

**2009 Compliance Recertification Application (2009 CRA)  
Compliance Application Review Document (CARD) No. 42  
Monitoring**

**42.0 BACKGROUND**

Assurance requirements were included in the disposal regulations to compensate in a qualitative manner for the inherent uncertainties in projecting the behavior of natural and engineered components of the Waste Isolation Pilot Plant (WIPP) for many thousands of years (50 FR 38072). Section 194.42 is one of the six assurance requirements in the Compliance Criteria. Section 194.42 specifically addresses requirements for monitoring the disposal system during pre- and post-closure operations. This requirement distinguishes between pre- and post-closure monitoring because of the differences in the monitoring techniques used to access the repository during operations (pre-closure) and after the repository has been backfilled and sealed (post-closure). The purpose of monitoring is to confirm that the repository is behaving as predicted.

**42.1 REQUIREMENTS**

(a) “The [U.S. Department of Energy (DOE or Department)] 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.”

## **42.2 1998 Certification Decision**

To meet the requirements of Section 194.42, U.S. Environmental Protection Agency (EPA or Agency) expected DOE to provide an analysis of disposal system parameters to determine which parameters may affect the containment of waste in the disposal system. The results of the analysis were to be used in developing pre- and post-closure monitoring plans. The analysis was expected to address, at a minimum, the seven parameters listed in the requirement. In addition, the analysis was to explain the methodology for examining the effects of the parameters on the containment of waste and state the results of the analysis.

In Chapter 7, Appendix MON, Attachment MONPAR of the Compliance Certification Application (CCA), DOE presented an analysis that encompassed the parameters identified in Section 194.42(a). In addition, DOE’s analysis included a substantial number of other

parameters that DOE identified as associated with major disposal system processes and models. DOE qualitatively considered these parameters for their impacts on the containment of waste or ability to verify predictions about future performance of the disposal system.

In the CCA, DOE committed to monitor ten parameters: creep closure, extent of deformation, initiation of brittle deformation, displacement of deformation features, Culebra groundwater composition, change in Culebra groundwater flow direction, waste activity, subsidence, drilling rate, and probability of encountering a Castile brine reservoir. The CCA contained the monitoring plans for these parameters.

The CCA addressed both pre-closure and post-closure monitoring and included the information required by the compliance criteria, therefore, EPA found DOE in compliance with the requirements of Section 194.42.

A complete description of EPA's 1998 Certification Decision for Section 194.26 can be obtained from Docket A-93-02, Items V-B-1 and V-B-2.

### **42.3 Changes in the 2004 Compliance Recertification Application (2004 CRA or 2004 CRA)**

Since 1998, DOE used the following steps to monitor and evaluate the ten monitored parameters in the 2004 CRA:

- 1) Sandia National Laboratory (SNL) analyzed the ten monitored parameters selected during the CCA analysis and set trigger limit values for each monitored parameter as appropriate (A-98-49, II-B2-34). The trigger values established a response framework for any observed changes in monitored parameters.
- 2) DOE periodically, often times monthly, monitored each parameter and reported results annually in numerous program specific reports (see 2004 CRA Appendix Data 2.2, 3.2, 4.2, 5.2, 7.2 for a list of these reports).
- 3) SNL did an annual review of the monitored parameters to determine if any parameters were out of the set trigger limit values (see 2004 CRA Appendix Data 10.2 for a list of these COMP reports);
- 4) DOE assessed the results of SNL's review, determined the significance of any parameters out of the set trigger limit values, and performed additional investigations to determine the impact of any changes in monitored parameters (see 2004 CRA Appendix Data 11.2.1, 11.2.2 for a list of reports and studies).

Since the CCA DOE found four monitored parameters that have changed;

- changes in the Culebra water level (i.e., raised level) that may impact Culebra groundwater flow direction and/or composition,
- change in the probability of encountering a Castle brine reservoir,

- change in the drilling rate because of increase oil and gas drilling in the Delaware Basin, and
- changes in the waste activity because of changes in the waste inventory.

Each of these changes were incorporated into the 2004 CRA PA and the EPA-mandated Performance Assessment Baseline Calculation (2004 PABC) to assess their impact on compliance.

The Culebra water level changes have been included in the PA by modification of the Culebra transmissivities to account for the increase water levels. The other three parameters have also been updated in the 2004 CRA PAs. Even with the changes included in the 2004 CRA PAs the results still show WIPP in compliance with disposal requirements (A-98-49, II-B1-16). (See **2004 CRA CARD 23-Models and Computer Codes** for details related to the 2004 CRA PA calculations.)

For the 2004 CRA DOE reassessed the CCA monitored parameter analysis in light of changes in the monitoring program results, experimental activities, PA changes, or site operations changes. This reassessment is documented in Wagner 2003 and is briefly described in 2004 CRA Chapter 7.2. DOE determined that the original analysis done in the CCA to comply with 40 CFR 194.42 requirements was adequate, arguments and conclusions have not changed, and the analysis did not need to be redone for the 2004 CRA, and that the ten monitored parameters were sufficient to be used to confirm PA predictions.

