40 CFR Part 191
Subparts B and C
Compliance Recertification Application 2026
for the
Waste Isolation Pilot Plant

Passive Institutional Controls
(40 CFR § 194.43)

United States Department of Energy
Waste Isolation Pilot Plant

Carlsbad Field Office
Carlsbad, New Mexico

Compliance Recertification Application 2026
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ACRONYMS AND ABBREVIATIONS

CCA	Compliance Certification Application
CFR	Code of Federal Regulations
CRA	Compliance Recertification Application
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
NEA	Nuclear Energy Agency
OECD	Organization for Economic Co-operation and Development
PCR	Planned Change Request
PIC	Passive Institutional Control
RK&M	Records, Knowledge and Memory
WIPP	Waste Isolation Pilot Plant

43.0 PASSIVE INSTITUTIONAL CONTROLS (40 CFR 194.43)

43.1 Requirements

§ 194.43 Passive Institutional Controls

(a) Any compliance application shall include detailed descriptions of the measures that will be employed to preserve knowledge about the location, design, and contents of the disposal system. Such measures shall include:

(1) Identification of the controlled area by markers that have been designed and will be fabricated and emplaced to be as permanent as practicable;

(2) Placement of records in the archives and land record systems of local, State, and Federal governments, and international archives, that would likely be consulted by individuals in search of unexploited resources. Such records shall identify:

(i) The location of the controlled area and the disposal system;

(ii) The design of the disposal system;

(iii) The nature and hazard of the waste;

(iv) Geologic, geochemical, hydrologic, and other site data pertinent to the containment of waste in the disposal system, or the location of such information; and

(v) The results of tests, experiments, and other analyses relating to backfill of excavated areas, shaft sealing, waste interaction with the disposal system, and other tests, experiments, or analyses pertinent to the containment of waste in the disposal system, or the location of such information.

(3) Other passive institutional controls practicable to indicate the dangers of the waste and its location.

(b) Any compliance application shall include the period of time passive institutional controls are expected to endure and be understood.

(c) The Administrator may allow the Department to assume passive institutional control credit, in the form of reduced likelihood of human intrusion, if the Department demonstrates in the compliance application that such credit is justified because the passive institutional controls are expected to endure and be understood by potential intruders for the time period approved by the Administrator. Such credit, or a smaller credit as determined by the Administrator, cannot be used for more than several hundred years and may decrease over time. In no case, however, shall passive institutional controls be assumed to eliminate the likelihood of human intrusion entirely.

43.2 Background

Title 40 of the Code of Federal Regulations (CFR) Part 191, Subparts B and C (U.S. EPA 1993), establishes requirements for designing and constructing disposal systems. Over the 10,000-year regulatory period, (1) the undisturbed performance of the system will not result in an annual committed effective dose to any member of the public over 15 millirem in accordance with 40 CFR 191.15(a), (2) the levels of radioactive contamination in groundwater will not exceed limits specified by the standard in 40 CFR 191.24, and (3) the probability of releases from all significant processes and events acting on the disposal system will not exceed the specifications in 40 CFR 191.13(a).

Appendix C to Part 191, Guidance for implementation of Subpart states “the Federal Government is committed to retaining ownership of all disposal sites for spent nuclear fuel and high-level and transuranic radioactive wastes and will establish appropriate markers and records, consistent with 40 CFR 191.14(c). The [Environmental Protection Agency (EPA)], assumes that, as long as such passive institutional controls endure and are understood, they: (1) can be effective in deterring systematic or persistent exploitation of these disposal sites and (2) can reduce the likelihood of inadvertent, intermittent human intrusion to a degree to be determined by the implementing agency. However, the [Environmental Protection Agency (EPA)] believes that passive institutional controls can never be assumed to eliminate the chance of inadvertent and intermittent human intrusion into these disposal sites.” A goal of Passive Institutional Controls (PICs) is to minimize the likelihood of inadvertent human activities that affect repository performance (U.S. DOE 1996, Compliance Certification Application [CCA], Appendix PIC).

