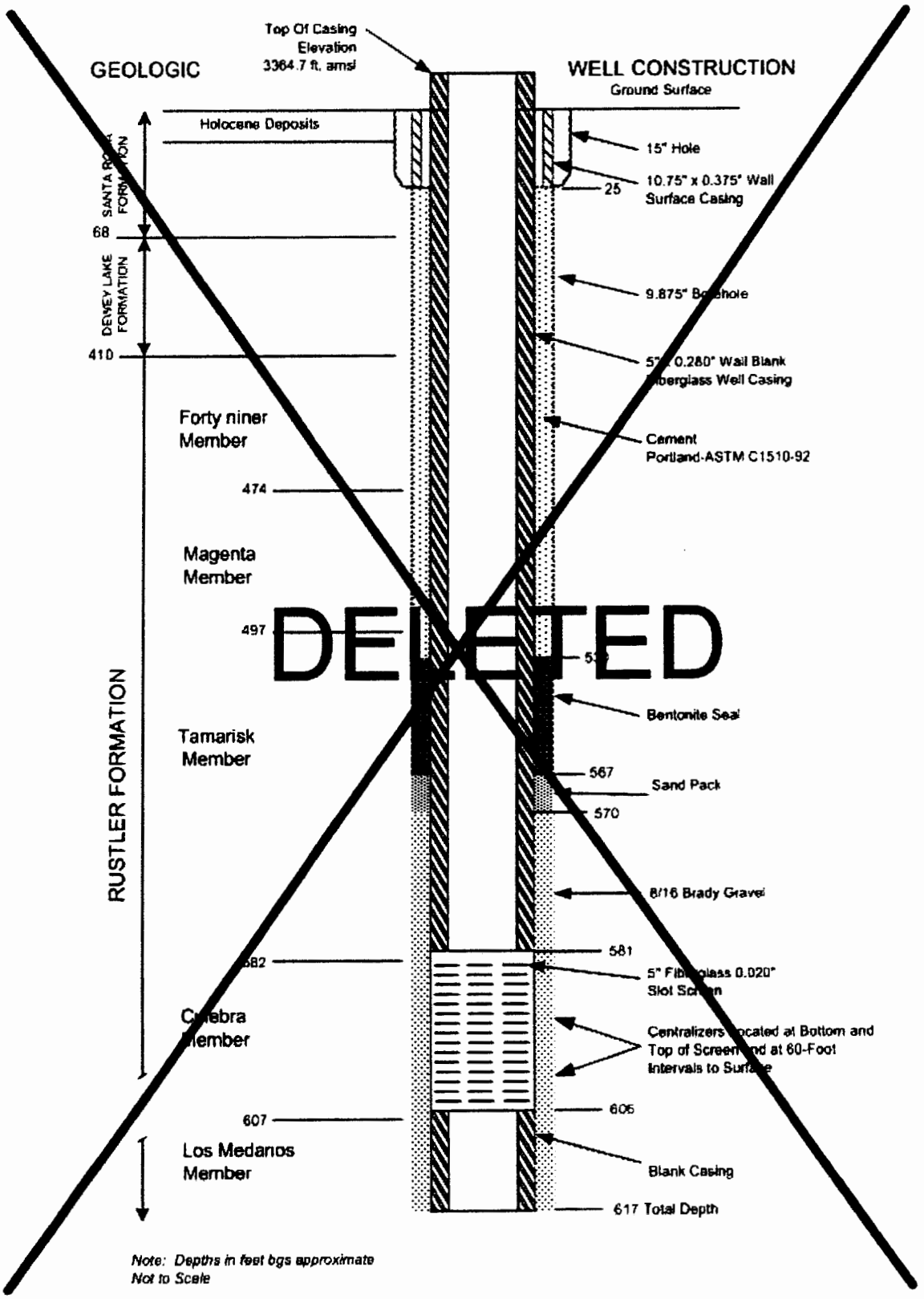


Figure L-~~14~~11
As-Built Configuration of Well WQSP-5



~~Figure L-15~~
~~As-Built Configuration of Well WQSP-6~~

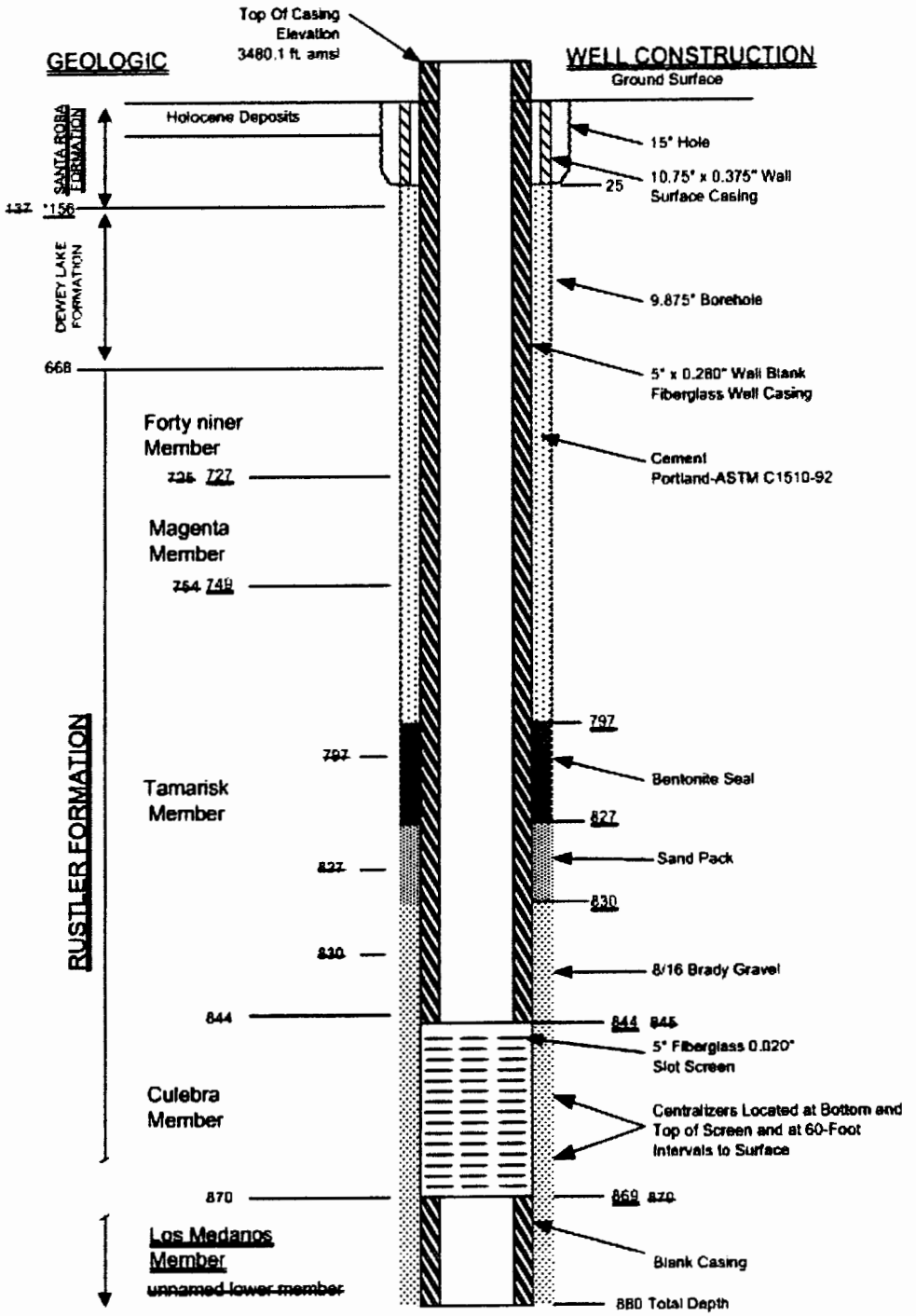


Figure L-~~15~~12
As-Built Configuration of Well WQSP-6

~~Figure L-16~~
~~Reserved~~

Chain of Custody Record

(MDC Name and Address)

C of C Control No. _____

RFA Control No. _____

SAMPLING PROGRAM _____ LAB DESTINATION _____

SAMPLE TEAM MEMBERS _____ CARRIER/WAYBILL NO. _____

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.

DELETED

Special Instructions _____

Possible Sample Hazards: _____

Signatures: (Name, Company, Date and Time: _____

1. Relinquished By: _____
   Received By: _____
2. Relinquished By: _____
   Received By: _____
3. Relinquished By: _____
   Received By: _____
4. Relinquished By: _____
   Received By: _____

WHITE - Original to accompany samples YELLOW- Field Copy PINK- OTHER

~~Figure L-17a~~
~~Example Chain of Custody Record~~

CHAIN OF CUSTODY RECORD

Page ____ of ____

Project Number	Project Name:	Total Number of Containers	Container Size / Request Analyses	Contract Laboratory
Samplers:	Date:			

Date	Time	Matrix	Sample Number

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

Requested Turnaround Time:	Sample Receipt Remarks:	Special Instructions:
☐ *Routine* ☐ *Rush*		
Sample Disposal: ☐ *Return to Client* ☐ *Disposal by Lab*	Results To:	
Carrier / Airbill No.:		

WHITE – Testing Laboratory
AF – Air Filter(s)
SE – Sediment

YELLOW – Field copy
AN – Animal(s)
SO – Soil

PINK – Record Copy
DI – Deionized Water
SW – Surface Water

GW – Ground Water
VG – Vegetation

WP 02-EM3001, revision xx

EXAMPLE

Figure L-17a13
Example Chain-of-Custody/Request for Analysis Form-Record

DELETED

REQUEST FOR ANALYSIS

(MOC Name and Address)

R/A Control

C/C Control No.

