# Title 40 CFR Part 191
# Subparts B and C
# Compliance Recertification Application 2014
# for the
# Waste Isolation Pilot Plant

## Appendix DATA-2014
## Monitoring Data and Reports

## United States Department of Energy
## Waste Isolation Pilot Plant

**Carlsbad Field Office**
**Carlsbad, New Mexico**

# Compliance Recertification Application 2014
# Appendix DATA-2014

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## Attachments

Attachment A: WIPP Borehole Update
Attachment B: WIPP Waste Containers and Emplacement

## Acronyms and Abbreviations

| | |
|---|---|
| CCA | Compliance Certification Application |
| CFR | Code of Federal Regulations |
| CH-TRU | contact-handled transuranic |
| CMP | Compliance Monitoring Program |
| COMP | compliance monitoring parameter |
| CRA | Compliance Recertification Application |
| DBDSP | Delaware Basin Drilling Surveillance Program |
| DOE | U.S. Department of Energy |
| EPA | U.S. Environmental Protection Agency |
| ft | foot |
| GMP | Geotechnical Monitoring Program |
| GWMP | Groundwater Monitoring Program |
| m | meter |
| PA | performance assessment |
| PABC | performance assessment baseline calculation |
| RH-TRU | remote-handled transuranic |
| SMP | Subsidence Monitoring Program |
| WDS | Waste Data System |
| WIPP | Waste Isolation Pilot Plant |

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# DATA-1.0 Introduction

Appendix DATA-2014 provides references to the data used to develop the Compliance Recertification Application (CRA) of 2014 (CRA-2014). Interpretation and analysis of those data are provided in the appropriate sections of the CRA-2014.

Title 40 CFR § 194.15(a)(1), (2), (3), and (5) (U.S. EPA 1996), Content of Recertification Applications, require that the U.S. Department of Energy (DOE) provide information obtained since the Compliance Certification Application (CCA) (U.S. DOE 1996) related to site geology, hydrology, and meteorology. Additional monitoring results and the results of laboratory investigations completed after the CRA-2009 (U.S. DOE 2009a) must also be provided, as well as information regarding the waste emplaced in the disposal system.

The DOE uses various programs to capture and analyze relevant information. These programs and the resulting information are discussed in the appropriate sections of this appendix.

## DATA-1.1 Reported Data

In the initial U.S. Environmental Protection Agency (EPA) certification of compliance for the Waste Isolation Pilot Plant (WIPP) (U.S. EPA 1998), the EPA agreed that 10 compliance monitoring parameters (COMPs) would be monitored during the operational period of the project. Monitoring is performed to detect substantial deviations from expected conditions in the WIPP performance assessment (PA). The locations of the data for the COMPs in this appendix are listed below:

| **COMP** | **Location in Appendix DATA-2014** |
|---|---|
| Change in the Culebra groundwater flow | Section DATA-5.0, Section DATA-10.0, and Section DATA-11.0 |
| Creep closure and stresses | Section DATA-4.0 and Section DATA-10.0 |
| Culebra groundwater composition | Section DATA-5.0, Section DATA-10.0, and Section DATA-11.0 |
| Displacement of deformation features | Section DATA-4.0 and Section DATA-10.0 |
| Drilling rate | Section DATA-2.0 and Section DATA-10.0 |
| Extent of brittle deformation | Section DATA-4.0, Section DATA-9.0, and Section DATA-10.0 |
| Initiation of brittle deformation | Section DATA-4.0 and Section DATA-10.0 |
| Probability of encountering a Castile brine reservoir | Section DATA-2.0 and Section DATA-10.0 |
| Subsidence measurement | Section DATA-3.0 and Section DATA-10.0 |
| Waste activity | Section DATA-7.0 and Section DATA-10.0 |

# DATA-2.0 Delaware Basin Drilling Surveillance Program

The Delaware Basin Drilling Surveillance Program (DBDSP) monitors drilling activities in the Delaware Basin. This section provides a brief discussion of the program and identifies the relevant data reports.

## DATA-2.1 Program Overview

The EPA requires the DOE to demonstrate the expected containment performance of the disposal system using a PA. The PAs documented in the CCA, CRA-2004 (U.S. DOE 2004), CRA-2009, and CRA-2014 demonstrated that the DOE complies with the EPA's containment standards for undisturbed and human intrusion scenarios.

The criteria in 40 CFR § 194.33 (U.S. EPA 1996) require the use of historic drilling information to derive the drilling rate for PA intrusion scenarios. The DBDSP continues to monitor drilling-related activities, providing data used to determine whether the assumptions and scenarios used in PA remain valid, and uses the monitoring data to determine the drilling rate. These monitoring activities will continue until the DOE and the EPA agree that no additional benefit can be gained by further monitoring.

## DATA-2.2 Reported Data

The two COMP parameters monitored by the DBDSP are the drilling rate (67.3 boreholes per square kilometer) (U.S. DOE 2012a) and the probability of encountering a Castile brine reservoir (4.5%) (Callicoat 2013a), which are discussed in the annual reports for this program and also in the COMPs assessments described in Section DATA-10.0. Other information collected by this program include drilling-related data, mining information, and seismic information.

Relevant data generated through the Delaware Basin Monitoring Program are provided in the following reports published since the CRA-2009:

- Delaware Basin Monitoring Annual Report, DOE/WIPP-08-2308, September 2008 (U.S. DOE 2008a).
- Delaware Basin Monitoring Annual Report, DOE/WIPP-09-2308, September 2009 (U.S. DOE 2009b).
- Delaware Basin Monitoring Annual Report, DOE/WIPP-10-2308, September 2010 (U.S. DOE 2010a).
- Delaware Basin Monitoring Annual Report, DOE/WIPP-11-2308, September 2011 (U.S. DOE 2011a).
- Delaware Basin Monitoring Annual Report, DOE/WIPP-12-2308, September 2012 (U.S. DOE 2012a).

- Callicoat, J. 2013. "Castile Brine Encounters 2012." Memo to File, Regulatory Environmental Services, Carlsbad, NM; RES:13:106 (Callicoat 2013a).

- Callicoat, J. 2013. "Seismic Activity within the Delaware Basin 2012." Memo to File, Regulatory Environmental Services, Carlsbad, NM; RES:13:107 (Callicoat 2013b).

# DATA-3.0 Subsidence Monitoring Program

Subsidence monitoring measures vertical movement of the land surface relative to a reference location. This section provides a brief discussion of the Subsidence Monitoring Program (SMP) and identifies the relevant data reports.

## DATA-3.1 Program Overview

The SMP uses a leveling survey to measure the relative vertical height differences between benchmarks. A level survey consists of using one benchmark's elevation as a constant elevation and determining the elevation of all other benchmarks relative to it. Comparison between level surveys allows vertical movement patterns to be established over time. These comparative surveys allow substantial deviation of actual subsidence from expected subsidence to be detected.

## DATA-3.2 Reported Data

Each year approximately 15 miles of leveling surveying is completed utilizing nine vertical control loops consisting of 48 subsidence monuments and 14 National Geodetic Survey vertical control points. Subsidence rates are small and are approximately at the resolution level of the survey accuracy. The benchmarks with the highest rates are seen above the mined panels. All subsidence rates fall within the predicted values. Data generated through the SMP are provided in the following reports published since the CRA-2009. Each report includes previous years' data.

- WIPP Subsidence Monument Leveling Survey 2008, DOE/WIPP 09-2293, December 2008 (U.S. DOE 2008b).
- WIPP Subsidence Monument Leveling Survey 2009, DOE/WIPP 10-2293, December 2009 (U.S. DOE 2009c).
- WIPP Subsidence Monument Leveling Survey 2010, DOE/WIPP 11-2293, December 2010 (U.S. DOE 2010b).
- WIPP Subsidence Monument Leveling Survey 2011, DOE/WIPP 12-2293, December 2011 (U.S. DOE 2011b).
- WIPP Subsidence Monument Leveling Survey 2012, DOE/WIPP 12-3497, December 2012 (U.S. DOE 2012b).

# DATA-4.0 Geotechnical Monitoring Program

The Geotechnical Monitoring Program (GMP) measures in situ geotechnical data in the WIPP repository. This section provides a brief discussion of the GMP and identifies the relevant data reports.

## DATA-4.1 Program Overview

The GMP obtains in situ data to support the continuous assessment of underground facilities. A detailed description of the geotechnical programs and procedures is presented in WP 07-1, WIPP Geotechnical Engineering Program Plan (Nuclear Waste Partnership 2012). Specifically, the program provides for

- Early detection of conditions that could affect operational safety
- Guidance for design modifications and remedial actions
- Data for interpreting the behavior of underground openings compared to established design criteria

The GMP collects data through instrumentation and observation. These data are used to confirm the understanding of geomechanical characteristics and aid in assessing the stability and performance of the underground facility. Constituent programs, described below, include the Geosciences Program, the Geomechanical Monitoring Program, and the Rock Mechanics Program.

The Geosciences Program includes the collection of underground data used to assess the repository by documenting the existing geologic conditions and characteristics and monitoring excavation response. Activities associated with this program include geologic and fracture mapping of the excavation surface, core logging, and borehole observations.

The Geomechanical Monitoring Program includes monitoring the geomechanical response of the underground openings after mining using instrumentation installed in the shafts and drifts of the facility. Geotechnical instrumentation installed underground in the shafts and drifts includes tape extensometer points, convergence meters, borehole extensometers, piezometers, strain gauges, load cells, and crack meters. The instrumentation is sensitive enough to detect small changes in rock displacements and stresses.

To determine significant deviations from expected conditions, the Management and Operating Contractor uses the Rock Mechanics Program to assess the performance of the underground excavation for safety and stability during the operational phase. The results from these assessments allow the identification of potentially unstable areas and the application of remedial actions, if necessary. Field data are used to compare the actual mechanical performance of the excavations to expected results. Analytical methods, such as numerical modeling, determine the potential effects of mining new excavations, excavation sequence, and long-term behavior of the repository. Extensive experimental work and observations have established an understanding of time-dependent geomechanical properties of the salt that are used to predict its in situ mechanical

performance. These assessments rely heavily on the in situ instrumentation data and field observations from the Geoscience and Geomechanical Monitoring Programs.

## DATA-4.2 Reported Data

Data generated through the GMP are reported annually in the Geotechnical Analysis Report. References for reports prepared since the development of the CRA-2009 are provided below. Each report includes previous years' data. Four parameters, relating to information collected by the GMP, are required to be monitored by the DOE. These are creep closure, extent of deformation, initiation of brittle deformation, and displacement of deformation features. Creep closure and displacement of deformation features are quantitative. Extent of deformation and initiation of brittle deformation are qualitative. These four parameters are discussed and analyzed in the COMPs reports listed in Section DATA-10.2.

- Washington TRU Solutions, LLC, 2009, Geotechnical Analysis Report for July 2007–June 2008, DOE/WIPP 09-3177, Carlsbad, NM (U.S. DOE 2009d).

- Washington TRU Solutions, LLC, 2010, Geotechnical Analysis Report for July 2008–June 2009, DOE/WIPP 10-3177, Carlsbad, NM (U.S. DOE 2010c).

- Washington TRU Solutions, LLC, 2011, Geotechnical Analysis Report for July 2009–June 2010, DOE/WIPP 11-3177, Carlsbad, NM (U.S. DOE 2011c).

- Washington TRU Solutions, LLC, 2012, Geotechnical Analysis Report for July 2010–June 2011, DOE/WIPP 12-3484, Carlsbad, NM (U.S. DOE 2012c).

The Geotechnical Analysis Report for July 2011–June 2012 was issued after the February 2013 CRA-2014 publication cutoff date.

# DATA-5.0 Groundwater Monitoring Program

The Groundwater Monitoring Program (GWMP) collects and analyzes data for various wells at or near the WIPP site. This section briefly describes the GWMP and identifies relevant reports.

## DATA-5.1 Program Overview

One function of the GWMP is the collection of groundwater data from the Culebra Dolomite Member of the Rustler Formation (hereafter referred to as the Culebra), such as water levels and water quality, from numerous wells located at and near the facility. The Culebra was selected as the focus of the GWMP. It has been extensively studied during past hydrologic characterization programs and was found to be the most likely hydrologic pathway to the accessible environment for any potential human-intrusion-caused release scenario. Data obtained through this program are used to generate the Culebra groundwater composition and the Culebra groundwater flow COMPs. Details on how the program is implemented are provided in Appendix MON-2014.

## DATA-5.2 Reported Data

The water quality data collected by the GWMP are discussed and analyzed in the reports listed below and also in the COMPs reports listed in Section DATA-10.2. This analysis provides validation of the various Culebra hydrological models for CRA-2014. Appendix HYDRO-2014 and the COMPs reports provide analyses of the water levels and the fluid density of the water columns in the various wells used in gathering data for the WIPP hydrological model. The following reports have been published since the CRA-2009:

- U.S. Department of Energy, 2008, Waste Isolation Pilot Plant Annual Site Environmental Report for 2007, DOE/WIPP 08-2225, Carlsbad, NM (U.S. DOE 2008c).

- U.S. Department of Energy, 2009, Waste Isolation Pilot Plant Annual Site Environmental Report for 2008, DOE/WIPP 09-2225, Carlsbad, NM (U.S. DOE 2009e).

- U.S. Department of Energy, 2010, Waste Isolation Pilot Plant Annual Site Environmental Report for 2009, DOE/WIPP 10-2225, Carlsbad, NM (U.S. DOE 2010d).

- U.S. Department of Energy, 2011, Waste Isolation Pilot Plant Annual Site Environmental Report for 2010, DOE/WIPP 11-2225, Carlsbad, NM (U.S. DOE 2011d).

- U.S. Department of Energy, 2012, Waste Isolation Pilot Plant Annual Site Environmental Report for 2011, DOE/WIPP 12-3489, Carlsbad, NM (U.S. DOE 2012d).

# DATA-6.0 Meteorological Monitoring Program

The Meteorological Monitoring Program measures atmospheric data for the WIPP site. This section provides a brief description of the program and relevant reports.

## DATA-6.1 Program Description

The primary WIPP meteorological station is located 600.5 meters (m) (1,970 feet (ft)) northeast of the Waste Handling Building. The main function of the station is to provide data for atmospheric modeling. The station measures and records wind speed, wind direction, and temperature at elevations of 2, 10, and 50 m (6.5, 33, and 165 ft). The station records ground-level measurements of barometric pressure, relative humidity, precipitation, and solar radiation.

## DATA-6.2 Reported Data

The annual site environmental reports listed in Section DATA-5.2 provide data relevant to the Meteorological Monitoring Program. The CCA, Appendix CLI provides information on past (long-term) climatic conditions and predicted future conditions at the WIPP site. A discussion of the wind, rainfall, and temperature variation can be found in CRA-2014, Section 15.

# DATA-7.0 Waste Information

Two types of information related to waste characteristics are collected: (1) information regarding waste that has been emplaced in the WIPP underground repository, and (2) information regarding future inventory that will be emplaced in the WIPP underground repository during the entire lifetime of the project. This section provides a brief description of the programs and a list of relevant reports.

## DATA-7.1 Program Overview

Information concerning waste that has been emplaced in the repository is tracked and recorded using the Waste Data System (WDS), formerly the WIPP Waste Information System. Information concerning future wastes to be emplaced in the WIPP is developed through periodic updates of the Annual Transuranic Waste Inventory Reports. The inventory for the CRA-2014 PA is from the Performance Assessment Inventory Report -2012 (Van Soest 2012) based on the *Annual Transuranic Waste Inventory Report–2012* (U.S. DOE 2012e), that provides updated inventory information. The DOE anticipates that these inventory updates will have only a small impact on normalized releases relative to the CRA-2014 PA, and therefore have no significant impact on compliance.

## DATA-7.2 Reported Data

Summary information generated by the WDS on emplaced waste and radionuclides is provided in the following reports published since the CRA-2009. See page 21 of the Annual Change Report 2011/2012, DOE/WIPP-12-3496 (U.S. DOE 2012f) for a detailed listing of the emplaced waste in the repository.

- U.S. Department of Energy, Annual Change Report 2007/2008, DOE/WIPP 08-3317, November 15, 2008 (U.S. DOE 2008d).

- U.S. Department of Energy, Annual Change Report 2008/2009, DOE/WIPP 09-0335, November 13, 2009 (U.S. DOE 2009f).

