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

**Monitoring  
(40 CFR § 194.42)**



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

**Carlsbad Field Office  
Carlsbad, New Mexico**

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**Compliance Recertification Application 2014**  
**Monitoring**  
**(40 CFR § 194.42)**

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### **Acronyms and Abbreviations**

CARD	Compliance Application Review Document
CCA	Compliance Certification Application
CFR	Code of Federal Regulations
CMP	Compliance Monitoring Program
COMP	Compliance Monitoring Parameter
CRA	Compliance Recertification Application
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
PA	performance assessment
PABC	Performance Assessment Baseline Calculation
WIPP	Waste Isolation Pilot Plant

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1 **42.0 Monitoring (40 CFR § 194.42)**

2 **42.1 Requirements**

§ 194.42 Monitoring

(a) The Department shall conduct an analysis of the effects of disposal system parameters on the containment of waste in the disposal system and shall include the results of such analysis in any compliance application. The results of the analysis shall be used in developing plans for pre-closure and post-closure monitoring required pursuant to paragraphs (c) and (d) of this section. The disposal system parameters analyzed shall include, at a minimum:

1. Properties of backfilled material, including porosity, permeability, and degree of compaction and reconsolidation;
2. Stresses and extent of deformation of the surrounding roof, walls, and floor of the waste disposal room;
3. Initiation or displacement of major brittle deformation features in the roof or surrounding rock;
4. Ground water flow and other effects of human intrusion in the vicinity of the disposal system;
5. Brine quantity, flux, composition, and spatial distribution;
6. Gas quantity and composition; and
7. Temperature distribution.

(b) For all disposal system parameters analyzed pursuant to paragraph (a) of this section, any compliance application shall document and substantiate the decision not to monitor a particular disposal system parameter because that parameter is considered to be insignificant to the containment of waste in the disposal system or to the verification of predictions about the future performance of the disposal system.

(c) Pre-closure monitoring. To the extent practicable, pre-closure monitoring shall be conducted of significant disposal system parameter(s) as identified by the analysis conducted pursuant to paragraph (a) of this section. A disposal system parameter shall be considered significant if it affects the system's ability to contain waste or the ability to verify predictions about the future performance of the disposal system. Such monitoring shall begin as soon as practicable; however, in no case shall waste be emplaced in the disposal system prior to the implementation of pre-closure monitoring. Pre-closure monitoring shall end at the time at which the shafts of the disposal system are backfilled and sealed.

(d) Post-closure monitoring. The disposal system shall, to the extent practicable, be monitored as soon as practicable after the shafts of the disposal system are backfilled and sealed to detect substantial and detrimental deviations from expected performance and shall end when the Department can demonstrate to the satisfaction of the Administrator that there are no significant concerns to be addressed by further monitoring. Post-closure monitoring shall be complementary to monitoring required pursuant to applicable federal hazardous waste regulations at parts 264, 265, 268, and 270 of this chapter and shall be conducted with techniques that do not jeopardize the containment of waste in the disposal system.

(e) Any compliance application shall include detailed pre-closure and post-closure monitoring plans for monitoring the performance of the disposal system. At a minimum, such plans shall:

- (1) Identify the parameters that will be monitored and how baseline values will be determined;
- (2) Indicate how each parameter will be used to evaluate any deviations from the expected performance of the disposal system; and
- (3) Discuss the length of time over which each parameter will be monitored to detect deviations from expected performance.