After closure, the Waste Isolation Pilot Plant (WIPP) will employ markers placed at the site to inform future generations about the disposal system's design and contents, including the presence and hazards of radioactive waste. The markers will be constructed to be as permanent as practicable and able to withstand both natural- and human-initiated forces that could reasonably be expected to occur at the site.

The current WIPP PIC program design was described in the original 1996 CCA. The permanent-marker conceptual design consists of eight different markers, including several large monuments, small subsurface markers, a salt berm, buried and aboveground information rooms, the hot cell, magnetic markers, and radar deflectors. The CCA stated, “As technology advances, this design concept will be revisited over the operational lifetime of WIPP. If the DOE believes the design can be enhanced, changes will be proposed during the recertification process for EPA approval” (U.S. DOE 1996, Chapter 7, Section 7.3, *Passive Institutional Controls*).

A condition of the U.S. EPA compliance certification required the U.S. Department of Energy (DOE) to show that the markers and other PIC measures can be implemented as soon as possible after closure of WIPP and it is feasible to construct the markers and place records as described in the CCA. The EPA also required the DOE to submit more detailed plans and drawings of the PIC prototype designs. In May 2002, the DOE submitted a Planned Change Request (PCR) to the EPA (U.S. DOE 2002) that included a permanent markers testing program plan, a monument survey, and a markers material analysis plan along with a proposed revised schedule for submitting detailed plans and drawings. The PCR was subsequently approved by the EPA later that year, and the EPA’s response included several comments for the DOE’s consideration: (1) the EPA welcomed a permanent markers testing program to provide an adequate technical basis for the PIC program; (2) the DOE is obligated to execute site markers as described in the CCA, and in order to modify the site markers plan, the DOE must obtain EPA approval; (3) in each Compliance Recertification Application (CRA), the DOE should present information showing progress that has occurred with regard to testing and implementation of the PICs; and (4) the EPA expects the DOE to provide an adequate technical basis showing an

alternative PIC design is likely to be more durable and more effective as a marker; further testing and analysis of materials, processes, and configurations should be done before the DOE concludes that certain features of the marker system are impractical (U.S. EPA 2002).

On January 11, 2007, the DOE requested that the EPA extend the schedule for PIC testing indefinitely (U.S. DOE 2007). The EPA agreed with the DOE's request by providing a revised schedule that allowed DOE more time to seek out the most viable PIC options (U.S. EPA 2008). In December 2009, at a meeting in Washington, D.C., the EPA requested that the DOE representatives from the WIPP become more involved with international efforts for nuclear waste disposal. As a result of the EPA's request, the DOE initiated involvement with international efforts through the Organisation for Economic Co-operation and Development (OECD) Nuclear Energy Agency (NEA) *Preservation of Records, Knowledge and Memory (RK&M) Across Generations* initiative to establish international guidelines for long-term preservation of information and memory.

The DOE was an active member of the RK&M group of the NEA through both its first and second phases of the project, which concluded with the issuance of the following documents: "Preservation of Records, Knowledge and Memory Across Generations, Reference Bibliography" (NEA 2018); "Preservation of Records, Knowledge and Memory Across Generations, Final Report of the RK&M Initiative" (NEA 2019a); "Preservation of Records, Knowledge and Memory Across Generations, Developing a Key Information File for a Radioactive Waste Repository" (NEA 2019b); and "Preservation of Records, Knowledge and Memory Across Generations, Compiling a Set of Essential Records for a Radioactive Waste Repository" (NEA 2019c).

On July 28, 2010, the DOE requested an extension for the PIC testing schedule outlined in the March 7, 2008, letter from the EPA (U.S. DOE 2010). With the potential for international standards to change guidance on how permanent markers and record archives are maintained, the DOE recommended that WIPP-specific work be put on hold until more concrete decisions are made and requested that the PIC testing schedule be extended until the NEA had established international standards for markers and record archives. To date, the EPA has not officially responded to this request.