- U.S. Department of Energy, Annual Change Report 2009/2010, DOE/WIPP 10-1660, November 15, 2010 (U.S. DOE 2010e).

- U.S. Department of Energy, Annual Change Report 2010/2011, DOE/WIPP 11-3479, August 30, 2011 (U.S. DOE 2011e).

- U.S. Department of Energy, Annual Change Report 2011/2012, DOE/WIPP 12-3496, October 2012 (U.S. DOE 2012f).

Information regarding current and future inventories stored at generator sites and in the WIPP is provided in the following reports published since the CRA-2009:

- U.S. Department of Energy, Annual Transuranic Waste Inventory Report–2008, DOE/TRU-08-3425, Revision 0 (U.S. DOE 2008e).

- U.S. Department of Energy, Annual Transuranic Waste Inventory Report–2009, DOE/TRU-09-3425, Revision 0 (U.S. DOE 2009g).

- U.S. Department of Energy, Annual Transuranic Waste Inventory Report–2010, DOE/TRU-10-3425, Revision 0 (U.S. DOE 2010f).

- U.S. Department of Energy, Annual Transuranic Waste Inventory Report–2011, DOE/TRU-11-3425, Revision 0 (U.S. DOE 2011f).

- U.S. Department of Energy, Annual Transuranic Waste Inventory Report–2012, DOE/TRU-12-3425, Revision 0 (U.S. DOE 2012e).

# DATA-8.0 WIPP Boreholes

Information regarding WIPP monitoring wells is identified in this section, and relevant data are provided.

## DATA-8.1 Program Overview

Information provided in this section was reported in DOE/WIPP 95-2092, Revision 1, Waste Isolation Pilot Plant Borehole Data Report (the CCA, Appendix BH). The CCA, Appendix BH serves as a central document providing data on boreholes. The report contains a comprehensive database of wells drilled in support of the WIPP Project and boreholes that were located within the 16-section land withdrawal area.

## DATA-8.2 Reported Data

Attachment A to this appendix provides updates on all of the monitoring wells used in the CCA, Appendix BH, and the new monitoring wells drilled since the initial certification. The attachment also adds wells that were in use, but inadvertently omitted from the CCA, Appendix BH. There were 6 wells drilled and 7 wells plugged during the CRA-2014 monitoring period from October 1, 2007, through December 31, 2012.

# DATA-9.0 Repository Investigations Program

The WIPP Repository Investigations Program conducts research activities to confirm assumptions, reduce uncertainty, and resolve issues regarding the conceptual models and parameters used in PA. The program is briefly described in this section and references to relevant reports are provided.

## DATA-9.1 Program Overview

The DOE has implemented and/or continued several experimental activities designed to address specific issues and needs of the WIPP repository. In addition, other investigations have been initiated to examine impacts of planned changes. The general areas covered under these investigations include

- Geochemistry
- Actinide chemistry
- Engineered barriers
- Rock mechanics (Sandia National Laboratories)

## DATA-9.2 Reported Data

Data acquired by the DOE from the repository investigations are available in the following reports, publications, and technical memoranda published since the CRA-2009. Abstracts, posters, presentations, test plans, and analysis plans are not included because they typically contain preliminary data.

**Geochemistry**

- "Proceedings of the International Workshops ABC-Salt (II) and HiTAC 2011" (Altmaier et al. 2012).
- "Numerical Values for Graphs Presented in Report LCO-ACP-17, Rev. 0, Entitled: "Solubility of An(UIV) in WIPP Brine: Thorium Analog Studies in WIPP Simulated Brine" (Borkowski 2012).
- "Actinide (III) Solubility in WIPP Brine: Data Summary and Recommendations" (Borkowski, Lucchini, Richmann, and Reed 2010).
- "Solubility of An(IV) in WIPP Brine: Thorium Analog Studies in WIPP Simulated Brine" (Borkowski, Richmann, and Lucchini 2012).
- "Complexation of Nd(III) with Tetraborate Ion and Its Effect on Actinide(III) Solubility in WIPP Brine" (Borkowski, Richmann, Reed, and Xiong 2010).

- "Predictions of the Compositions of Standard WIPP Brines as a Function of pcH for Laboratory Studies of the Speciation and Solubilities of Actinides" (Brush, Domski, and Xiong 2011).

- "Revised Predictions of WIPP Baseline Actinide Solubilities as a Function of the Volume of Standard Brines" (Brush, Domski, and Xiong 2012).

- "Predictions of Actinide Solubilities as a Function of the Volume of Standard WIPP Brines" (Brush, Domski, Xiong, and Long 2011).

- "Sensitivity of the Long-Term Performance of the WIPP to EDTA" (Brush, Xiong, Garner, Kirchner, and Long 2008).

- "Results of the Calculations of Actinide Solubilities for the CRA-2009 PABC" (Brush, Xiong, and Long 2009).

- "Solubility and Speciation of Cm(III) and Nd(III) in Borate Rich NaCl and $CaCl_2$ Solutions" (Hinz et al. 2012).

- Memorandum to Records Center (Subject: Derivation of Pitzer ion interaction parameters for the pair $Na^+$ and $FeEDTA^{2-}$) (Jang 2012a).

- Memorandum to Records Center (Subject: Derivation of the solubility product for ferrous iron oxalate dihydrate in NaCl solutions and related Pitzer ion interaction parameter) (Jang 2012b).

- "Iron, Lead, Sulfide, and EDTA Solubilities" (Jang, Xiong, Kim, and Nemer 2011).

- "Iron, Lead, Sulfide, and EDTA Solubilities" (Jang, Xiong, Kim, and Nemer 2012).

- "Uranium Solubility in Carbonate-Free ERDA-6 Brine" (Lucchini, Khaing, and Reed 2010).

- "Actinide (VI) Solubility in Carbonate-free WIPP Brine: Data Summary and Recommendations" (Lucchini, Khaing, Borkowski, Richmann, and Reed 2010).

- "WIPP Actinide-Relevant Brine Chemistry" (Lucchini et al. 2013).

- "Uranium(VI) Solubility in WIPP Brine" (Lucchini, Richmann, and Borkowski 2013).

- "Influence of Carbonate on Uranium Solubility in Brine" (Lucchini, Ballard, and Khaing 2012).

- "Solubility of $Fe_2(OH)_3Cl$ (pure-iron end-member of hibbingite) in NaCl and $Na_2SO_4$ brines" (Nemer, Xiong, Ismail, and Jang 2010).

- "Determination of ferrous and ferric iron in aqueous biological samples" (Pepper, Borkowski, Richmann, and Reed 2010).

- "Using Thermodynamic Models: Saline Systems" (Reed 2011).
- "Intrinsic, Mineral, and Microbial Colloid Enhancement Parameters for the WIPP Actinide Source Term" (Reed, Swanson, Lucchini, and Richmann 2013).
- "Redox-Controlling Processes for Multivalent Metals and Actinides in the WIPP" (Reed et al. 2012).
- "Subsurface Interactions of Actinide Species and Microorganisms" (Reed, Deo, and Rittmann 2010).
- "Comparison of the Calculated Thorium Solubility (Concentration) Using the Constants from the TMT_050405 Database with the Experimental Data Published in Altmaier, M., Neck, V., Muller, R. and Fanghanel, T. *Radiochimica Acta*, 93(2), 83-92 (2005)" (Richmann 2010).
- "Iron and Lead Corrosion in WIPP-Relevant Conditions: 12 Month Results" (Roselle 2010).
- "Determination of $pC_{H+}$ Correction Factors in Brines" (Roselle 2011a).
- "Iron and Lead Corrosion in WIPP-Relevant Conditions: 18 Month Results" (Roselle 2011b).
- "Iron and Lead Corrosion in WIPP-Relevant Conditions: 24 Month Results" (Roselle 2011c).
- "Determination of Corrosion Rates from Iron/Lead Corrosion Experiments to be used for Gas Generation Calculations" (Roselle 2013).
- "Thermodynamic Modeling of Trivalent Am, Cm, and Eu-Citrate Complexation in Concentrated $NaClO_4$ Media" (Thakur, Xiong, Borkowski, and Choppin 2012).
- "Thermodynamic Properties of Brucite Determined by Solubility Studies and Their Significance to Nuclear Waste Isolation" (Xiong 2008a).
- "Experimental Determination of Solubility Constant of Hydromagnesite (5424) in NaCl Solutions up to 4.4 M at Room Temperature" (Xiong 2010a).
- Memorandum to Record Center (Subject: Calculations of Thermodynamic Parameters for Experimental Data Generated at Los Alamos National Laboratory Carlsbad Operation (LANL-CO)) (Xiong 2010b).
- Memorandum to Record Center (Subject: Summary Report for Migration of the WIPP Thermodynamic Code from FMT to EQ3/6 Version 8.0a) (Xiong 2010c).
- "Experimental Study of Thermodynamic Parameters of Borate in WIPP Relevant Brines at Sandia National Laboratories Carlsbad Facility" (Xiong 2011a).
- "Organic Species of Lanthanum in Natural Environments: Implications to Mobility of Rare Earth Elements in Low Temperature Environments" (Xiong 2011b).

- "WIPP Verification and Validation Plan/Validation Document for EQ3/6 Version 8.0a for Actinide Chemistry, Revision 1. Supersedes ERMS 550239" (Xiong 2011c).

- "Experimental Determination of Solubility Constant of Di-Calcium Ethylenediaminetetraacetic Acid ($Ca_2EDTA$), $Ca_2C_{10}H_{12}N_2O_8(S)$, in the NaCl-$H_2O$ System" (Xiong 2012a).

- "Thermodynamic Model for the Na-$B(OH)_3$-Cl-$SO_4$ System" (Xiong 2012b).

- "Thermodynamic Model for the Na-$B(OH)_3$-Cl-$SO_4$ System, Revision 1, Superseding ERMS 558111" (Xiong 2012c).

- "Experimental Investigations of the Reaction Path in the MgO-$CO_2$-$H_2O$ System in Solutions with Various Ionic Strengths, and Their Applications to Nuclear Waste Isolation" (Xiong and Lord 2008).

- "Experimental determination of the solubility constant for magnesium chloride hydroxide hydrate ($Mg_3Cl(OH)_5$•$4H_2O$, Phase 5) at room temperature, and its importance to nuclear waste isolation in geological repositories in salt formations" (Xiong, Deng, Nemer, and Johnsen 2009a).

- Memorandum to Larry Brush (Subject: Thermodynamic Data for phase 5 ($Mg_3Cl(OH)_5 \cdot 4H_2O$) Determined from Solubility Experiments.) (Xiong, Deng, Nemer, and Johnsen 2009b).

- "Responses to Three EPA Comments Pertaining to Comparisons of Measured and Predicted Dissolved and Colloidal Th(IV) and Am(III) Concentrations" (Xiong, Brush, Garner, and Long 2010a).

- "Responses to Three EPA Comments Pertaining to Comparisons of Measured and Predicted Dissolved and Colloidal Th(IV) and Am(III) Concentrations, Revision 1. Supersedes ERMS 553409" (Xiong, Brush, Garner, and Long 2010b).

- "Uncertainty Analysis of Actinide Solubilities for the WIPP CRA-2009 PABC, Rev. 1, Supersedes ERMS 552500" (Xiong, Brush, Domski, and Long 2011).

- "Experimental Determination of Solubilities of Lead Oxalate ($PbC_2O_4$(cr)) in a NaCl Medium to High Ionic Strengths, and the $Im_portanc_e$ of Lead Oxalate in Low Temperature Environments" (Xiong, Kirkes, Westfall, Olivas, and Roselle 2011).

**Microbiology**

- "The Effect of High Ionic Strength on Neptunium (V) Adsorption to a Halophilic Bacterium" (Ams et al. 2013).

- "Update on Microbial Characterization of WIPP Groundwaters" (Swanson and Simmons 2013).

- "Degradation of Organic Complexing Agents by Halophilic Microorganisms in Brines" (Swanson, Norden, Khaing, and Reed 2012).

- "Status Report on the Microbial Characterization of Halite and Groundwater Samples from the WIPP" (Swanson, Reed, Ams, Norden, and Simmons 2012).

- "Biodegradation of Organic Complexing Agents by WIPP-indigenous Halophilic Microorganisms in Brines" (Swanson, Simmons, Norden, and Khaing 2013).

**Performance Assessment**

- "Calculation of Organic-Ligand Concentrations for the WIPP CRA-2014 PA" (Brush and Domski 2013a).

- "Prediction of Baseline Actinide Solubilities for the WIPP CRA-2014 PA" (Brush and Domski 2013b).

- "Uncertainty Analysis of Actinide Solubilities for the WIPP CRA-2014 PA" (Brush and Domski 2013c).

- "Calculation of Organic-Ligand Concentrations for the WIPP CRA-2009 PABC" (Brush and Xiong 2009).

- "Summary Report for the AP-151 (PC3R) Performance Assessment, Revision 1" (Camphouse, Clayton, Kicker, and Pasch 2011).

- Memorandum to WIPP Records Center (Subject: Recommendations and Justifications of Parameter Values for the Run-of-Mine Salt Panel Closure System Design Modeled in the PCS-2012 PA) (Camphouse, Gross, Herrick, Kicker, and Thompson 2012).

- "Summary Report and Run Control for the 2012 WIPP Panel Closure System Performance Assessment, Rev. 0" (Camphouse et al. 2012).

- Memorandum to the SNL WIPP Records Center Defense Waste Management Programs (Subject: Memo AP-154, Task 10 EQ3/6 Database Update) (Domski 2012).

- Memorandum to the WIPP Records Center (Subject: Calculations Performed in Support of Reconsolidation of Crushed Salt in Panel Closures) (Herrick 2012a).

- Memorandum to the WIPP Records Center (Subject: JAS3D Calculations Performed in Support of the PCS-2012 PA Parameters Selections) (Herrick 2012b).

- "Estimating the Extent of the Disturbed Rock Zone around a WIPP Disposal Room" (Herrick, Park, Lee, and Holcomb 2009).

- "Determining the Hydrodynamic Shear Strength of Surrogate Degraded TRU Waste Materials as an Estimate for the Lower Limit of the Performance Assessment Parameter TAUFAIL, Revision 0" (Herrick, Schuhen, Chapin, and Kicker 2012).

- Memorandum to Records (Subject: Verification of FMT database and conversion to EQ3/6 format) (Ismail, Deng, Jang, and Wolery 2009).

- Email to Tom Peake (Subject: Response to EPA Questions on Two-Phase Flow and ROM Permeability) (U.S. DOE 2012g).

- Letter to Mr. Jonathan Edwards (Subject: Response to EPA Letter Dated December 22, 2011) (U.S. DOE 2012h).

- "Verification and Validation Plan/Validation Document for EQ3/6 Version 8.0a for Actinide Chemistry, Document Version 8.10" (Wolery, Xiong, and Long 2010).

- Memorandum to Larry Brush (Subject: HMI–an EQ3/6 Database with Iron Species) (Xiong 2008b).

- Email to Jennifer Long (Subject: Release of FMT_090720.CHEMDAT) (Xiong 2009).

- Email to Jennifer Long (Subject: Release of EQ3/6 Database DATA0.FM1) (Xiong 2011d).

- "Experimental Study of Thermodynamic Parameters of Borate in WIPP Relevant Brines at Sandia National Laboratories Carlsbad Facility" (Xiong 2012d).

- Memorandum to The WIPP Record Center (Subject: Memo of Corrections for 'Second Milestone Report on Test Plan TP 08-02, "Iron, Lead, Sulfide, and EDTA Solubilities" (ERMS 557198)') (Xiong 2012e).

- "Establishment of Uncertainty Ranges and Probability Distributions of Actinide Solubilities for Performance Assessment in the Waste Isolation Pilot Plant" (Xiong, Nowak, Brush, Ismail, and Long 2010).

- "Uncertainty Analysis of Actinide Solubilities for the WIPP CRA-2009 PABC" (Xiong, Brush, Ismail, and Long 2009).

**Engineered Barriers**

- "Improvements in Our Understanding of How MgO Will Control pH in WIPP Disposal Rooms" (Brush 2008).

- "Experimental Work Conducted on MgO Long-Term Hydration" (Deng, Xiong, Nemer, and Johnsen 2009).

## Rock Mechanics

- Memorandum to Chris Camphouse (Subject: Follow-up to questions concerning TAUFAIL flume testing raised during the November 14-15, 2012 technical exchange between the DOE and EPA) **(**Herrick and Kirchner 2013).