3

4 **42.2 Background**

5 In 40 CFR §194.42 (U.S. EPA 1996), the U.S. Environmental Protection Agency (EPA) provides  
6 criteria to demonstrate compliance with the assurance requirement at 40 CFR §191.14(b) (U.S.  
7 EPA 1993) to monitor the disposal system. The purpose of this monitoring is “to detect  
8 substantial and detrimental deviations from expected performance,” with the expected  
9 performance predicted by performance assessment (PA). The criteria also require both a  
10 preclosure and postclosure monitoring program using techniques that do not jeopardize the

1 containment of waste in the disposal system. Ten monitoring parameters were identified in an  
2 analysis performed to fulfill the section 194.42 requirement during the original certification  
3 process. More detailed information describing the section 194.42 Compliance Monitoring  
4 Program (CMP) is located in the U.S. Department of Energy (DOE) Compliance Monitoring  
5 Implementation Plan (U.S. DOE 2005); the 2004 Compliance Recertification Application (CRA-  
6 2004) (U.S. DOE 2004), Chapter 7.0, Section 7.2; Appendix MON-2009 (U.S. DOE 2009); and  
7 Appendix Mon-2014.

8 The 10 parameters, their associated monitoring programs, the frequency of data collection and  
9 reporting, related PA parameters, and related screening decisions used to support the PA are  
10 listed in Appendix MON-2014, Table MON-1. These parameters are periodically evaluated to  
11 determine if there is an impact on the PA-related parameters, conceptual models, or features,  
12 events, and processes screening decisions (Wagner and Kuhlman 2010b; Wagner 2011; Wagner,  
13 Kuhlman, and Johnson 2012; Wagner 2013).

### 14 **42.3 1998 Certification Decision**

15 Based on information in the Compliance Certification Application (CCA) (U.S. DOE 1996) and  
16 supplemental monitoring-related information for the CCA submitted to the EPA in response to  
17 its request for additional information regarding the methodology of the MONPAR analysis, the  
18 EPA determined that the DOE was in compliance with the criteria of section 194.42 (U.S. EPA  
19 1998a, Section VIII.D.2, Monitoring). Additional details of the EPA's evaluation of compliance  
20 can be found in the Compliance Application Review Document (CARD) 42, Monitoring (U.S.  
21 EPA 1998b).

### 22 **42.4 Changes in the CRA-2004**

23 Since 1998, the DOE has monitored and evaluated the 10 monitoring parameters listed in  
24 Appendix MON-2004, Table MON-1. For the CRA-2004, the DOE reassessed the CCA  
25 monitoring parameter analysis in light of changes in the monitoring program. This reassessment  
26 is documented in Kirkes and Wagner (Kirkes and Wagner 2003), and described in the CRA-  
27 2004, Chapter 7.0, Section 7.2. It was determined that the CCA, Appendix MON, Attachment  
28 MONPAR monitoring parameter analysis performed to comply with section 194.42 requirements  
29 was adequate and did not need to be redone for the CRA-2004. The 10 monitoring parameters  
30 identified in the CCA were still sufficient to be included in the Compliance Monitoring Program  
31 (CMP) to detect substantial deviations from performance expectations and to comply with the  
32 requirements of section 194.42. Supplemental information was submitted to the EPA in  
33 response to its request for compliance monitoring annual reports and monitoring data references  
34 (Response C-42-1 through C-42-4 [Detwiler 2004a]; Response C-42-5 and C-42-6 [Detwiler  
35 2004b]). Since the CCA, the DOE found four monitoring parameters that either did not fall  
36 within the set trigger values or indicated a change from values used in the CCA. These  
37 parameters include:

- 38 • Changes in the Culebra Dolomite Member of the Rustler Formation (hereafter referred to as  
39 Culebra) water level that may impact Culebra groundwater flow direction and/or composition
- 40 • A change in the probability of encountering a Castile brine reservoir

- 1 • A change in the drilling rate because of continued oil and gas drilling in the Delaware Basin
- 2 • Changes in the waste activity caused by changes in the waste inventory

3 The impacts of these changes were considered in Appendix PA-2004 and the EPA-mandated  
4 CRA-2004 Performance Assessment Baseline Calculation (PABC) to assess their impact on  
5 compliance (see CARD 23, Models and Computer Codes [U.S. EPA 2006a]), which documented  
6 the EPA's review of these impacts and its determination of continued compliance with the  
7 disposal standards.