In 2017, the DOE sponsored a NUCLEAR competition as an international, architectural investigation into the design of a nuclear waste site marker. Participants were asked to design a marker for the WIPP site that would deter human intrusion for 10,000 years. Due to the diversity of the competition, which included entries from 40 countries, and the complexity of the problem, the host of the competition proposed the extrapolation of trends from all submissions as a useful exercise to consider the design of a nuclear marker system (Graham et al. 2018).

Information and data from previous compliance certification and recertification applications, which form the basis of past DOE compliance positions and EPA decision documents, are found in the CRA-2019 (U.S. DOE 2019).

43.3 Changes or New Information Since the CRA-2019

In November 2022, the OECD/NEA held a three-day workshop in Dessel, Belgium on "Remembering the Past in the Future." This workshop, sponsored by the OECD/NEA Expert Group on Awareness Preservation, built upon the RK&M Initiative and brought in the subjects of stakeholder and community communications and engagement, information and knowledge preservation, and the communication of information to future generations through a new concept called "universal icons." More information on this workshop is available at https://www.oecd-nea.org/jcms/pl_67956/remembering-the-past-in-the-future-building-awareness-of-radioactive-waste-repositories-together.

The DOE issued a Planned Change Notification for the excavation of five new main access drifts located to the west of the currently mined area of the WIPP (U.S. DOE 2021b). On October 13, 2021, the EPA acknowledged the DOE plans for the mining of the west main access drifts, stating that although there were no "concerns resulting in the facility being out of compliance with 40 CFR Part 194," the EPA expected the DOE to appropriately incorporate the new drifts in future performance assessments to capture their impact on projected releases from the repository (U.S. EPA 2021).

In March 2024, the DOE submitted a PCR to use two replacement panels, Panels 11 and 12 (U.S. DOE 2024). The updated PIC information described in this section addresses the addition of the five new west main access drifts. This information is also consistent with the PIC changes described in the March 2024 PCR.

Replacement Panels 11 and 12 are located to the west of the existing repository and represent an interim repository state that recovers lost disposal capacity from Panels 1, 7, and 9, thereby ensuring uninterrupted transuranic waste-disposal operations upon the completion of waste emplacement in Panel 8 (U.S. DOE 2024). Upon closure of WIPP, continued compliance with the criteria of 40 CFR 194.43 will be achieved by extending the current PIC approach over the surface expression area for Panels 11 and 12. The expanded footprint consists of two adjoining rectangular areas. One rectangular area is approximately 2,780 feet by 2,360 feet (875 meters by 720 meters), covering Panels 1 through 10. The second (adjoining) rectangular area, as it applies to Replacement Panels 11 and 12, is approximately 1,040 feet by 1,210 feet (317 meters by 369 meters). The new PIC marker system footprint is illustrated in Figure 43-1.

Panels 1 through 12 will not accommodate the entire waste volume of 6.2 million cubic feet authorized by the Land Withdrawal Act (U.S. Congress 1992). As a result, the DOE may request the use of additional waste panels in the future. The final state repository would continue to comply with the criteria in 40 CFR 194.43 through further extension of the placement of berms, granite monuments, and warning markers.

The PIC program information, as provided in the CCA (U.S. DOE 1996), CRA-2004 (U.S. DOE 2004), CRA-2009 (U.S. DOE 2009), CRA-2014 (U.S. DOE 2014), and CRA-2019 (U.S. DOE 2019), remains unchanged. Based on the changes to the PIC program described in this section and prior CCA and CRA information, the DOE continues to demonstrate compliance with the provisions of 40 CFR 194.43.