- "Data Report for Analysis Plan for Demonstration Test Process: Soil Flume Sixnet Data Acquisition System" (Schuhen 2011).

# DATA-10.0 Compliance Monitoring Program

Annually, the Compliance Monitoring Program (CMP) extracts data from the repository investigations and five of the monitoring programs described above (DBDSP, SMP, GMP, GWMP, and WDS) to derive values for the 10 COMPs described in Section DATA-1.0 and to evaluate whether significant changes in the parameters have occurred. The CMP activities are briefly described in this section. Data generated under the CMP are also identified.

## DATA-10.1 Program Overview

The objective of the CMP is to provide assurance that any deviations from the expected long-term performance of the repository are identified at the earliest possible time. The CMP is implemented in accordance with DOE/WIPP 99-3119, Compliance Monitoring Implementation Plan for 40 CFR §191.14(b), Assurance Requirement (U.S. DOE 2012i). Annual evaluations of the compliance parameters follow the requirements found in Sandia National Laboratories SP 9-8, Monitoring Parameter Assessment Per 40 CFR 194.42, Revision 1 (Wagner 2011).

## DATA-10.2 Reported Data

The data and the results of the annual COMPs assessments performed in accordance with the requirements of the CMP are provided in the following reports published since the CRA-2009. There are no COMPs data or results that indicate a reportable event or condition adverse to predicted performance.

- Sandia National Laboratories, "Sandia National Laboratories Compliance Monitoring Parameter Assessment for 2008, WBS 1.3.1, January 2009," Carlsbad, NM (Sandia National Laboratories 2009).

- Sandia National Laboratories, "Sandia National Laboratories Compliance Monitoring Parameter Assessment for 2009, WBS 1.3.1, January 2010," Carlsbad, NM (Sandia National Laboratories 2010a).

- Sandia National Laboratories, "Sandia National Laboratories Compliance Monitoring Parameter Assessment for 2010, WBS 1.3.1, November 2010," Carlsbad, NM (Sandia National Laboratories 2010b).

- Sandia National Laboratories, "Sandia National Laboratories Compliance Monitoring Parameter Assessment for 2011, WBS 1.3.1, December 2011," Carlsbad, NM (Sandia National Laboratories 2011).

- Sandia National Laboratories, "Sandia National Laboratories Compliance Monitoring Parameter Assessment for 2012, WBS 1.3.1, November 2012," Carlsbad, NM (Sandia National Laboratories 2012).

A reassessment of the Trigger Values used to support the annual COMPs assessment is provided in "Sandia National Laboratories Trigger Value Derivation Report, Revision 2, WBS 1.3.1, December 2010," Carlsbad, NM (Sandia National Laboratories 2010c).

# DATA-11.0 Hydrological Investigation

The Exhaust Shaft Hydraulic Assessment, now the Shallow Subsurface Water Investigation, was initiated in September 1996 to investigate the source and extent of water seepage into the exhaust shaft at the WIPP. An investigation of rising water levels in the Culebra was initiated in 1999. These hydrologic investigations are briefly described in this section. Sources of data generated from the investigations are also identified.

## DATA-11.1 Program Overview

### DATA-11.1.1 Shallow Subsurface Water Investigation

Investigations of water entering the exhaust shaft led to the observation of a shallow perched groundwater horizon in a saturated layer within the lower Santa Rosa Formation and the upper Dewey Lake Redbeds Formation, about 15 m (49 ft) below ground surface. During the original drilling and geological mapping of the shaft, no water was encountered at that horizon, indicating that the presence of water may be related to site activities subsequent to shaft drilling. Three wells and 12 piezometers were installed over an 80-acre area between September 1996 and July 1997 (INTERA 1997). In 2007, three more piezometers were installed. No new piezometers have been installed since 2007. Water-level and water-quality parameters continue to be monitored and reported on a regular basis.

### DATA-11.1.2 Culebra Water-Level Rise Investigation

During the 1999 annual COMPs assessment, Culebra water levels in many of the WIPP monitoring wells exceeded the CCA ranges of uncertainty established for equilibrium freshwater heads to calibrate transmissivity fields needed for Culebra flow and transport calculations. Culebra water-level rises had also been observed at the time of the CCA submittal in 1996 but were attributed to natural recovery of water levels following years of hydraulic well testing at the WIPP site and grouting of the WIPP shafts. Subsequent to the 1999 COMPs assessment, Culebra water levels showed a continued rise even though water levels at the WIPP site were thought to have fully recovered from hydraulic testing and shaft grouting. In response to this observation, the DOE initiated an investigation into the cause of the water-level rise and the impact of the rise on the long-term performance of the WIPP, which is discussed in Appendix HYDRO-2009 and Appendix HYDRO-2014. Culebra water-level rises peaked around 2008 and have shown a continuing gradual decline since that time.

## DATA-11.2 Reported Data

Data acquired from the two hydrologic investigations are provided in the reports cited below for the Shallow Subsurface Water Investigation and the Culebra water-level rise investigation.

### DATA-11.2.1 Shallow Subsurface Water Investigation

The Geotechnical Analysis Reports listed in Section DATA-4.2 provide data relevant to the Shallow Subsurface Water Investigation. Additional detailed information on this subject is contained in “Hydrologic Assessment of Shallow Subsurface Water” (Daniel B. Stephens &

Associates, Inc. 2008), and "Assessment of Lead in PZ-13 Near the Site and Preliminary Design Validation (SPDV) Pile at Waste Isolation Pilot Plant" (Daniel B. Stephens & Associates, Inc. 2010).

## DATA-11.2.2 Culebra Water-Level Rise Investigation

The following reports are related to Culebra water-level investigations:

- Letter to Rick Beauheim (Subject: WIPP/SNL-6 (C)) (Hall Environmental Analysis Laboratory 2008a).
- Letter to Rick Beauheim (Subject: WIPP/H-15 (M)) (Hall Environmental Analysis Laboratory 2008b).
- Letter to Rick Beauheim (Subject: WIPP/LRL-7) (Hall Environmental Analysis Laboratory 2008c).
- Letter to Rick Beauheim (Subject: WIPP/USGS-4) (Hall Environmental Analysis Laboratory 2008d).
- Letter to Rick Beauheim (Subject: WIPP/USGS-8) (Hall Environmental Analysis Laboratory 2008e).
- Letter to Rick Beauheim (Subject: WIPP/H-6bR) (Hall Environmental Analysis Laboratory 2009a).
- Letter to Rick Beauheim (Subject: WIPP/H-15R) (Hall Environmental Analysis Laboratory 2009b).
- Letter to Rick Beauheim (Subject: WIPP/H-18 (M)) (Hall Environmental Analysis Laboratory 2009c).
- Letter to Rick Beauheim (Subject: WIPP/H-3b1 (M)) (Hall Environmental Analysis Laboratory 2009d).
- Letter to Rick Beauheim (Subject: WIPP/H-4bR) (Hall Environmental Analysis Laboratory 2009e).
- Letter to Rick Beauheim (Subject: WIPP/WIPP-18 (M)) (Hall Environmental Analysis Laboratory 2010a).
- Letter to Rick Beauheim (Subject: WIPP/H-6c (M)) (Hall Environmental Analysis Laboratory 2010b).
- Letter to Rick Beauheim (Subject: WIPP/H-8a (M)) (Hall Environmental Analysis Laboratory 2010c).

- Letter to Rick Beauheim (Subject: WIPP/H-2b1 (M)) (Hall Environmental Analysis Laboratory 2011a).
- Letter to Mike Schuhen (Subject: WIPP/H-4c (M)) (Hall Environmental Analysis Laboratory 2011b).
- Letter to Mike Schuhen (Subject: WIPP/H-9c (M)) (Hall Environmental Analysis Laboratory 2011c).
- Letter to Mike Schuhen (Subject: WIPP/H-9c ( M )) (Hall Environmental Analysis Laboratory 2011d)
- Letter to Mike Schuhen (Subject: WIPP/H-9bR (C)) (Hall Environmental Analysis Laboratory 2011e).
- Letter to Mike Schuhen (Subject: WIPP/H-11b4R (C)) (Hall Environmental Analysis Laboratory 2012a).
- Letter to Mike Schuhen (Subject: WIPP/H-9bR (C)) (Hall Environmental Analysis Laboratory 2012b).
- Letter to Mike Schuhen (Subject: WIPP/H-9bR (C)) (Hall Environmental Analysis Laboratory 2012c).
- "2007 Calculated Densities for Use in Deriving Equivalent Freshwater Heads of the Culebra Dolomite Member of the Rustler Formation near the WIPP Site" (Johnson 2008).
- "2008 Calculated Densities for Use in Deriving Equivalent Freshwater Heads of the Culebra Dolomite Member of the Rustler Formation near the WIPP Site" (Johnson 2009).
- Memorandum to Records Center (Subject: 2009 Calculated Densities) (Johnson 2010).
- Memorandum to Records Center (Subject: Memo of Correction 2010 Calculated Densities) (Johnson 2011).
- Memorandum to Records Center (Subject: 2003 Calculated Densities) (Johnson 2012a).
- Memorandum to Records Center (Subject: 2004 Calculated Densities) (Johnson 2012b).
- Memorandum to Records Center (Subject: 2005 Calculated Densities) (Johnson 2012c).
- Memorandum to Records Center (Subject: 2006 Calculated Densities) (Johnson 2012d).
- Memorandum to Records Center (Subject: 2011 Calculated Densities) (Johnson 2012e).
- Memorandum to Records Center (Subject: 2012 Calculated Densities) (Johnson 2012f).
- "Culebra Water Level Monitoring Network Design" (Kuhlman 2010).

# DATA-12.0 Waste Containers and Emplacement

Information regarding WIPP waste emplacement containers and underground waste emplacement layouts are provided in this section. Approved containers that are inside other containers, such as pipe overpacks, are not discussed.

## DATA-12.1 Program Overview

Information provided in this section was compiled from several sources to serve as a central document describing both waste emplacement containers and waste emplacement layouts. Both contact-handled transuranic (CH-TRU) and remote-handled transuranic (RH-TRU) waste containers are described along with CH-TRU and RH-TRU waste emplacement layouts in a typical panel in the repository. Only containers approved for disposal in the repository are discussed.

## DATA-12.2 Reported Data

Attachment B to this appendix provides detailed information on the various waste containers and their emplacement in the underground repository.

# DATA-13.0 References

(*Indicates a reference that has not been previously submitted.)


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Borkowski, M. 2012. Numerical Values for Graphs Presented in Report LCO-ACP-17, Rev. 0, Entitled: *Solubility of An(UIV) in WIPP Brine: Thorium Analog Studies in WIPP Simulated Brine* and for Graphs Published in Borkowski, M., et al. Radiochimica Acta 98, (9-11) 577–582 (2010)." LA-UR 12-26640. Carlsbad, NM: Los Alamos National Laboratory.*

Borkowski, M. J-F. Lucchini, M.K. Richmann, and D.T. Reed. 2010. *Actinide (III) Solubility in WIPP Brine: Data Summary and Recommendations*. Report LA-14360. Los Alamos, NM: Los Alamos National Laboratory.*

Borkowski, M., M.K. Richmann, and J-F. Lucchini. 2012. *Solubility of An(IV) in WIPP Brine: Thorium Analog Studies in WIPP Simulated Brine*. Report LCO-ACP-17, LA-UR 12-24417. Carlsbad, NM: Los Alamos National Laboratory.*

Borkowski, M., M.K. Richmann, D.T. Reed, and Y.-L. Xiong. 2010. "Complexation of Nd(III) with Tetraborate Ion and Its Effect on Actinide(III) Solubility in WIPP Brine," *Radiochimica Acta* 98.9-11 (2010): 577–582.*

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Brush, L.H., and P.S. Domski. 2013a. *Calculation of Organic-Ligand Concentrations for the WIPP CRA-2014 PA*. Analysis report, January 14, 2013. ERMS 559005. Carlsbad, NM: Sandia National Laboratories.*

Brush, L.H., and P.S. Domski. 2013b. *Prediction of Baseline Actinide Solubilities for the WIPP CRA-2014 PA*. Analysis report, January 21, 2013. ERMS 559138. Carlsbad, NM: Sandia National Laboratories.*

Brush, L.H., and P.S. Domski. 2013c. *Uncertainty Analysis of Actinide Solubilities for the WIPP CRA-2014 PA*. Analysis report, February 22, 2013. ERMS 559278. Carlsbad, NM: Sandia National Laboratories.*

Brush, L.H., and Y.-L. Xiong. 2009. *Calculation of Organic-Ligand Concentrations for the WIPP CRA-2009 PABC*. Analysis report, June 16, 2009. ERMS 551481. Carlsbad, NM: Sandia National Laboratories.*

Brush, L.H., P.S. Domski, and Y.-L. Xiong. 2011. *Predictions of the Compositions of Standard WIPP Brines as a Function of pcH for Laboratory Studies of the Speciation and Solubilities of Actinides*. Analysis report, June 24, 2011. ERMS 555727. Carlsbad, NM: Sandia National Laboratories.*

Brush, L.H., P.S. Domski, and Y.-L. Xiong. 2012. *Revised Predictions of WIPP Baseline Actinide Solubilities as a Function of the Volume of Standard Brines*. Analysis report, May 17, 2012. ERMS 557524. Carlsbad, NM: Sandia National Laboratories.*

Brush, L.H., P.S. Domski, Y.-L. Xiong, and J.J. Long. 2011. *Predictions of Actinide Solubilities as a Function of the Volume of Standard WIPP Brine*s. Analysis Report, September 8, 2011. ERMS 556140. Carlsbad, NM: Sandia National Laboratories.*

Brush, L.H., Y.-L. Xiong, and J.J. Long. 2009. *Results of the Calculations of Actinide Solubilities for the CRA-2009 PABC*. Analysis Report, October 7, 2009. ERMS 552201. Carlsbad, NM: Sandia National Laboratories.*

Brush, L.H., Y.-L. Xiong, J.W. Garner, T.B Kirchner, and J.J. Long. 2008. *Sensitivity of the Long-Term Performance of the WIPP to EDTA*. Analysis report, March 20, 2008. ERMS 548398. Carlsbad, NM: Sandia National Laboratories.*

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Camphouse, R.C., D.C. Kicker, T.B. Kirchner, J.J. Long, B. Malama, T.R. Zeitler. 2012. *Summary Report and Run Control for the 2012 WIPP Panel Closure System Performance Assessment, Rev. 0*. ERMS 558365. Carlsbad, NM: Sandia National Laboratories.*

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Domski, P. 2012. Memorandum to the SNL WIPP Records Center Defense Waste Management Programs (Subject: *Memo AP-154, Task 10 EQ3/6 Database Update*). October 31, 2012. ERMS 558579. Carlsbad, NM: Sandia National Laboratories.*

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Hall Environmental Analysis Laboratory. 2009a. Letter to Rick Beauheim (Subject: *WIPP/H-6bR*). January 21, 2009. Order No. 0812250.*

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Hall Environmental Analysis Laboratory. 2009d. Letter to Rick Beauheim (Subject: *WIPP/H-3b1 ( M )*). August 13, 2009. Order No. 0907569.*

Hall Environmental Analysis Laboratory. 2009e. Letter to Rick Beauheim (Subject: *WIPP/H-4bR*). August 25, 2009. Order No. 0908237.*

Hall Environmental Analysis Laboratory. 2010a. Letter to Rick Beauheim (Subject: *WIPP/WIPP-18 ( M )*). April 6, 2010. Order No. 1003482.*

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# Title 40 CFR Part 191
# Subparts B and C
# Compliance Recertification Application 2014
# for the
# Waste Isolation Pilot Plant

# Appendix DATA-2014
# Attachment A: WIPP Borehole Update

## United States Department of Energy
## Waste Isolation Pilot Plant

**Carlsbad Field Office**
**Carlsbad, New Mexico**

# Appendix DATA-2014
# Attachment A:  WIPP Borehole Update

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## Acronyms and Abbreviations

| | |
|---|---|
| BLM | Bureau of Land Management |
| CCA | Compliance Certification Application |
| CRA | Compliance Recertification Application |
| DOE | Department of Energy |
| WIPP | Waste Isolation Pilot Plant |

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# DATA-A-1.0 WIPP Boreholes

The U.S. Department of Energy (DOE) prepared DOE/WIPP 95-2092, Revision 1, Waste Isolation Pilot Plant (WIPP) Borehole Data Report (the Compliance Certification Application [CCA], Appendix BH) (U.S. DOE 1996) to serve as a central document, providing data on boreholes used in characterizing the site. The report contains a comprehensive database on wells drilled in support of the Waste Isolation Pilot Plant (WIPP) Project and boreholes located within the 16-section land withdrawal area.