Date Sample Shipped

Lab Destination

Laboratory Contact

Send Lab Report To

VOC Monitoring Program

Date Report Required

Purchase Order No.

Project Contact

Project Contact Phone No.

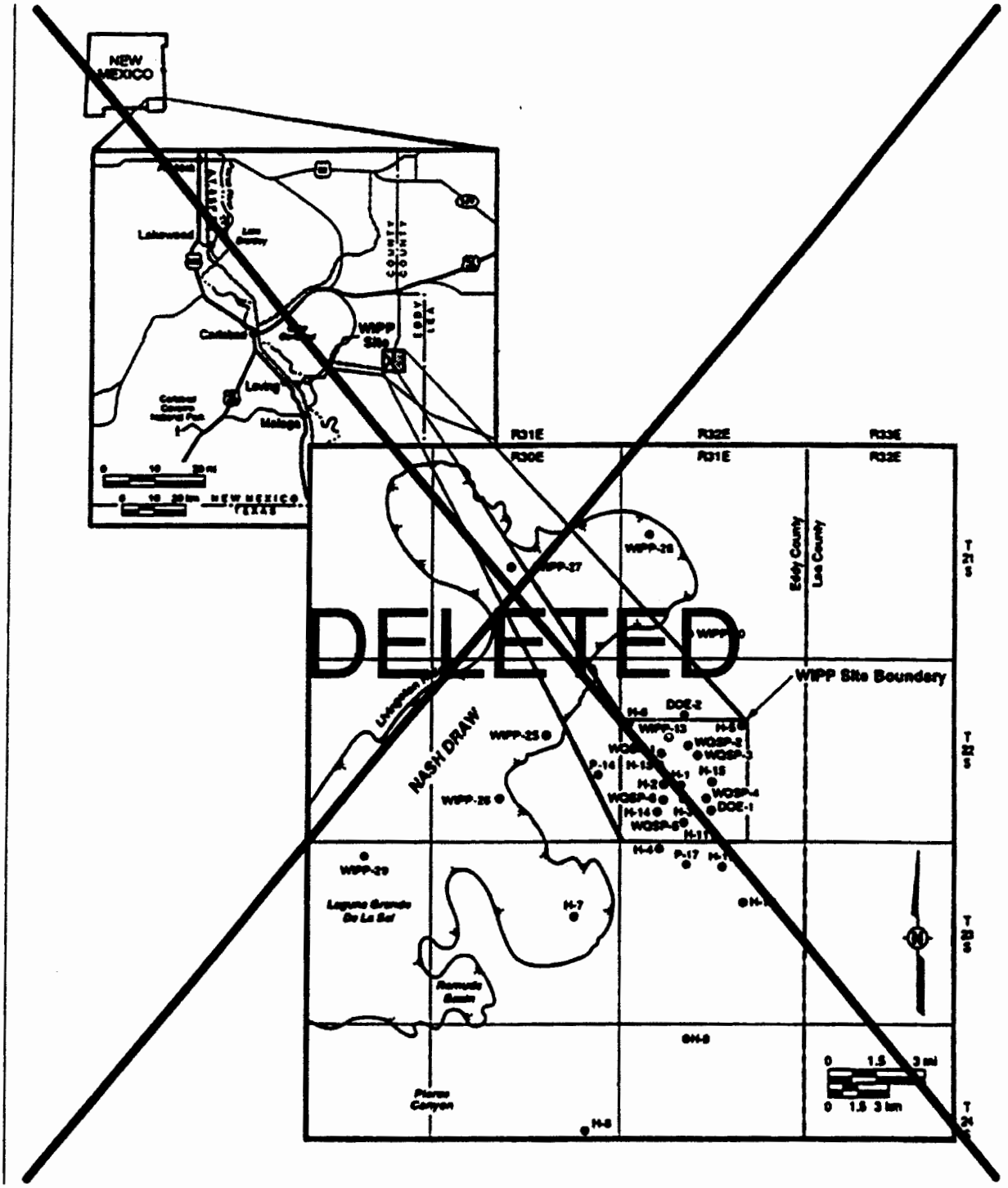
Serial No.	Sample No.	C-of-C No.	Sample Type	Sample Pressure	Preservative	Contract-Specific Testing	Special Instructions