#### **42.3.1 Evaluation of Compliance for 2004 Recertification**

EPA reviewed Wagner 2003, 2004 CRA Chapters 2 and 7.2, 2004 CRA Appendix DATA, 2004 CRA Appendix MON 2004, and other monitored parameter related documents. EPA has also inspected DOE's parameter monitoring program annually since the WIPP started receiving radioactive waste in March, 1999 (See Table 1 for a summary of these inspections). EPA's inspections are intended to verify that DOE's process and monitoring programs are adequate. Since 1999, EPA found DOE's parameter monitoring program and their response to changes in parameters to be adequate. EPA's monitoring inspection reports can be obtained from Docket A-98-49, Category II-B3.

EPA reviewed DOE's process for the 2004 CRA to determine if the analysis required by 40 CFR 194.42(a) needs to be redone. EPA confirmed that DOE has not modified any of the parameter selection arguments or conclusions since the original CCA nor has the parameter monitoring programs changed. EPA agrees that the analysis does not need to be redone because even with changes in some monitored parameters they do not negatively impact PA predictions, and that the CCA ten monitored parameters do not need to be modified. EPA agrees that DOE needs to continue to monitor these parameters to confirm PA predictions of the WIPP disposal system.

DOE did not change their response to the requirements of 40 CFR 194.42(b), (c), (d), or (e) for the 2004 CRA. DOE did a reassessment (Docket A-98-49, II-B2-38) to determine if their CCA monitored parameter analysis needed to be redone or modified in any way. DOE determined that even though some monitored parameters have changed no new parameters need

to be added nor did the parameter monitoring programs need to be modified. DOE did not change any argument or conclusion that justified why a parameter was considered significant or insignificant for the 2004 CRA nor did DOE change their pre-closure or post-closure program plans or activities.

EPA did not receive any public comments on DOE's continued compliance with the monitoring requirements of Section 194.42.

**Table CARD 42-1 Summary of Monitored Parameter Inspection Results for the 2004 CRA**

Date of Parameter Monitoring Inspection	Inspection Results: [See Inspection Reports For Details]
March 23, 1999	During this inspection the Agency found that DOE adequately implemented programs to monitoring these ten parameters during pre-closure operations. EPA did not have any findings or concerns during this inspection.
June 20, 2000	During this inspection the inspectors found that DOE continues to adequately implemented programs to monitoring these ten parameters during pre-closure operations. EPA did not have any findings or concerns during this inspection.
June 19, 2001	Inspectors concluded that DOE has adequately maintained programs to monitor the necessary ten parameters during pre-closure operations, except for the subsidence monitoring program. Inspectors found that the subsidence monitoring program at WIPP was not able to show that it had an implemented effective quality assurance program. EPA found that the Subsidence Program did not have developed adequate written procedures.
June 24, 2002	Inspectors concluded that DOE has adequately maintained programs to monitor the necessary ten parameters during pre-closure operations. EPA evaluated the new subsidence procedure and found it to be adequate and a significant improvement. EPA did not have any findings or concerns during this inspection.
June 17, 2003	Inspectors concluded that DOE has adequately maintained programs to monitor the necessary ten parameters during pre-closure operations. We had no findings or concerns, but we did have one observation. For some of the parameters that are required to be monitored, such as some geomechanical and waste activity parameters, EPA observed that it was not clear that they were reported properly . During the inspection DOE committed to make sure that all monitored parameters are clearly reported annually.
June 28, 2004	Based on program documents, interviews, and field demonstrations during the inspection, we concluded that the monitoring program covers the ten monitored parameters required in the certification decision; that the monitoring, sample collection, and sample/data analysis procedures reviewed were complete and appropriate; that staff were adequately trained and implemented the procedures adequately; and that appropriate quality assurance measures are applied. EPA did not have any findings or concerns during this inspection.
July 12, 2005	Based on program documents, interviews, and field demonstrations during the inspection, EPA concludes that the monitoring program covers

	the ten monitored parameters required in the certification decision; that the monitoring, sample collection, and sample/data analysis procedures reviewed were complete and appropriate; that staff were adequately trained and implemented the procedures adequately; and that appropriate quality assurance measures are applied. EPA did not have any findings or concerns during this inspection.
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**42.3.2 2004 Recertification Decision**

Based on a review of the information in the 2004 CRA, supplemental information provided by DOE (FDMS Docket ID No. EPA-HQ-OAR-2004-0025, Air Docket A-98-49), EPA determines that DOE continues to comply with the requirements of Section 194.42.

**42.4 Changes in the 2009 Recertification (2009 CRA)**

Since the 2004 Recertification DOE’s program as described in CARD 42.3 has not changed (see DOE 2009 CRA Section 42.6).

Since CRA 2004, as in the CCA, four monitored parameters have continued to change;

- changes in the Culebra water level (i.e., raised level) that may impact Culebra groundwater flow direction and/or composition,
- change in the probability of encountering a Castle brine reservoir,
- change in the drilling rate because of increase oil and gas drilling in the Delaware Basin, and
- changes in the waste activity because of changes in the waste inventory.