The CCA, Appendix BH (U.S. DOE 1996) describes seven groups of boreholes: commercially drilled boreholes, DOE wells, geologic exploration boreholes, hydrologic test boreholes, potash boreholes, subsurface exploration boreholes, and Water Quality Sampling Program boreholes. There are 179 boreholes listed in the report. At the time of the CCA, 80 of those boreholes were being used as monitoring wells. The rest of the boreholes were plugged and abandoned after being drilled for their specific purpose, i.e., potash information, hydrocarbon information, or WIPP site characterization information.

The Appendix DATA-2004, Attachment G, WIPP Borehole Update (U.S. DOE 2004), was provided to add the new monitoring wells drilled since the initial certification and wells that were in use but omitted from the CCA, Appendix BH. The Appendix DATA-2004, Attachment G provided information on 112 boreholes.

The Appendix DATA-2009, Attachment A, WIPP Borehole Update (U.S. DOE 2009), was provided to add the new monitoring wells. The Appendix DATA-2009, Attachment A provided information on 215 boreholes.

For the 2014 Compliance Recertification Application (CRA-2014), a thorough search was performed to define the number of boreholes associated with WIPP site characterization and monitoring. Currently, there are 221 boreholes that were either specifically drilled to support the WIPP site characterization process or obtained for monitoring purposes. This update provides the status for those boreholes.

Table DATA-A-1 provides the status of all 221 boreholes, including the name of the formation being monitored, whether the borehole is currently configured as a water or observation well, and whether it has been plugged and abandoned. A status of "N/A" means the borehole was not being used or had not yet been drilled at the time of the status report. "Observation" means the borehole was drilled for site characterization, but left unplugged for future monitoring purposes.

**Table DATA-A-1. Status of WIPP Boreholes December 2012 WIPP**

| Well Name | CCA Status | CRA-2004 Status | CRA-2009 Status | CRA-2014 Status | Original Depth | Year Drilled |
|---|---|---|---|---|---|---|
| AEC-7 | Culebra | Culebra | Culebra | Culebra | 4,734 ft | 1974 |
| AEC-8 | Bell Canyon | Bell Canyon | Plugged | Plugged | 4,922 ft | 1974 |
| B-1 | Observation | Observation | Observation | Observation | 58 ft | 1978 |

## Table DATA-A-1. Status of WIPP Boreholes December 2012 WIPP (Continued)

| Well Name | CCA Status | CRA-2004 Status | CRA-2009 Status | CRA-2014 Status | Original Depth | Year Drilled |
|---|---|---|---|---|---|---|
| B-1A | Observation | Observation | Observation | Observation | 13 ft | 1978 |
| B-2 | Plugged | Plugged | Plugged | Plugged | 34 ft | 1978 |
| B-3 | Plugged | Plugged | Plugged | Plugged | 29 ft | 1978 |
| B-4 | Observation | Observation | Observation | Observation | 39 ft | 1978 |
| B-4A | Observation | Observation | Observation | Observation | 14 ft | 1978 |
| B-5 | Plugged | Plugged | Plugged | Plugged | 32 ft | 1978 |
| B-6 | Plugged | Plugged | Plugged | Plugged | 26 ft | 1978 |
| B-7 | Plugged | Plugged | Plugged | Plugged | 35 ft | 1978 |
| B-8 | Plugged | Plugged | Plugged | Plugged | 100 ft | 1979 |
| B-9 | Plugged | Plugged | Plugged | Plugged | 38 ft | 1978 |
| B-10 | Plugged | Plugged | Plugged | Plugged | 32 ft | 1978 |
| B-11 | Plugged | Plugged | Plugged | Plugged | 30 ft | 1978 |
| B-12 | Plugged | Plugged | Plugged | Plugged | 41 ft | 1978 |
| B-13 | Observation | Observation | Observation | Observation | 28 ft | 1978 |
| B-14 | Plugged | Plugged | Plugged | Plugged | 25 ft | 1978 |
| B-15 | Plugged | Plugged | Plugged | Plugged | 57 ft | 1978 |
| B-16 | Observation | Observation | Observation | Observation | 31 ft | 1978 |
| B-17 | Plugged | Plugged | Plugged | Plugged | 26 ft | 1978 |
| B-18 | Observation | Observation | Observation | Observation | 33 ft | 1978 |
| B-19 | Plugged | Plugged | Plugged | Plugged | 39 ft | 1978 |
| B-20 | Observation | Observation | Observation | Observation | 14 ft | 1978 |
| B-20A | Observation | Observation | Observation | Observation | 34 ft | 1978 |
| B-21 | Plugged | Plugged | Plugged | Plugged | 40 ft | 1978 |
| B-22 | Plugged | Plugged | Plugged | Plugged | 28 ft | 1978 |
| B-23 | Plugged | Plugged | Plugged | Plugged | 41 ft | 1978 |
| B-24 | Plugged | Plugged | Plugged | Plugged | 29 ft | 1978 |
| B-25 | Plugged | Plugged | Plugged | Plugged | 902 ft | 1978 |
| B-26 | Plugged | Plugged | Plugged | Plugged | 28 ft | 1979 |
| B-27 | Plugged | Plugged | Plugged | Plugged | 26 ft | 1979 |
| B-28 | Plugged | Plugged | Plugged | Plugged | 27 ft | 1979 |
| B-29 | Plugged | Plugged | Plugged | Plugged | 29 ft | 1978 |
| B-30 | Plugged | Plugged | Plugged | Plugged | 28 ft | 1978 |
| B-31 | Plugged | Plugged | Plugged | Plugged | 31 ft | 1978 |
| B-32 | Plugged | Plugged | Plugged | Plugged | 100 ft | 1979 |
| B-33 | Plugged | Plugged | Plugged | Plugged | 31 ft | 1978 |

## Table DATA-A-1. Status of WIPP Boreholes December 2012 WIPP (Continued)

| Well Name | CCA Status | CRA-2004 Status | CRA-2009 Status | CRA-2014 Status | Original Depth | Year Drilled |
|---|---|---|---|---|---|---|
| B-34 | Plugged | Plugged | Plugged | Plugged | 100 ft | 1979 |
| B-35 | Plugged | Plugged | Plugged | Plugged | 32 ft | 1979 |
| B-36 | Plugged | Plugged | Plugged | Plugged | 28 ft | 1979 |
| B-37 | Plugged | Plugged | Plugged | Plugged | 28 ft | 1979 |
| B-37A | Plugged | Plugged | Plugged | Plugged | 22 ft | 1979 |
| B-38 | Observation | Observation | Observation | Observation | 50 ft | 1979 |
| B-39 | Plugged | Plugged | Plugged | Plugged | 28 ft | 1979 |
| B-40 | Plugged | Plugged | Plugged | Plugged | 28 ft | 1979 |
| B-41 | Plugged | Plugged | Plugged | Plugged | 100 ft | 1979 |
| B-42 | Plugged | Plugged | Plugged | Plugged | 100 ft | 1979 |
| B-43 | Plugged | Plugged | Plugged | Plugged | 100 ft | 1979 |
| B-44 | Plugged | Plugged | Plugged | Plugged | 100 ft | 1979 |
| B-45 | Plugged | Plugged | Plugged | Plugged | 100 ft | 1979 |
| B-46 | Plugged | Plugged | Plugged | Plugged | 100 ft | 1979 |
| B-47 | Plugged | Plugged | Plugged | Plugged | 18 ft | 1979 |
| B-48 | Plugged | Plugged | Plugged | Plugged | 16 ft | 1979 |
| B-49 | Plugged | Plugged | Plugged | Plugged | 19 ft | 1979 |
| B-50 | Plugged | Plugged | Plugged | Plugged | 24 ft | 1979 |
| B-51 | Plugged | Plugged | Plugged | Plugged | 15 ft | 1979 |
| B-52 | Plugged | Plugged | Plugged | Plugged | 30 ft | 1979 |
| B-53 | Plugged | Plugged | Plugged | Plugged | 30 ft | 1979 |
| B-54 | Observation | Observation | Observation | Observation | 210 ft | 1979 |
| B-301 | Plugged | Plugged | Plugged | Plugged | 40 ft | 1979 |
| B-302 | Plugged | Plugged | Plugged | Plugged | 39 ft | 1979 |
| B-303 | Plugged | Plugged | Plugged | Plugged | 39 ft | 1979 |
| B-304 | Plugged | Plugged | Plugged | Plugged | 42 ft | 1979 |
| B-305 | Plugged | Plugged | Plugged | Plugged | 41 ft | 1979 |
| B-306 | Plugged | Plugged | Plugged | Plugged | 38 ft | 1979 |
| B-307 | Plugged | Plugged | Plugged | Plugged | 40 ft | 1979 |
| B-308 | Plugged | Plugged | Plugged | Plugged | 40 ft | 1979 |
| B-309 | Plugged | Plugged | Plugged | Plugged | 39 ft | 1979 |
| C-2505 | N/A | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 97 ft | 1996 |
| C-2506 | N/A | Santa Rosa/Dewey | Santa Rosa/Dewey | Santa Rosa/Dewey | 69 ft | 1996 |

## Table DATA-A-1. Status of WIPP Boreholes December 2012 WIPP (Continued)

| Well Name | CCA Status | CRA-2004 Status | CRA-2009 Status | CRA-2014 Status | Original Depth | Year Drilled |
|---|---|---|---|---|---|---|
| | | Lake | Lake | Lake | | |
| C-2507 | N/A | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 73 ft | 1996 |
| C-2737 | N/A | Culebra/Magenta | Culebra/Magenta | Culebra/Magenta | 800 ft | 2001 |
| C-2811 | N/A | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 80 ft | 2001 |
| CB-1 | Culebra | Culebra/Bell Canyon | Bell Canyon | Culebra | 4,299 ft | 1974 |
| D-268 | Culebra | Rancher's Water Well | Rancher's Water Well | Rancher's Water Well | 1,411 ft | 1984 |
| DOE-1 | Culebra | Culebra | Plugged | Plugged | 4,057 ft | 1982 |
| DOE-2 | Culebra | Magenta | Bell Canyon | Magenta | 4,325 ft | 1984 |
| ERDA-6 | Plugged | Plugged | Plugged | Plugged | 2,775 f | 1975 |
| ERDA-9 | Culebra | Culebra | Culebra | Culebra | 2,886 ft | 1976 |
| ERDA-10 | Plugged | Plugged | Plugged | Plugged | 4,430 ft | 1977 |
| ERDA-11 | Plugged | Plugged | Plugged | Plugged | 40 ft | 1977 |
| ES-001 | N/A | Plugged | Plugged | Plugged | 54 ft | 1996 |
| ES-002 | N/A | Plugged | Plugged | Plugged | 19 ft | 1996 |
| H-1 | Culebra/Magenta | Plugged | Plugged | Plugged | 856 ft | 1976 |
| H-2A | Culebra | Culebra | Plugged | Plugged | 672 ft | 1977 |
| H-2B1 | Magenta | Magenta | Magenta | Magenta | 661 ft | 1977 |
| H-2B2 | Culebra | Culebra | Culebra | Culebra | 660 ft | 1983 |
| H-2C | Magenta | Culebra | Plugged | Plugged | 795 ft | 1977 |
| H-3B1 | Magenta | Magenta | Magenta | Magenta | 902 ft | 1976 |
| H-3B2 | Culebra | Culebra | Culebra | Culebra | 725 ft | 1983 |
| H-3B3 | Magenta | Culebra | Plugged | Plugged | 730 ft | 1983 |
| H-3D | Dewey Lake | Dewey Lake/Forty-niner | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 554 ft | 1987 |
| H-4A | N/A | Plugged | Plugged | Plugged | 532 ft | 1978 |
| H-4B | Culebra | Culebra | Culebra | Plugged | 529 ft | 1978 |
| H-4BR | N/A | N/A | N/A | Culebra | 529 ft | 2009 |
| H-4C | Magenta | Magenta | Magenta | Magenta | 661 ft | 1978 |
| H-5A | Culebra | Culebra | Plugged | Plugged | 930 ft | 1978 |

## Table DATA-A-1. Status of WIPP Boreholes December 2012 WIPP (Continued)

| Well Name | CCA Status | CRA-2004 Status | CRA-2009 Status | CRA-2014 Status | Original Depth | Year Drilled |
|---|---|---|---|---|---|---|
| H-5B | Culebra | Culebra | Culebra | Culebra | 925 ft | 1978 |
| H-5C | Magenta | Magenta | Not in Use | Magenta | 1,076 ft | 1978 |
| H-6A | Culebra | Culebra | Plugged | Plugged | 637 ft | 1978 |
| H-6B | Culebra | Culebra | Culebra | Plugged | 640 ft | 1978 |
| H-6BR | N/A | N/A | N/A | Culebra | 640 ft | 2008 |
| H-6C | Culebra | Culebra | Magenta | Magenta | 741 ft | 1978 |
| H-7A | N/A | Plugged | Plugged | Plugged | 154 ft | 1979 |
| H-7B1 | Culebra | Culebra | Culebra | Culebra | 286 ft | 1979 |
| H-7B2 | Culebra | Culebra | Plugged | Plugged | 295 ft | 1983 |
| H-7C | N/A | N/A | Rancher's Water Well | Rancher's Water Well | 420 ft | 1979 |
| H-8A | Magenta | Magenta | Magenta | Magenta | 505 ft | 1979 |
| H-8B | N/A | Rancher's Water Well | Rancher's Water Well | Rancher's Water Well | 624 ft | 1979 |
| H-8C | Rustler | Rustler | Rancher's Water Well | Rancher's Water Well | 808 ft | 1979 |
| H-9A | Culebra | Plugged | Plugged | Plugged | 692 ft | 1979 |
| H-9B | Culebra | Culebra | Not in Use | Plugged | 708 ft | 1979 |
| H-9BR | N/A | N/A | N/A | Culebra | 686 ft | 2010 |
| H-9C | Culebra | Magenta | Culebra/Magenta | Magenta | 816 ft | 1979 |
| H-10A | Magenta | Magenta | Magenta | Magenta | 1,318 ft | 1979 |
| H-10B | Magenta | Plugged | Plugged | Plugged | 1,398 ft | 1979 |
| H-10C | N/A | Culebra | Culebra | Culebra | 1,550 ft | 1979 |
| H-11B1 | Culebra | Culebra | Plugged | Plugged | 785 ft | 1983 |
| H-11B2 | Culebra | Magenta | Magenta | Magenta | 776 ft | 1983 |
| H-11B3 | Culebra | Plugged | Plugged | Plugged | 789 ft | 1983 |
| H-11B4 | N/A | Culebra | Culebra | Plugged | 765 ft | 1988 |
| H-11B4R | N/A | N/A | N/A | Culebra | 755 ft | 2011 |
| H-11B4RA | N/A | N/A | N/A | Plugged | 774 ft | 2011 |
| H-12 | Culebra | Culebra | Culebra | Culebra | 1,001 ft | 1983 |
| H-14 | Culebra | Magenta | Magenta | Magenta | 589 ft | 1986 |
| H-15 | Culebra | Magenta | Culebra/Magenta | Magenta | 900 ft | 1986 |
| H-15R | N/A | N/A | N/A | Culebra | 924 ft | 2009 |
| H-16 | Dewey Lake | N/A | Rustler | Rustler | 851 ft | 1987 |
| H-17 | Culebra | Culebra | Culebra | Culebra | 880 ft | 1987 |