TURNAROUND TIME REQUIRED (Rush must be approved by appropriate Manager) NORMAL_____ RUSH____(Subject to rush surcharge)
POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or contain high levels of hazardous substances.)
NONHAZARD_____ FLAMMABLE_____ SKIN IRRITANT_____ HIGHLY TOXIC_____ BIOLOGICAL_____ OTHER

SAMPLE DISPOSAL (Please indicate disposition of sample following analysis.) RETURN TO CLIENT_____ DISPOSAL BY LAB_____ (Please Specify)

FOR LAB USE ONLY
RECEIVED BY _____ DATE/TIME _____

~~Figure L-17b~~
~~Example Request for Analysis~~



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~~Figure L-18~~
~~Ground-water Surface Elevation Monitoring Locations~~

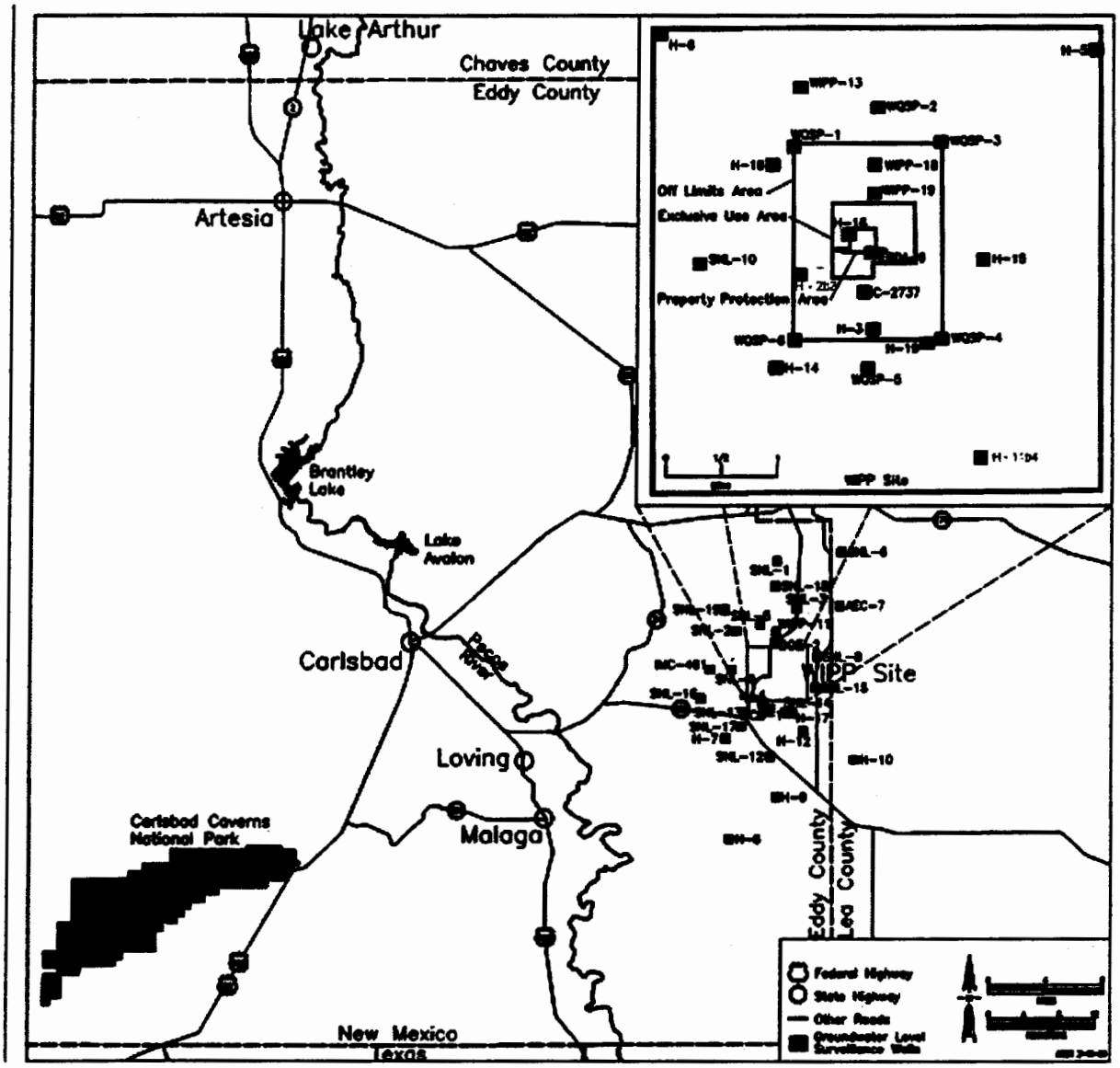

Figure L-14
Groundwater Level Surveillance Wells
(inset represents the groundwater surveillance wells in WIPP Land Withdrawal Area)