## 8 **42.5 EPA's Evaluation of Compliance for the 2004 Recertification**

9 In CARD 42, the EPA stated that through its annual monitoring and waste emplacement  
10 inspections it had determined that the DOE meets the requirements of section 194.42 (U.S. EPA  
11 2006b). The results of these inspections are documented in CARD 21, Tables CARD 21-1 and  
12 21-2 (U.S. EPA 2006c).

## 13 **42.6 Changes or New Information Between the CRA-2004 and the CRA-2009** 14 **(Previously: Changes or New Information Since the 2004 Recertification)**

15 The CMP outlined in Section 42.2 was developed to implement the requirements of section  
16 194.42; the program continued to monitor the Waste Isolation Pilot Plant (WIPP) disposal  
17 system to detect substantial and detrimental deviations from expected performance. During this  
18 time, the program did not indicate such a condition. No changes were made to this program  
19 from that described in the CRA-2004, Chapter 7.0, Section 7.2, and Attachment MON-2004.  
20 New information that supplemented the information in the CRA-2004, Chapter 7.0, Section 7.2  
21 included the following:

- 22 1. Results of the CMP since 2004 (Appendix DATA-2009) (U.S. DOE 2009)
- 23 2. Assessment of the impact of changes on the CMP (Wagner 2008)

24 The annual Compliance Monitoring Parameters (COMPs) report presented monitoring results  
25 and determined whether the results were within PA expectations, whether they impacted the  
26 assumptions or parameters used in PA, or whether they impacted the monitoring program. A  
27 review of the conclusions in the last four annual COMPs reports (Wagner 2008) showed the  
28 following:

- 29 • The results of the COMPs assessments concluded that there were no reportable conditions or  
30 events.
- 31 • Water levels in the Culebra continued to rise across the monitored region. The DOE  
32 continued its investigation of those events. Those investigations led to the inclusion of  
33 updated water-level information during the CRA-2004 PABC (see preface to Appendix  
34 TFIELD-2009). The CRA-2009 PA (U.S. DOE 2009) used the CRA-2004 PABC  
35 transmissivity fields.

1 • The CMP investigated sample collection and analytical laboratory techniques to reduce  
2 uncertainties in water chemistry results.

3 • No changes to the COMPs or CMP were recommended.

4 The results of the COMPs reports validated the need to monitor groundwater and demonstrated  
5 the importance of continued monitoring and the need to incorporate results into the PA (Sandia  
6 National Laboratories 2004).

7 The CCA, Appendix MON, Attachment MONPAR documented an analysis that was used to  
8 determine which monitoring parameters should be included in the CMP. A reassessment of this  
9 analysis, documented in Wagner (Wagner 2008), determined whether changes to elements of the  
10 WIPP program since the last certification affect the conclusions in the CCA, Appendix MON,  
11 Attachment MONPAR analysis. The reassessment first determined which changes should be  
12 considered, and then determined the impact of those changes on the conclusions drawn in the  
13 CCA, Appendix MON, Attachment MONPAR analysis. Changes to the following disposal  
14 system elements were evaluated:

15 1. Monitoring results

16 2. Experimental activities

17 3. PA changes: methodology, parameters, and implementation

18 4. WIPP operational changes

19 5. Proposed changes to activities and conditions approved by the EPA

20 Based on the review of operational activities, conditions, monitoring data, the PA, and  
21 experimental programs that occurred since the CRA-2004, the reassessment concluded, “the  
22 conclusions of the MONPAR analysis remain valid and its conclusions continue to be adequate  
23 for inclusion in the CRA-2009” (Wagner 2008).

24 The DOE believed the information presented in the CRA-2004, Chapter 7.0, Section 7.2;  
25 Appendix MON-2004; Appendix MON-2009; and the supplemental information provided in this  
26 section continued to demonstrate compliance with the provisions of section 194.42.