## Table DATA-A-1. Status of WIPP Boreholes December 2012 WIPP (Continued)

| Well Name | CCA Status | CRA-2004 Status | CRA-2009 Status | CRA-2014 Status | Original Depth | Year Drilled |
|---|---|---|---|---|---|---|
| H-18 | Culebra | Magenta | Magenta | Magenta | 840 ft | 1987 |
| H-19B | N/A | N/A | N/A | N/A | 40 ft | 1995 |
| H-19B0 | N/A | Culebra | Culebra | Culebra | 779 ft | 1995 |
| H-19B1 | N/A | Plugged | Plugged | Plugged | 733 ft | 1995 |
| H-19B2 | N/A | Culebra | Culebra | Culebra | 785 ft | 1995 |
| H-19B3 | N/A | Culebra | Culebra | Culebra | 785 ft | 1995 |
| H-19B4 | N/A | Culebra | Culebra | Culebra | 782 ft | 1995 |
| H-19B5 | N/A | Culebra | Culebra | Culebra | 786 ft | 1995 |
| H-19B6 | N/A | Culebra | Culebra | Culebra | 788 ft | 1995 |
| H-19B7 | N/A | Culebra | Culebra | Culebra | 785 ft | 1995 |
| IMC-461 | N/A | N/A | Culebra | Culebra | 1,316 ft | 2004 |
| P-1 | Plugged | Plugged | Plugged | Plugged | 1,591 ft | 1976 |
| P-2 | Plugged | Plugged | Plugged | Plugged | 1,895 ft | 1976 |
| P-3 | Plugged | Plugged | Plugged | Plugged | 1,676 ft | 1976 |
| P-4 | Plugged | Plugged | Plugged | Plugged | 1,857 ft | 1976 |
| P-5 | Plugged | Plugged | Plugged | Plugged | 1,830 ft | 1976 |
| P-6 | Plugged | Plugged | Plugged | Plugged | 1,573 ft | 1976 |
| P-7 | Plugged | Plugged | Plugged | Plugged | 1,574 ft | 1976 |
| P-8 | Plugged | Plugged | Plugged | Plugged | 1,660 ft | 1976 |
| P-9 | Plugged | Plugged | Plugged | Plugged | 1,796 ft | 1976 |
| P-10 | Plugged | Plugged | Plugged | Plugged | 2,009 ft | 1976 |
| P-11 | Plugged | Plugged | Plugged | Plugged | 1,940 ft | 1976 |
| P-12 | Plugged | Plugged | Plugged | Plugged | 1,598 ft | 1976 |
| P-13 | Plugged | Plugged | Plugged | Plugged | 1,576 ft | 1976 |
| P-14 | Culebra | Plugged | Plugged | Plugged | 1,545 ft | 1976 |
| P-15 | Culebra | Plugged | Plugged | Plugged | 1,465 ft | 1976 |
| P-16 | Plugged | Plugged | Plugged | Plugged | 1,585 ft | 1976 |
| P-17 | Culebra | Culebra | Plugged | Plugged | 1,660 ft | 1976 |
| P-18 | Culebra | Plugged | Plugged | Plugged | 1,998 ft | 1976 |
| P-19 | Plugged | Plugged | Plugged | Plugged | 2,000 ft | 1976 |
| P-20 | Plugged | Plugged | Plugged | Plugged | 1,995 ft | 1976 |
| P-21 | Plugged | Plugged | Plugged | Plugged | 1,915 ft | 1976 |
| PZ-1 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 68 ft | 1997 |

## Table DATA-A-1. Status of WIPP Boreholes December 2012 WIPP (Continued)

| Well Name | CCA Status | CRA-2004 Status | CRA-2009 Status | CRA-2014 Status | Original Depth | Year Drilled |
|---|---|---|---|---|---|---|
| PZ-2 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 65 ft | 1997 |
| PZ-3 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 71 ft | 1997 |
| PZ-4 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 65 ft | 1997 |
| PZ-5 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 72 ft | 1997 |
| PZ-6 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 66 ft | 1997 |
| PZ-7 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 72 ft | 1997 |
| PZ-8 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 68 ft | 1997 |
| PZ-9 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 82 ft | 1997 |
| PZ-10 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 57 ft | 1997 |
| PZ-11 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 82 ft | 1997 |
| PZ-12 | N/A | Santa Rosa | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 72 ft | 1997 |
| PZ-13 | N/A | N/A | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 77 ft | 2007 |
| PZ-14 | N/A | N/A | Santa Rosa/Dewey Lake | Santa Rosa/Dewey Lake | 73 ft | 2007 |
| PZ-15 | N/A | N/A | Gatuña/Santa Rosa | Gatuña/Santa Rosa | 56 ft | 2007 |
| SNL-1 | N/A | N/A | Culebra | Culebra | 644 ft | 2004 |
| SNL-2 | N/A | N/A | Culebra | Culebra | 614 ft | 2003 |

## Table DATA-A-1. Status of WIPP Boreholes December 2012 WIPP (Continued)

| Well Name | CCA Status | CRA-2004 Status | CRA-2009 Status | CRA-2014 Status | Original Depth | Year Drilled |
|---|---|---|---|---|---|---|
| SNL-3 | N/A | N/A | Culebra | Culebra | 970 ft | 2003 |
| SNL-5 | N/A | N/A | Culebra | Culebra | 687 ft | 2004 |
| SNL-6 | N/A | N/A | Culebra | Culebra | 1,360 ft | 2005 |
| SNL-8 | N/A | N/A | Culebra | Culebra | 981 ft | 2005 |
| SNL-9 | N/A | N/A | Culebra | Culebra | 845 ft | 2003 |
| SNL-10 | N/A | N/A | Culebra | Culebra | 651 ft | 2006 |
| SNL-12 | N/A | N/A | Culebra | Culebra | 905 ft | 2003 |
| SNL-13 | N/A | N/A | Culebra | Culebra | 480 ft | 2005 |
| SNL-14 | N/A | N/A | Culebra | Culebra | 719 ft | 2005 |
| SNL-15 | N/A | N/A | Culebra | Culebra | 950 ft | 2005 |
| SNL-16 | N/A | N/A | Culebra | Culebra | 224 ft | 2006 |
| SNL-17A | N/A | N/A | Culebra | Culebra | 375 ft | 2006 |
| SNL-17 | N/A | N/A | Plugged | Plugged | 365 ft | 2006 |
| SNL-18 | N/A | N/A | Culebra | Culebra | 566 ft | 2006 |
| SNL-19 | N/A | N/A | Culebra | Culebra | 381 ft | 2006 |
| WIPP-11 | N/A | N/A | Culebra | Culebra | 3,580 ft | 1978 |
| WIPP-12 | Culebra | Culebra | Plugged | Plugged | 3,928 ft | 1978 |
| WIPP-13 | Culebra | Culebra | Culebra | Culebra | 3,856 ft | 1978 |
| WIPP-14 | Plugged | Plugged | Plugged | Plugged | 1,000 ft | 1981 |
| WIPP-15 | Water Well | Rancher’s Water Well | Rancher’s Water Well | Rancher's Water Well | 810 ft | 1978 |
| WIPP-16 | Plugged | Plugged | Plugged | Plugged | 1,300 ft | 1980 |
| WIPP-18 | Culebra | Magenta | Magenta | Magenta | 1,060 ft | 1978 |
| WIPP-19 | Culebra | Culebra | Culebra | Culebra | 1,038 ft | 1978 |
| WIPP-21 | Culebra | Culebra | Plugged | Plugged | 1,045 ft | 1978 |
| WIPP-22 | Culebra | Culebra | Plugged | Plugged | 1,450 ft | 1978 |
| WIPP-25 | Culebra/Magenta | Culebra/Magenta | Culebra/Magenta | Plugged | 655 ft | 1978 |
| WIPP-26 | Culebra | Culebra | Plugged | Plugged | 503 ft | 1978 |
| WIPP-27 | Culebra/Magenta | Culebra | Plugged | Plugged | 592 ft | 1978 |
| WIPP-28 | Rustler | Plugged | Plugged | Plugged | 801 ft | 1978 |
| WIPP-29 | Culebra | Culebra | Plugged | Plugged | 377 ft | 1978 |
| WIPP-30 | Culebra/Magenta | Culebra/Magenta | Culebra/Magenta | Plugged | 912 ft | 1978 |
| WIPP-31 | Plugged | Plugged | Plugged | Plugged | 1,982 ft | 1980 |
| WIPP-32 | Plugged | Plugged | Plugged | Plugged | 390 ft | 1979 |
| WIPP-33 | Plugged | Plugged | Plugged | Plugged | 840 ft | 1979 |

## Table DATA-A-1. Status of WIPP Boreholes December 2012 WIPP (Continued)

| Well Name | CCA Status | CRA-2004 Status | CRA-2009 Status | CRA-2014 Status | Original Depth | Year Drilled |
|---|---|---|---|---|---|---|
| WIPP-34 | Plugged | Plugged | Plugged | Plugged | 1,820 ft | 1979 |
| WQSP-1 | Culebra | Culebra | Culebra | Culebra | 737 ft | 1994 |
| WQSP-2 | Culebra | Culebra | Culebra | Culebra | 846 ft | 1994 |
| WQSP-3 | Culebra | Culebra | Culebra | Culebra | 879 ft | 1994 |
| WQSP-4 | Culebra | Culebra | Culebra | Culebra | 800 ft | 1994 |
| WQSP-5 | Culebra | Culebra | Culebra | Culebra | 681 ft | 1994 |
| WQSP-6 | Culebra | Culebra | Culebra | Culebra | 617 ft | 1994 |
| WQSP-6A | Dewey Lake | Dewey Lake | Dewey Lake | Dewey Lake | 225 ft | 1994 |

1

# DATA-A-2.0 Individual Well Reports

This section provides basic data on the new wells drilled (6) and the wells plugged (7) during the CRA-2014 monitoring period (October 2007 through December 2012).

All WIPP monitoring wells have been drilled in New Mexico within the vicinity of the WIPP site. The Bureau of Land Management (BLM) controls the drilling, operation, and abandonment of hydrocarbon wells on federal land in New Mexico. The New Mexico Oil Conservation Division controls the drilling, operation, and abandonment of hydrocarbon wells on state and patented lands in New Mexico. The New Mexico Office of the State Engineer regulates the drilling, operation, and abandonment of groundwater wells (this includes mineral exploration, monitoring, and observation wells) in the State of New Mexico. This agency has regulatory oversight of wells in the WIPP land withdrawal area. All WIPP monitoring wells have been permitted through this agency and drilled according to the regulations in place at the time of drilling. Right-of-way permits have been acquired from the BLM when monitoring wells are located on federal lands outside the WIPP land withdrawal area.

## DATA-A-2.1 New Wells Drilled Since the CRA-2009

H-4BR
Location: T22S-R31E-05 Year Drilled: 2009 Total Depth: 518 ft (158 m)
Status: Culebra Monitoring Well Elevation: 3332 ft (1016 m)

H-6BR
Location: T22S-R31E-18 Year Drilled: 2008 Total Depth: 640 ft (195 m)
Status: Culebra Monitoring Well Elevation: 3347 ft (1020 m)

H-9BR
Location: T24S-R31E-04 Year Drilled: 2010 Total Depth: 686 ft (209 m)
Status: Culebra Monitoring Well Elevation: 3405 ft (1038 m)

H-11B4R
Location: T22S-R31E-33 Year Drilled: 2011 Total Depth: 755 ft (230 m)
Status: Culebra Monitoring Well Elevation: 3409 ft (1039 m)

H-11B4RA
Location: T22S-R31E-33 Year Drilled: 2011 Total Depth: 774 ft (236 m)
Status: Culebra Monitoring Well Elevation: 3410 ft (1039 m)

H-15R
Location: T22S-R31E-28 Year Drilled: 2009 Total Depth: 924 ft (282 m)
Status: Culebra Monitoring Well Elevation: 3480 ft (1061 m)

# DATA-A-2.2 Plugged Wells

H-4B
Location: T23S-R31E-05 Year Drilled: 1978 Total Depth: 529 ft (161 m)
Status: Plugged in 2009 Elevation: 3333 ft (1016 m)
Notes: The well was cemented to the surface using Class C neat cement.

H-6B
Location: T22S-R31E-18 Year Drilled: 1978 Total Depth: 640 ft (195 m)
Status: Plugged in 2008 Elevation: 3348 ft (1020 m)
Notes: The well was cemented to the surface using Class C neat cement.

H-9B
Location: T24S-R31E-04 Year Drilled: 1979 Total Depth: 708 ft (216 m)
Status: Plugged in 2010 Elevation: 3406 ft (1038 m)
Notes: In 2002, the open-hole portion of the well was inadvertently plugged during pressure grouting of well H-9A. The well was cemented to the surface using Class C neat cement.

H-11B4
Location: T22S-R31E-33 Year Drilled: 1988 Total Depth: 765 ft (233 m)
Status: Plugged in 2011 Elevation: 3409 ft (1039 m)
Notes: The well was cemented to the surface using Class C neat cement.

H-11B4RA
Location: T22S-R31E-15 Year Drilled: 2011 Total Depth: 774 ft (236 m)
Status: Plugged in 2011 Elevation: 3409 ft (1039 m)
Notes: Plugged due to improper screen depth by driller. The well was cemented to the surface using Class C neat cement.

WIPP-25
Location: T22S-R30E-15 Year Drilled: 1978 Total Depth: 655 ft (200 m)
Status: Plugged in 2009 Elevation: 3212 ft (979 m)
Notes: The well was cemented to the surface using Class C neat cement.

WIPP-30
Location: T21S-R31E-33 Year Drilled: 1978 Total Depth: 912 ft (278 m)
Status: Plugged in 2008 Elevation: 3428 ft (1045 m)
Notes: The well was cemented to the surface using Class C neat cement.

# DATA-A-3.0 References

(*Indicates a reference that has not been previously submitted.)

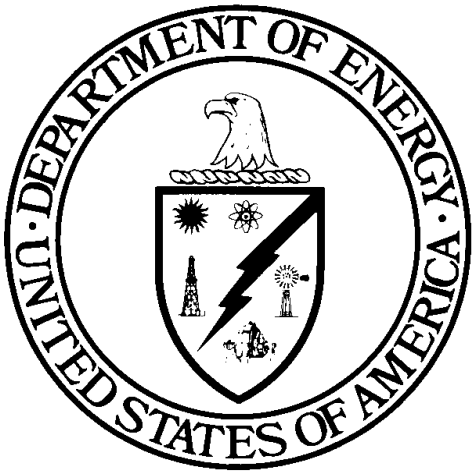
U.S. Department of Energy (DOE). 1996. Title 40 CFR Part 191 *Compliance Certification Application for the Waste Isolation Pilot Plant* (October). 21 vols. DOE/CAO 1996-2184. Carlsbad, NM: Carlsbad Area Office.

U.S. Department of Energy (DOE). 2004. Title 40 CFR Part 191 *Compliance Recertification Application for the Waste Isolation Pilot Plant* (March). 10 vols. DOE/WIPP 2004-3231. Carlsbad, NM: Carlsbad Field Office.

U.S. Department of Energy (DOE). 2009. Title 40 CFR Part 191 *Compliance Recertification Application for the Waste Isolation Pilot Plant* (March). DOE/WIPP 2009-3424. Carlsbad, NM: Carlsbad Field Office.*

# Title 40 CFR Part 191
# Subparts B and C
# Compliance Recertification Application 2014
# for the
# Waste Isolation Pilot Plant

# Appendix DATA-2014
# Attachment B: WIPP Waste Containers and Emplacement




## United States Department of Energy
## Waste Isolation Pilot Plant

**Carlsbad Field Office**
**Carlsbad, New Mexico**

# Appendix DATA-2014
# Attachment B: WIPP Waste Containers and Emplacement

## Table of Contents



## List of Figures



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## Acronyms and Abbreviations

| | |
|---|---|
| CH | contact-handled |
| CH-TRU | contact-handled transuranic |
| EPA | U.S. Environmental Protection Agency |
| gal | gallon |
| mm | millimeter |
| RH | remote-handled |
| RH-TRU | remote-handled transuranic |
| SLB2 | Standard Large Box 2 |
| SWB | Standard Waste Box |
| TDOP | 10-Drum Overpack |
| TRU | transuranic |

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# DATA-B-1.0 Authorized Waste Emplacement Containers

## DATA-B-1.1 Container Descriptions

The following containers are identified as outer containment vessels for waste emplacement in the repository:

- 55-gallon (gal) Drum
- 85-gal Drum (Short)
- 85-gal Drum (Tall)
- 100-gal Drum
- Shielded Container
- Standard Large Box 2 (SLB2)
- Standard Waste Box (SWB)
- Ten-Drum Overpack (TDOP)
- Remote-handled transuranic (RH-TRU) 72B Canister (RH-TRU Waste Canister)

## DATA-B-1.2 Dunnage Containers

Dunnage containers are empty containers used to complete a shipping configuration, such as the seven-pack, if too few containers that meet transportation requirements are available. Dunnage containers are clearly marked "Empty." The TDOP and the RH-TRU Waste Canister are not used as dunnage containers for shipping purposes. For emplacement purposes in the repository, the 55-, 85-, and 100-gal drums can be used as dunnage containers only if they arrive in a shrink-wrapped package assembly, such as the seven-pack, four-pack, or three-pack. To date, 55-gal drums and several SWBs have been emplaced in the repository as dunnage containers.