The Culebra water level changes were incorporated into the EPA-mandated Performance Assessment Baseline Calculation for 2009 (2009 PABC) to assess their impact on compliance. The Culebra water level changes have been included in the PA by modification of the Culebra transmissivities to account for the increase water levels. The other three parameters have also been updated in the PABC09. Even with the changes included in the PABC09 the results still show WIPP in compliance with disposal requirements (EPA 2010b). (See **2009 CRA CARD 23-Models and Computer Codes** for details related to the 2009 PABC calculations.)

For the 2009 CRA DOE reassessed the CCA monitored parameter analysis in light of changes in the monitoring program results, experimental activities, PA changes, or site operations changes. This reassessment is documented in Wagner 2008b and is briefly described in DOE Section 42.6. DOE determined that the original analysis done in the CCA to comply with 40 CFR 194.42 requirements was adequate, arguments and conclusions have not changed, and the analysis did not need to be redone for the 2009 CRA, and that the ten monitored parameters were sufficient to be used to confirm PA predictions.

**42.4.1 Evaluation of Compliance for 2009 Recertification**

EPA reviewed Wagner 2008b, DOE 2009 CRA Section 42, 2009 CRA Appendix DATA-2009, 2009 CRA Appendix MON-2009, and other monitored parameter related documents. EPA

has also inspected DOE's parameter monitoring program annually (See Table 42-2 for a summary of these inspections). EPA's inspections continue to verify that DOE's process and monitoring programs are adequate. Since 2006, EPA found DOE's parameter monitoring program and their response to changes in parameters to be adequate. EPA's monitoring inspection reports can be obtained from Docket A-98-49, Category II-B3.

EPA reviewed DOE's process for the 2009 CRA to determine if the analysis required by 40 CFR 194.42(a) needs to be redone. EPA confirmed that DOE has not modified any of the parameter selection arguments or conclusions since the original CCA nor has the parameter monitoring programs changed. EPA agrees that the analysis does not need to be redone because even with changes in some monitored parameters they do not negatively impact PA predictions, and that the CCA ten monitored parameters do not need to be modified. EPA agrees that DOE needs to continue to monitor these parameters to confirm PA predictions of the WIPP disposal system.

DOE did not change their response to the requirements of 40 CFR 194.42(b), (c), (d), or (e) for the 2009 CRA. DOE did a reassessment (Wagner 2008b) to determine if their CCA monitored parameter analysis needed to be redone or modified in any way. DOE determined that even though some monitored parameters have changed no new parameters need to be added nor did the parameter monitoring programs need to be modified. DOE did not change any argument or conclusion that justified why a parameter was considered significant or insignificant for the 2009 CRA nor did DOE change their pre-closure or post-closure program plans or activities.

EPA did not receive any public comments on DOE's continued compliance with the monitoring requirements of Section 194.42.

**Table CARD 41-2 Summary of Monitored Parameter Inspection Results Since the 2004**

Date of Parameter Monitoring Inspection	Inspection Results: [See Inspection Reports For Details]
June 20-22, 2006	Based on program documents, interviews, and field demonstrations during the inspection, EPA concludes that the monitoring program covers the ten monitored parameters required by EPA's 1998 Certification Decision. This inspection determined that the monitoring, sample collection, and sample/data analysis procedures were complete and appropriate; that staff were adequately trained and implemented the procedures adequately; and that appropriate quality assurance measures are applied. For these reasons, EPA finds that DOE has maintained adequate parameter monitoring during the past year and has the procedures and requirements in place to sustain their program into the next year. EPA has no findings or concerns. Docket No: A-98-49, Item: II-B3-97
July 10-12, 2007	Based on program documents, interviews, and field demonstrations during the inspection, EPA concludes that the monitoring program covers the ten monitoring parameters required by EPA's 1998 Certification Decision. This inspection determined that the monitoring, sample collection, and sample/data analysis procedures were complete and appropriate; that staff were adequately trained and implemented the procedures adequately; and that appropriate quality assurance measures are applied. For these reasons, EPA continues to find that DOE has maintained adequate parameter monitoring during the past year and has the procedures and requirements in place to sustain their program into the next year. EPA has no findings or concerns. Docket No: A-98-49, Item: II-B3-102
July 22-24, 2008	Based on program documents, interviews, and field demonstrations during the inspection, EPA concludes that the monitoring program covers the ten monitoring parameters required by EPA's 1998 Certification Decision. This inspection determined that the monitoring, sample collection, and sample/data analysis procedures were complete and appropriate; that staff were adequately trained and implemented the procedures adequately; and that appropriate quality assurance measures are applied. EPA continues to find that DOE has maintained adequate parameter monitoring during the past year and has the procedures and requirements in place to sustain their program into the next year. EPA has no findings or concerns. Docket No: A-98-49, Item: II-B3-108

#### **42.4.2 2009 Recertification Decision**

Based on a review of the information in the 2009 CRA, supplemental information provided by DOE (FDMS Docket ID No. EPA-HQ-OAR-2009-0330, Air Docket A-98-49), and EPA's annual inspections of the WIPP monitoring program, EPA determines that DOE continues to comply with the requirements of Section 194.42.