## 27 **42.7 EPA’s Evaluation of Compliance for the 2009 Recertification**

28 In the CRA-2009 CARD 42, the EPA outlined its review of information in the CRA-2009,  
29 supplemental information provided by the DOE and the results of the EPA’s annual inspections  
30 of the WIPP, and determined that the DOE continued to comply with the requirements of section  
31 194.42 (U.S. EPA 2010a and U.S. EPA 2010b).

## 1 **42.8 Changes or New Information Since the CRA-2009**

2 The CMP in Section 42.2 implements the requirements of section 194.42, and the program  
3 continues to monitor the WIPP to detect substantial and detrimental deviations from expected  
4 performance. This program has not indicated such a condition. The DOE has continued to  
5 monitor and evaluate the 10 monitoring parameters. Minor changes have been made to the  
6 monitoring program from that described in the CRA-2009 or Appendix MON-2009 (U.S. DOE  
7 2009). The DOE did not change its pre-closure or post-closure program plans or activities, so  
8 there are no changes to report for the requirements of 40 CFR 194.42(b), (c), (d), or (e). Due to a  
9 revision to the WIPP groundwater conceptual model during the CRA-2009 PABC, changes were  
10 needed to the related Culebra groundwater monitoring parameter derivation and trigger values.  
11 Other changes were made to parameter trigger values as part of the trigger value report revision  
12 (Wagner and Kuhlman 2010a).

13 Changes were also made to the Culebra Groundwater Monitoring Program regarding  
14 groundwater composition sampling frequency and the method for reporting the change in the  
15 groundwater flow parameter (Nuclear Waste Partnership LLC 2012). The DOE has changed  
16 from semi-annual sampling to an annual sampling schedule, based on 15 years of data showing  
17 little or no change in constituent concentrations. DOE also changed the method used to produce  
18 the annual water level map required by the WIPP Hazardous Waste Facility Permit (Permit).  
19 These changes to the Groundwater Monitoring Program Plan (Nuclear Waste Partnership LLC  
20 2012) were necessary to align the 40 CFR 194.42 compliance monitoring program with related  
21 changes made to respond to a New Mexico Environment Department Class 2 Permit  
22 Modification request to revise the WIPP Groundwater Detection Monitoring Program Plan. This  
23 permit modification was approved January 31, 2012 (NMED 2012).

24 Minor changes to the 40 CFR 194.42 monitoring program have occurred over the last five-year  
25 recertification cycle. The trigger values for some of the monitoring parameters have been  
26 revised; however, no changes were made to the 10 monitoring parameters (Wagner and Kuhlman  
27 2010a; Wagner Kuhlman and Johnson 2012). Changes were made to the process used to derive  
28 the Change in Culebra Groundwater Flow parameter and the sampling frequency has changed  
29 from biannually to annually for the Change in Groundwater Composition parameter (Wagner and  
30 Kuhlman 2010b, Section 2.3.2.2). The results of the CMP over this period have not identified  
31 any substantial and detrimental deviations from expected performance.

32 New monitoring information that supplements the information provided since the last  
33 recertification cycle includes the following:

- 34 1. Monitoring results for the 10 parameters since 2009 are contained in Appendix DATA-2014
- 35 2. Information included in the Trigger Value Derivation Report revision (Wagner and Kuhlman  
36 2010a)
- 37 3. The reassessment of the parameters to determine if there is an impact on the PA-related  
38 parameters, conceptual models, or features, events, and processes screening decisions  
39 (Wagner 2013)

1 4. Changes to *Change in Culebra Composition*, and *Change in Culebra Groundwater Flow*  
2 parameters to align with the Permit (NMED 2012; Wagner and Kuhlman 2010b)

3 The DOE believes the information presented in this section, along with Appendix MON-2014  
4 and Appendix DATA-2014, continues to demonstrate compliance with the provisions of section  
5 194.42.

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