## DATA-B-1.3 Payload Descriptions

This section gives a brief description of each payload container and its configuration for emplacement. This description also includes a figure and a table for each container.

The 55-gal drum is shipped in a seven-pack configuration and is normally emplaced in the repository in the same configuration but can be emplaced as an individual unit should the need arise. A single drum can be used for collecting and storing derived waste. An illustration of the 55-gal drum components and emplacement configuration is provided in Figure DATA-B-1. The drum specifications are provided in Table DATA-B-1.

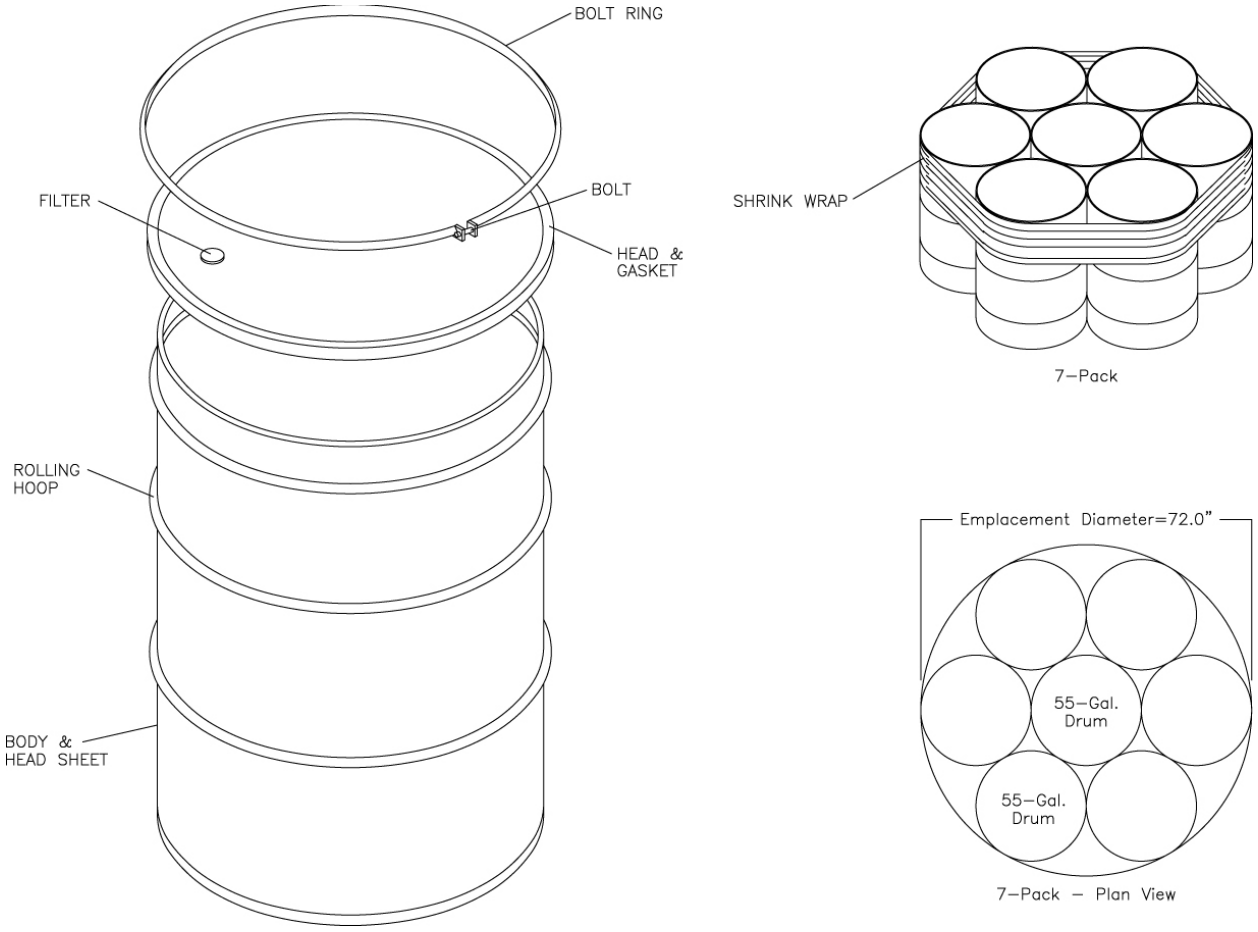


**Figure DATA-B-1. 55-gal Drum Components and Emplacement Configuration**

**Table DATA-B-1. 55-gal Drum Specifications**

| Dimension | Approximate Measurement | | | |
|---|---|---|---|---|
| | Inside Dimension (inches) | Outside Dimension (inches) | Inside Dimension (mm) | Outside Dimension (mm) |
| Height | 33 ¼ | 35 | 845 | 889 |
| Diameter | 22 ½ | 24 | 572 | 610 |

The 85-gal drum (short) is shipped in a four-pack configuration and will be emplaced in the repository in the same configuration but can be emplaced as an individual unit should the need arise. A single drum can be used for collecting and storing derived waste or for overpacking a 55-gal drum. An illustration of the 85-gal drum (short) components and emplacement configuration is provided in Figure DATA-B-2. The drum specifications are provided in Table DATA-B-2.

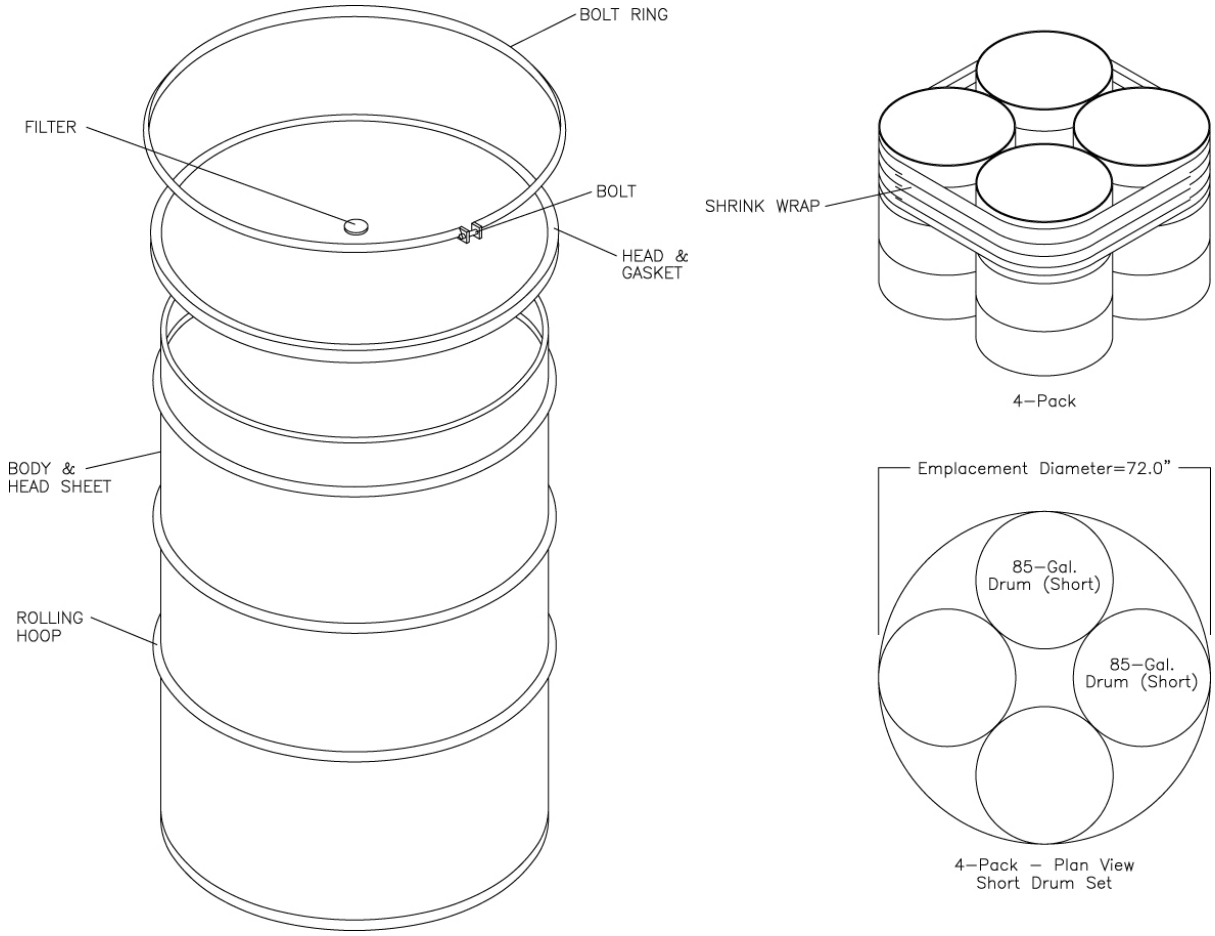


**Figure DATA-B-2. 85-gal Drum (Short) Components and Emplacement Configuration**

**Table DATA-B-2. 85-gal Drum (Short) Specifications**

| Dimension | Approximate Measurement | | | |
|---|---|---|---|---|
| | Inside Dimension (inches) | Outside Dimension (inches) | Inside Dimension (mm) | Outside Dimension (mm) |
| Height | 33 ¼ | 35 | 845 | 889 |
| Diameter | 27 ⅛ | 29 ¾ | 689 | 756 |

The 85-gal drum (tall) is shipped in a four-pack configuration and will be emplaced in the repository in the same configuration. It is also used for overpacking 55-gal drums that are individually emplaced in the repository. A single drum can be used for collecting and storing derived waste. An illustration of the 85-gal drum (tall) components and emplacement configuration is provided in Figure DATA-B-3. The drum specifications are provided in Table DATA-B-3.

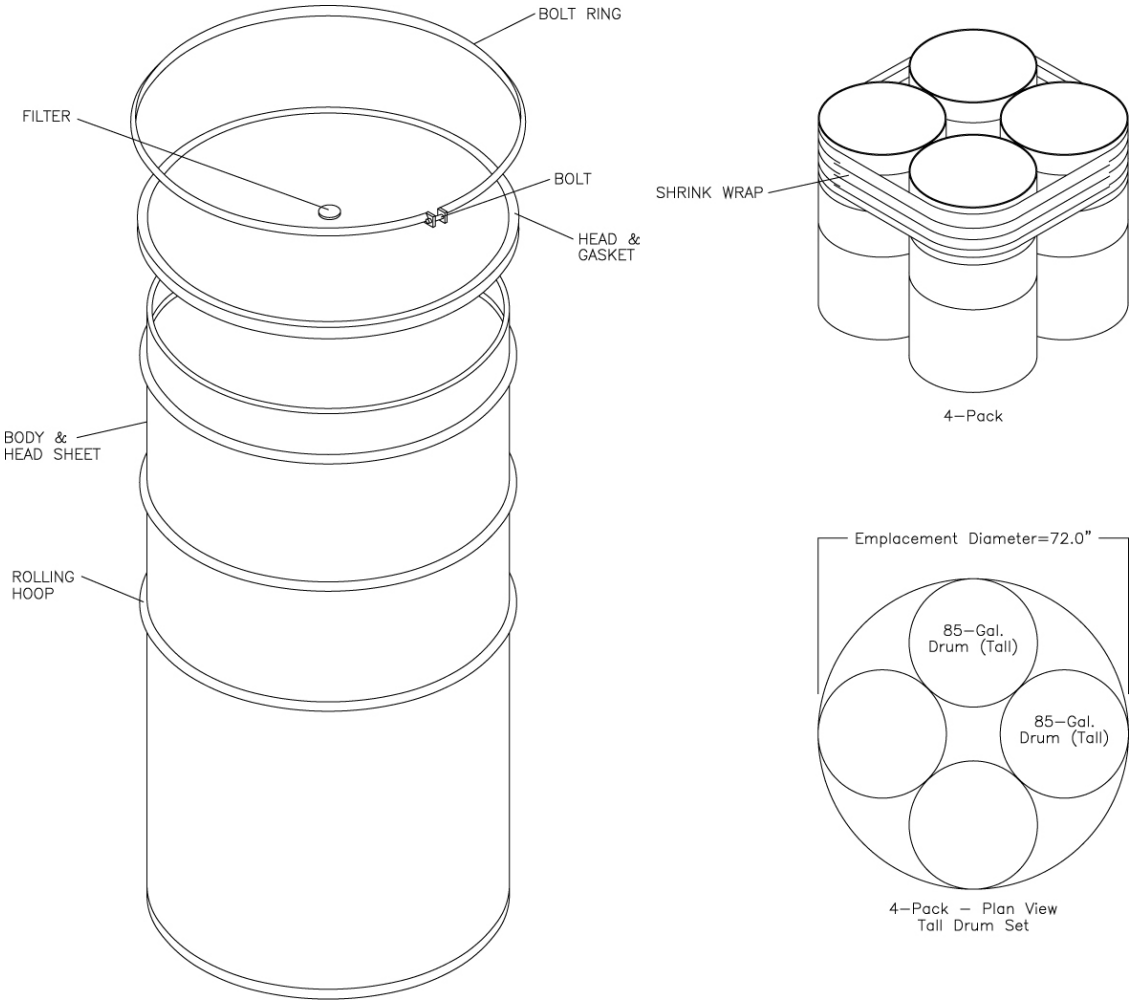


**Figure DATA-B-3. 85-gal Drum (Tall) Components and Emplacement Configuration**

**Table DATA-B-3. 85-gal Drum (Tall) Specifications**

| Dimension | Approximate Measurement | | | |
|---|---|---|---|---|
| | Inside Dimension (inches) | Outside Dimension (inches) | Inside Dimension (mm) | Outside Dimension (mm) |
| Height | 38 ¼ | 40 ¼ | 972 | 1,022 |
| Diameter | 26 | 28 ⅝ | 660 | 728 |

The 100-gal drum is shipped in a three-pack configuration and will be emplaced in the repository in the same configuration. The 100-gal drum can be emplaced as an individual unit should the need arise. An illustration of the 100-gal drum components and emplacement configuration is provided in Figure DATA-B-4. The drum specifications are provided in Table DATA-B-4.

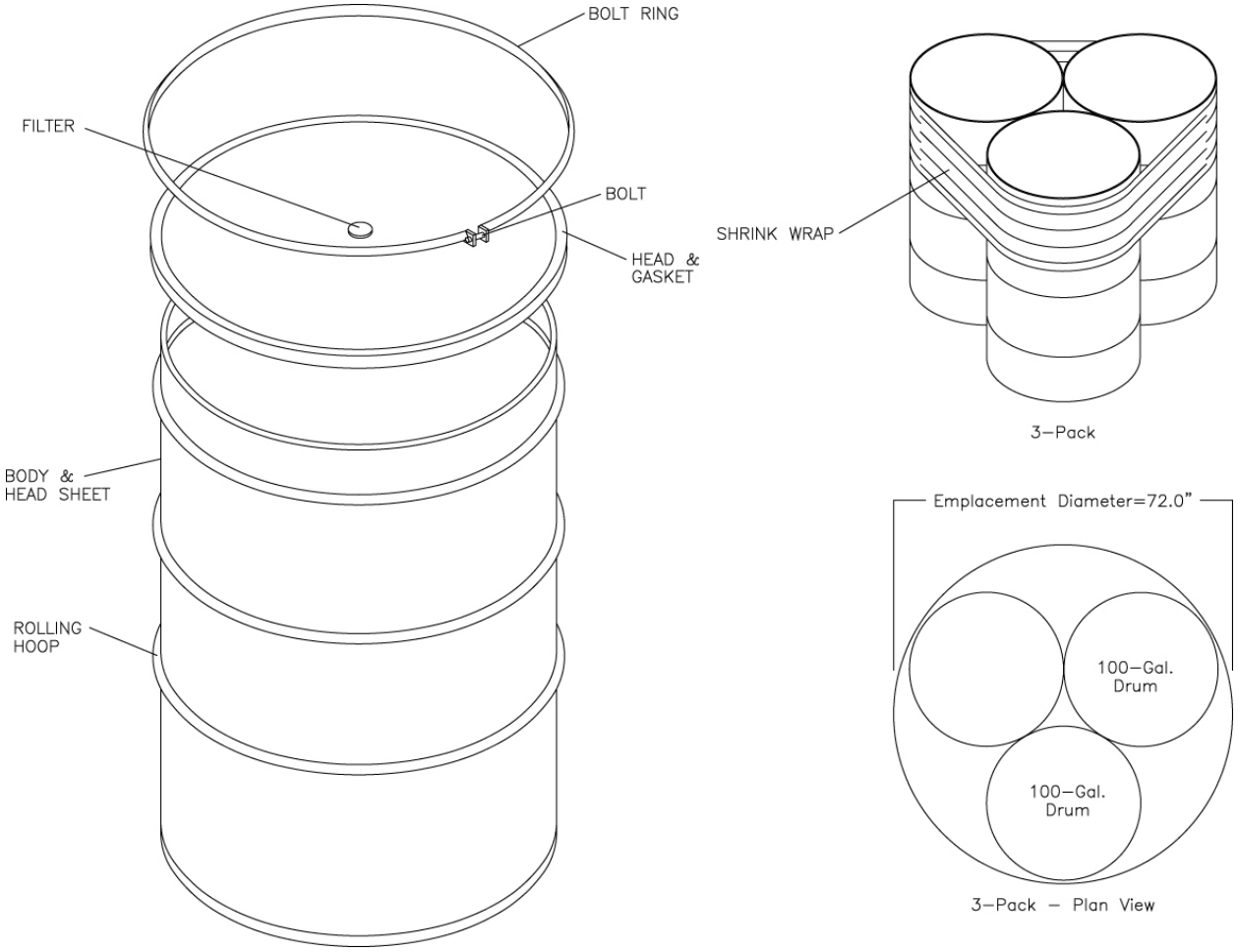


**Figure DATA-B-4. 100-gal Drum Components and Emplacement Configuration**

**Table DATA-B-4. 100-gal Drum Specifications**

| Dimension | Approximate Measurement | | | |
|---|---|---|---|---|
| | Inside Dimension (inches) | Outside Dimension (inches) | Inside Dimension (mm) | Outside Dimension (mm) |
| Height | 33 | 35 | 838 | 889 |
| Diameter | 30 | 32 | 762 | 813 |

The shielded container is shipped in a three-pack configuration and will be emplaced in the repository in the same configuration. The shielded container assemblies will be used to dispose of RH-TRU waste but will be managed and disposed of as contact-handled transuranic (CH-TRU) waste. An illustration of the shielded container components is provided in Figure DATA-B-5. The container specifications are provided in Table DATA-B-5.

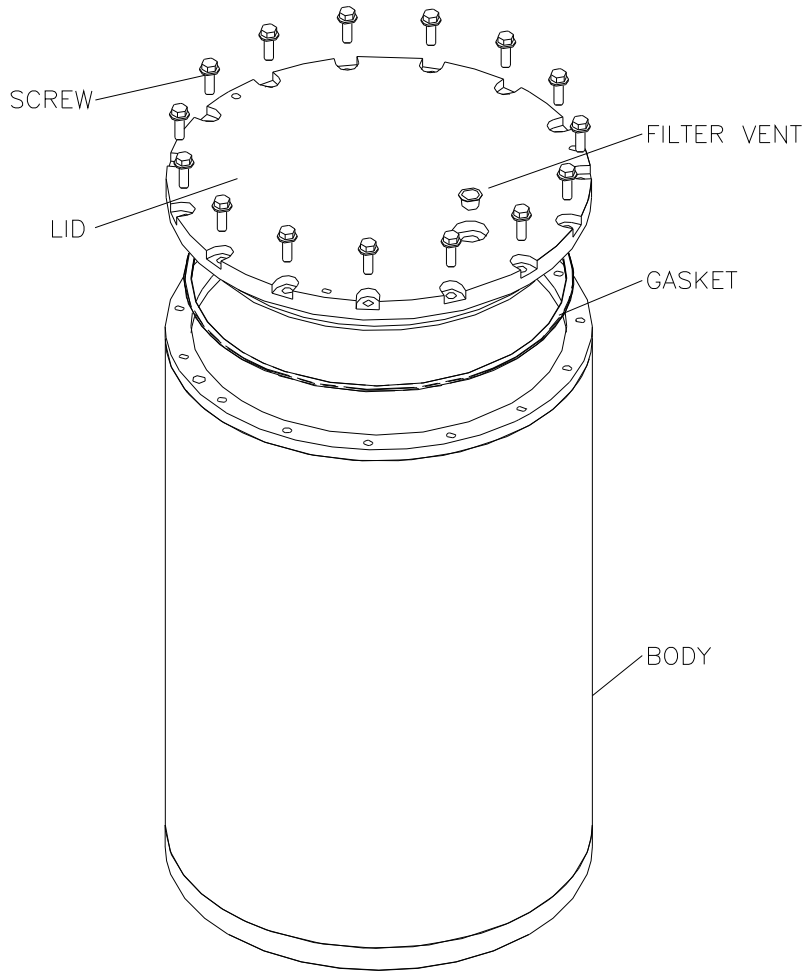


**Figure DATA-B-5. Illustration of a Shielded Container**

**Table DATA-B-5. Shielded Container Specifications**

| Dimension | Approximate Measurement | | | |
|---|---|---|---|---|
| | Inside Dimension (inches) | Outside Dimension (inches) | Inside Dimension (mm) | Outside Dimension (mm) |
| Height | 29 ¾ | 35 ¾ | 756 | 908 |
| Diameter | 20 ⅜ | 23 | 518 | 584 |

The SLB2 is shipped and emplaced as an individual unit. An illustration of the SLB2 is provided in Figure DATA-B-6. The box specifications are provided in Table DATA-B-6.

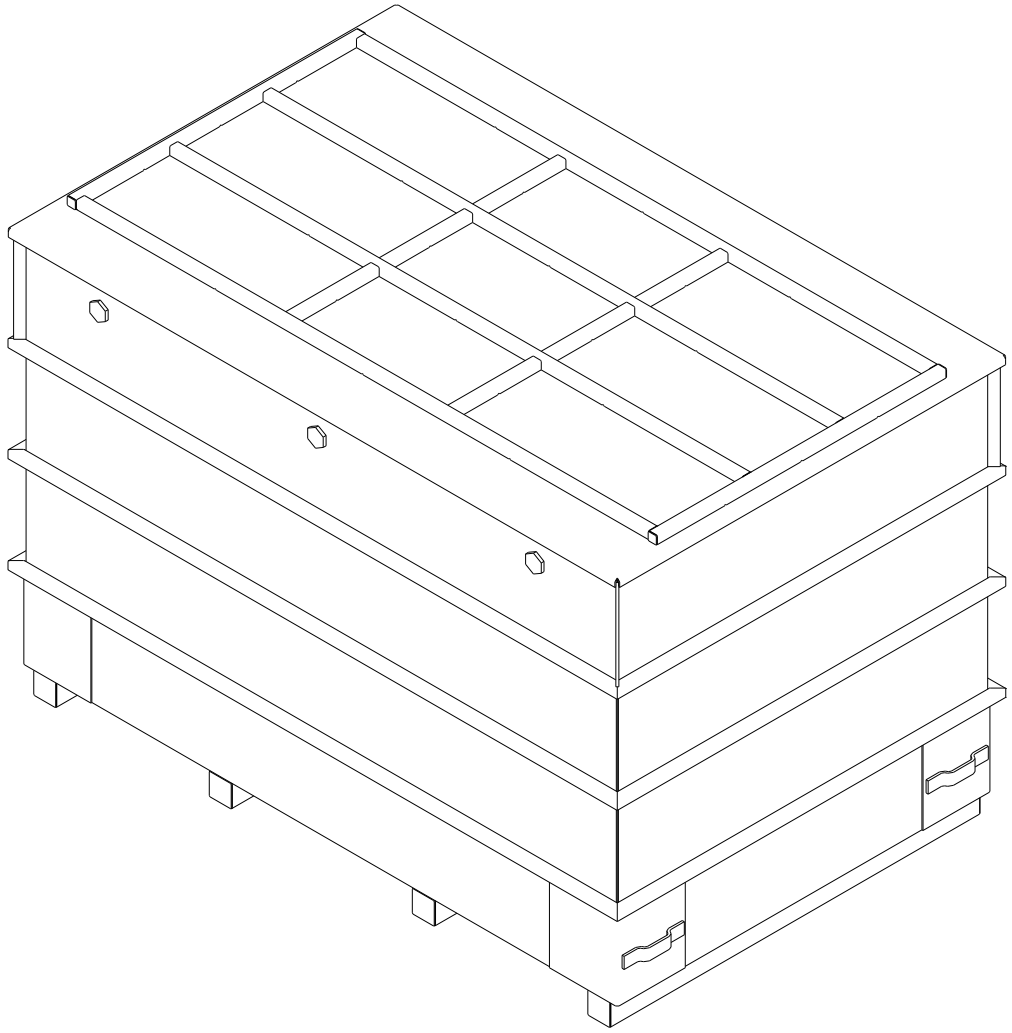

**Figure DATA-B-6. Illustration of a SLB2**

**Table DATA-B-6. SLB2 Specifications**

| Dimension | Approximate Measurement | | | |
|---|---|---|---|---|
| | Inside Dimension (inches) | Outside Dimension (inches) | Inside Dimension (mm) | Outside Dimension (mm) |
| Height | 66 | 73 | 1,676 | 1,854 |
| Length | 102 | 108 | 2,591 | 2,743 |
| Width | 63 | 69 | 1,600 | 1,753 |

The SWB is shipped and emplaced as an individual unit. An SWB can be used as an overpack or to collect derived waste in the Waste Handling Building CH Bay. An illustration of the SWB is provided in Figure DATA-B-7. The box specifications are provided in Table DATA-B-7.

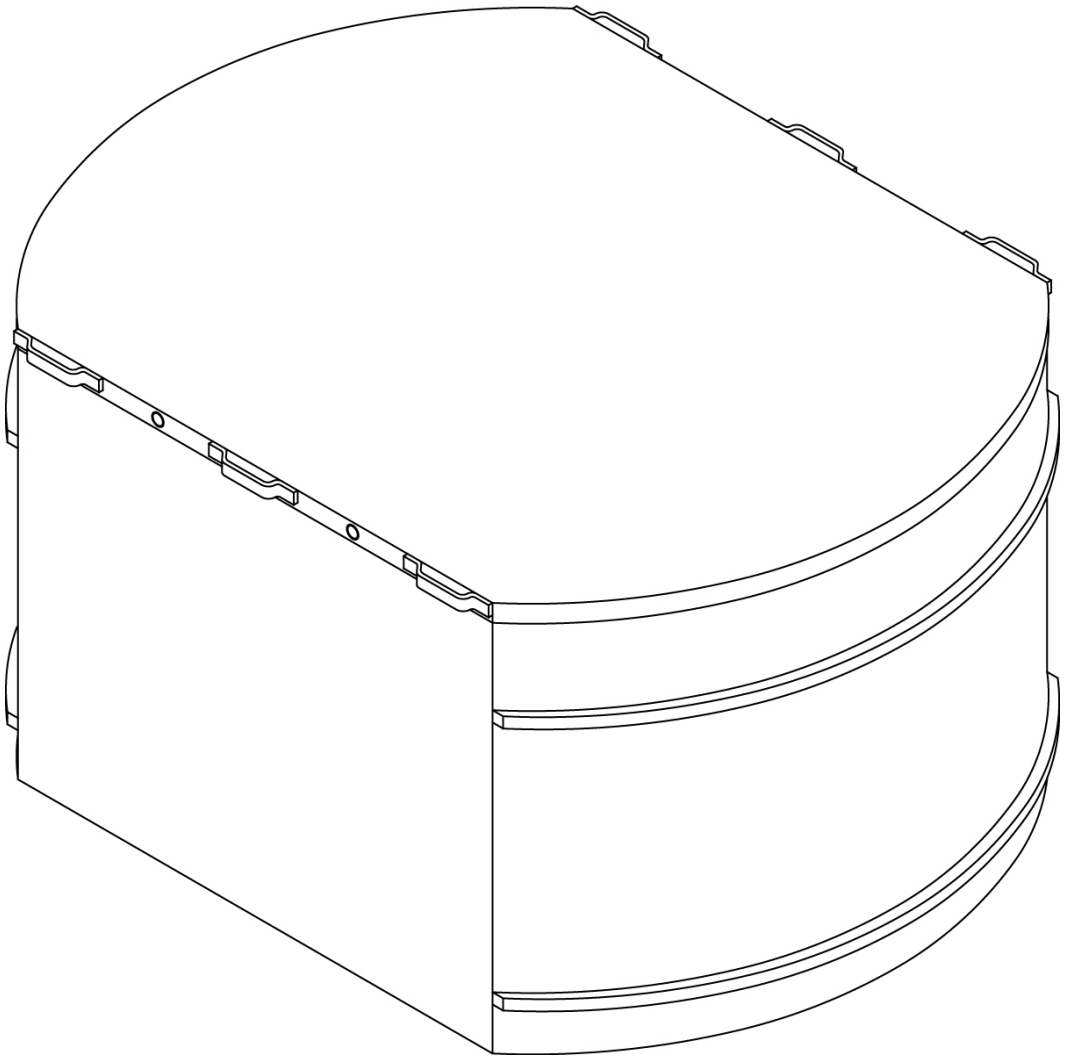

**Figure DATA-B-7. Illustration of a SWB**

**Table DATA-B-7. SWB Specifications**

| Dimension | Approximate Measurement | | | |
|---|---|---|---|---|
| | Inside Dimension (inches) | Outside Dimension (inches) | Inside Dimension (mm) | Outside Dimension (mm) |
| Height | 36 9/16 | 36 7/8 | 929 | 937 |
| Length | 68 3/4 | 71 | 1,746 | 1,803 |
| Width | 52 | 54 1/2 | 1,321 | 1,384 |

The TDOP is shipped as an individual unit and emplaced as an individual unit. An illustration of TDOP components is provided in Figure DATA-B-8. The TDOP specifications are provided in Table DATA-B-8.

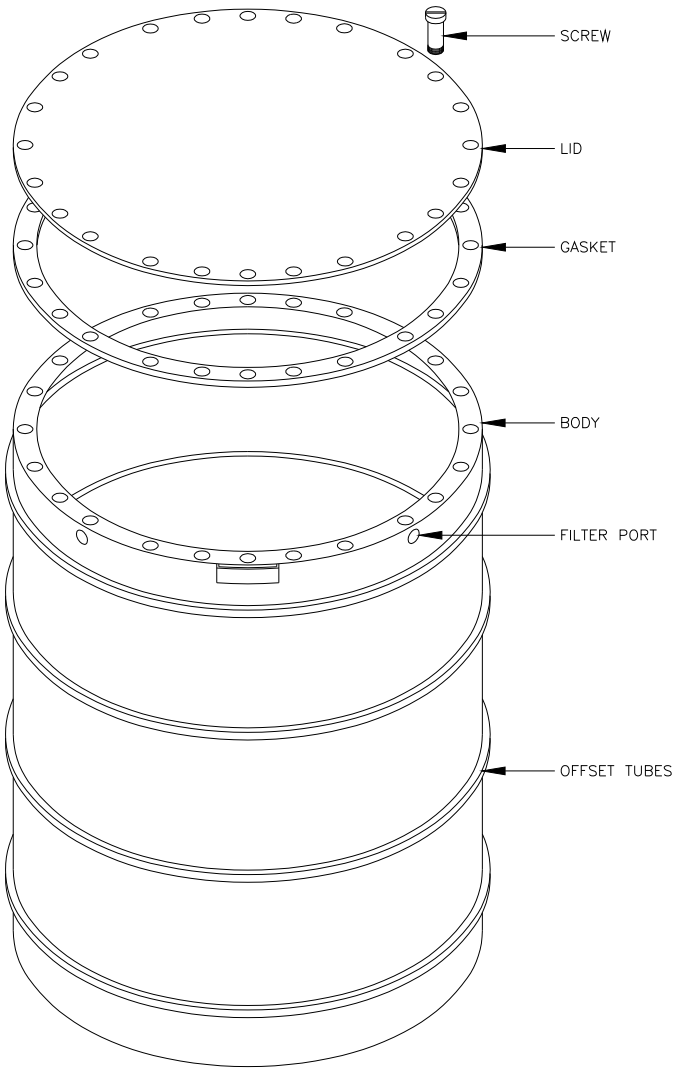


**Figure DATA-B-8. TDOP Components**

**Table DATA-B-8. TDOP Specifications**

| Dimension | Approximate Measurement | | | |
|---|---|---|---|---|
| | Inside Dimension (inches) | Outside Dimension (inches) | Inside Dimension (mm) | Outside Dimension (mm) |
| Height | 72 ⅝ | 73 ⅛ | 1,845 | 1,858 |
| Diameter | 68 ¾ | 71 ¼ | 1,746 | 1,810 |

The RH-TRU Waste Canister is shipped as a single unit and emplaced as a single unit. Illustrations of canister components are provided in Figure DATA-B-9. The canister specifications are provided in Table DATA-B-9.

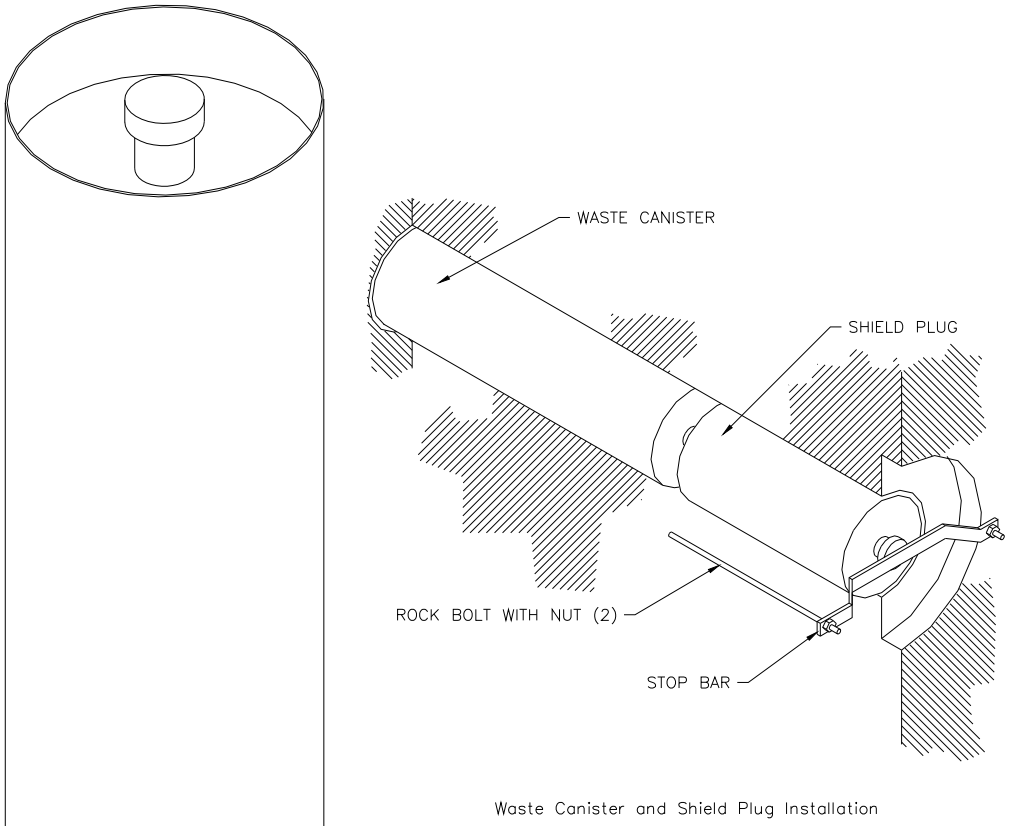


**Figure DATA-B-9. RH-TRU Waste Canister Components**

**Table DATA-B-9. RH-TRU Waste Canister Specifications**

| Dimension | Approximate Measurement | | | |
|---|---|---|---|---|
| | Inside Dimension (inches) | Outside Dimension (inches) | Inside Dimension (mm) | Outside Dimension (mm) |
| Height | 108 | 120 ½ | 2,743 | 3,061 |
| Diameter | 25 ½ | 26 | 648 | 660 |

## DATA-B-1.4 Emplacement Configurations

Shown in Figure DATA-B-10 is the typical position for waste emplacement containers randomly emplaced in the room of a panel. TDOPs and SLB2s are only emplaced on the bottom position, with another assembly stacked on top. Most other assemblies can be stacked three high before the magnesium oxide (MgO) supersack is emplaced on the top of the stack, with the exception of shielded containers. The EPA has agreed with the DOE's recommendation to not place MgO supersacks on top of shielded container assemblies (Moody 2010). The CH-TRU waste emplacement within the repository panels is shown in Figure DATA-B-11. The planned RH-TRU waste emplacement is shown in Figure DATA-B-12.

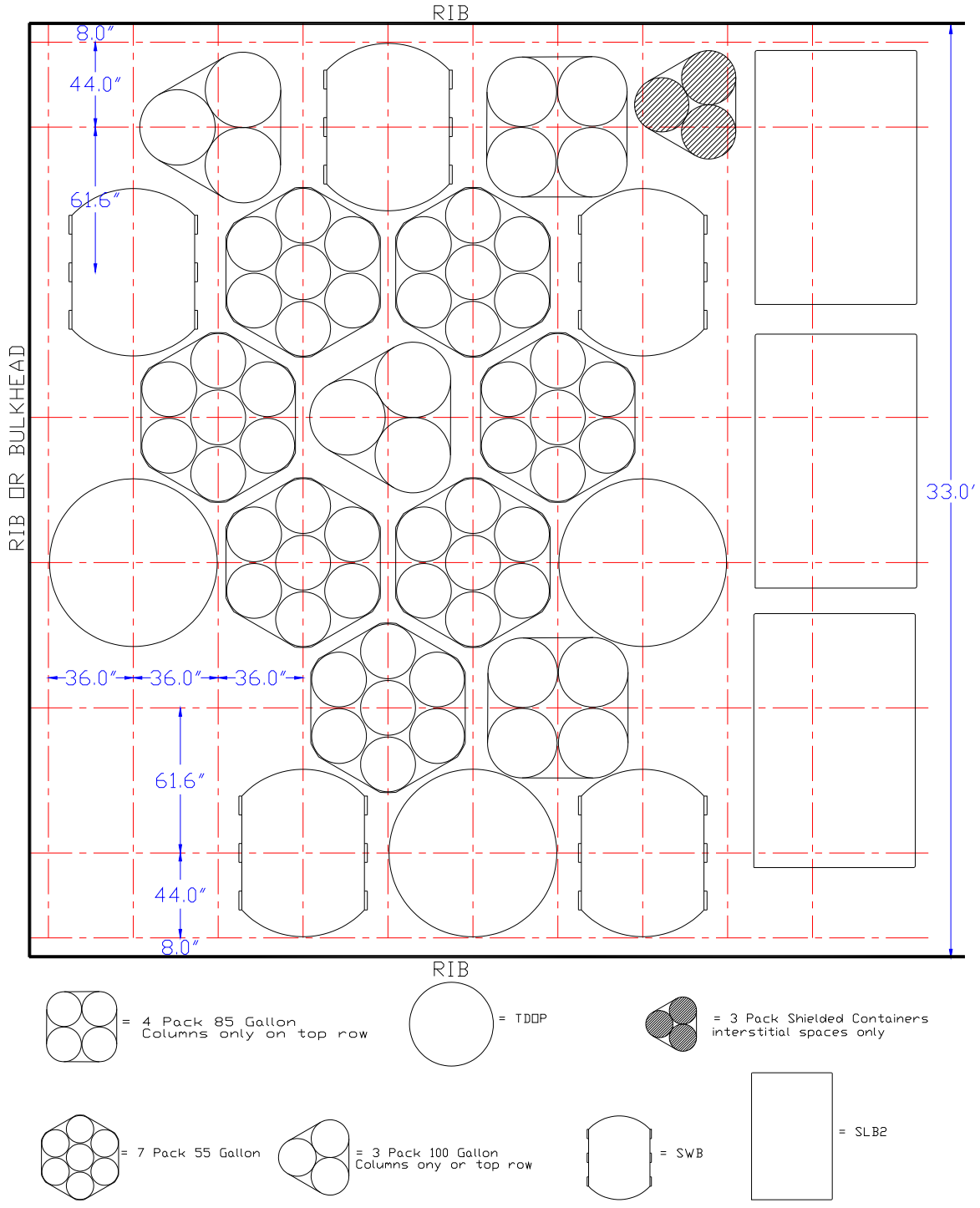


**Figure DATA-B-10. CH-TRU Waste Emplacement Layout**

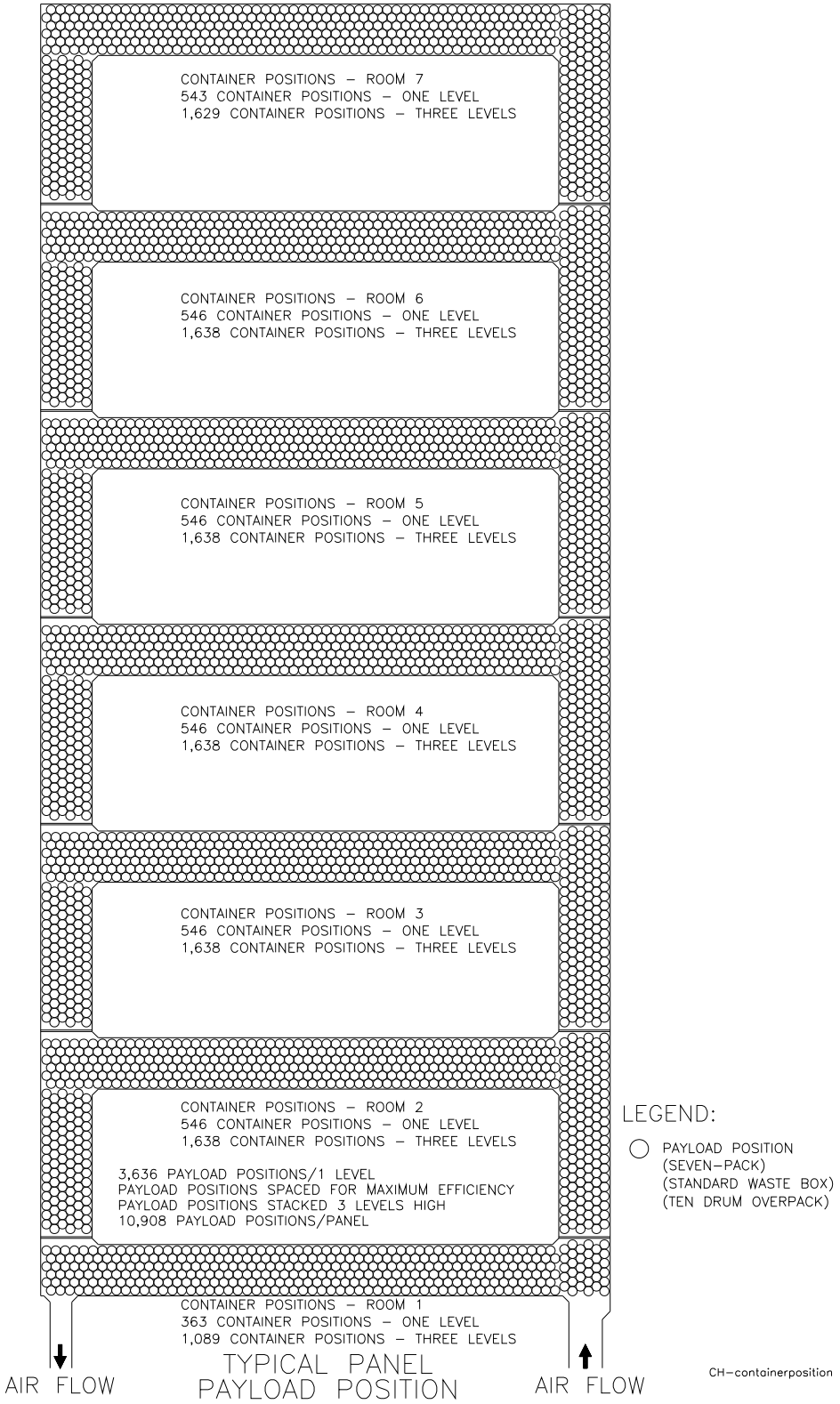


**Figure DATA-B-11. CH-TRU Waste Emplacement**

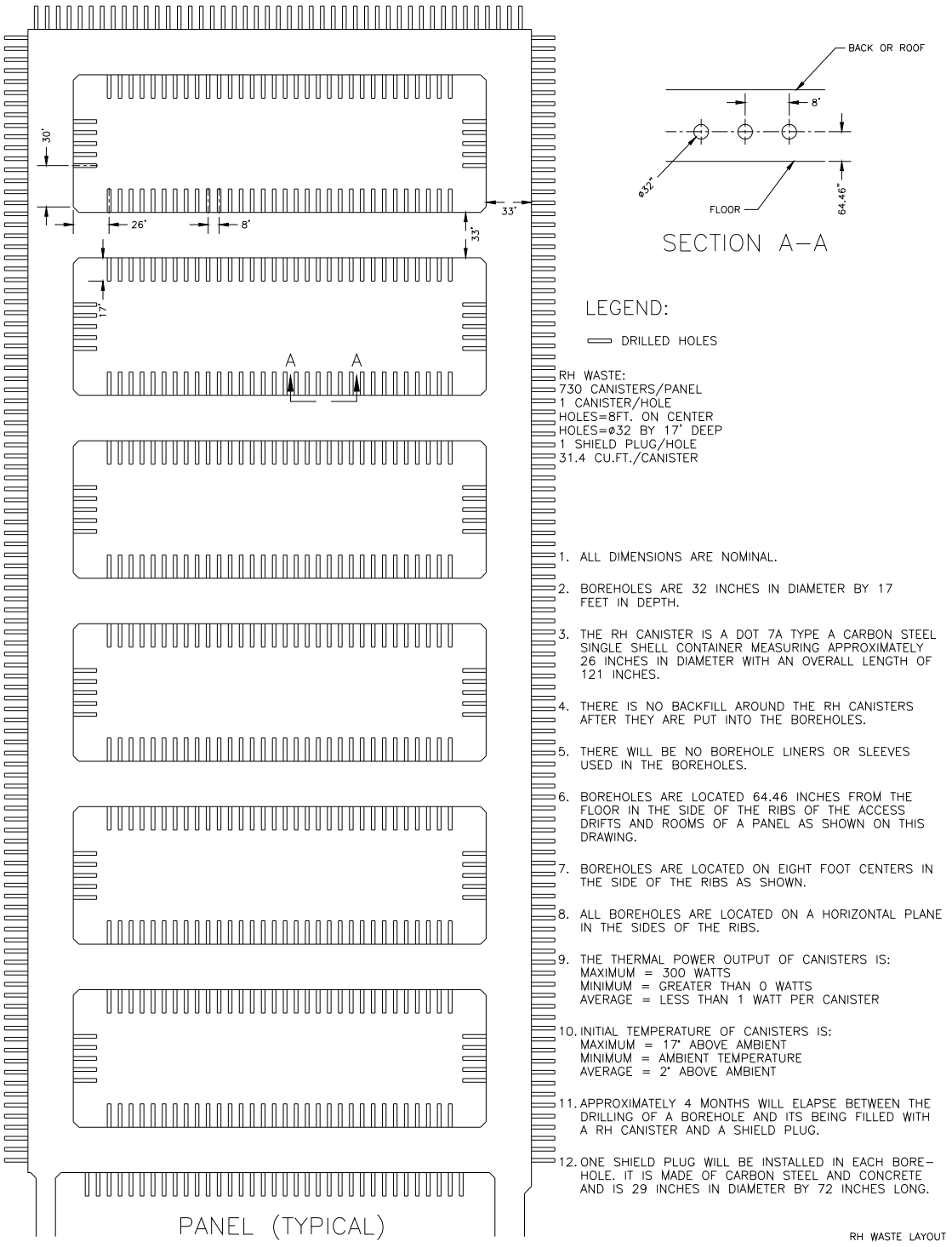


**Figure DATA-B-12. RH-TRU Waste Emplacement**

# DATA-B-2.0 References

(*Indicates a reference that has not been previously submitted.)

Moody, D.C. 2010. Letter to M. Flynn (Subject: *Additional information regarding Shielded Containers*). September 8, 2010. Carlsbad, NM: Carlsbad Field Office.*