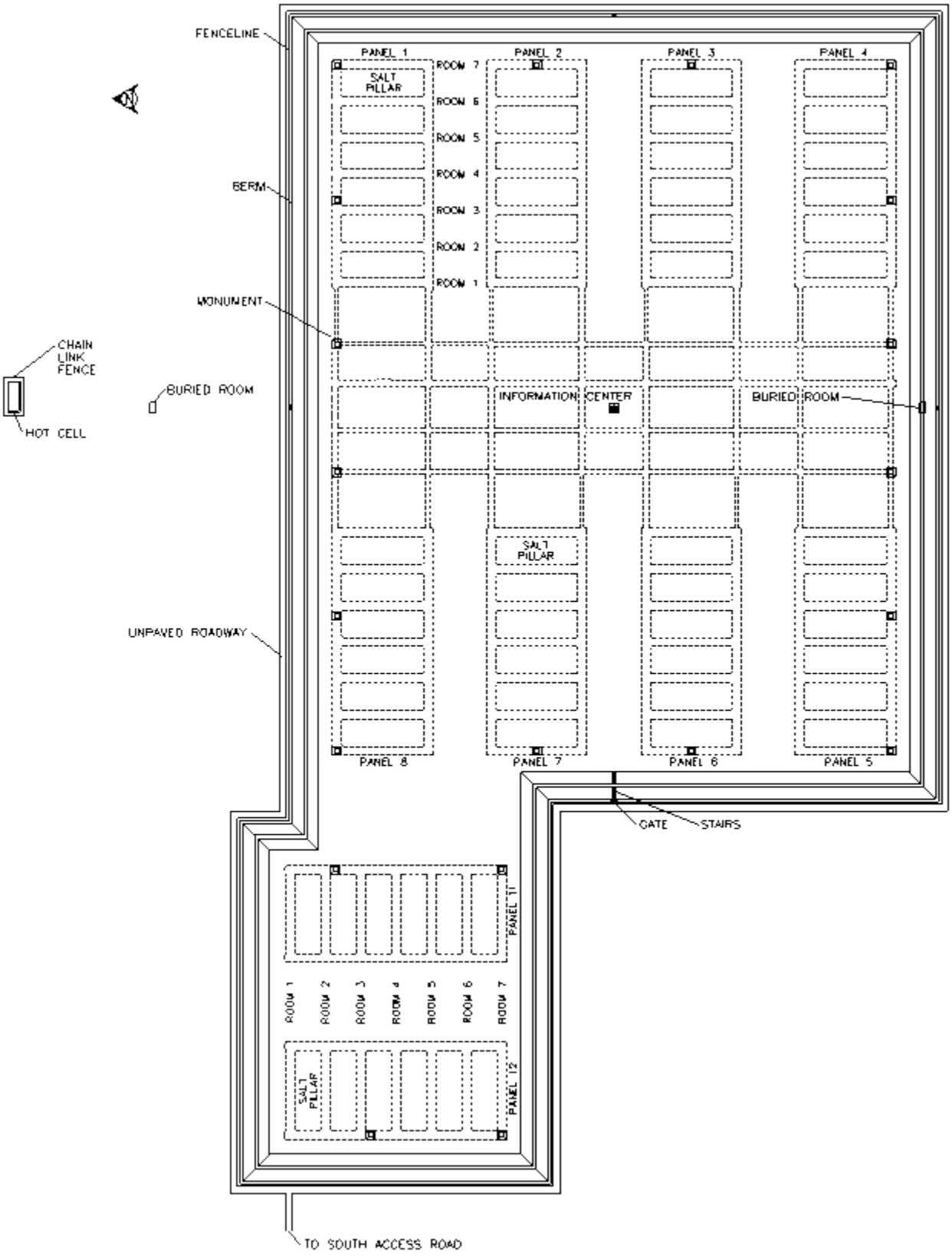


Figure 43-1. New Passive Institutional Controls Marker System Footprint

43.4 References

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

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U.S. EPA. 2021. Letter from Lee Ann B. Veal, Director, Radiation Protection Division, United States Environmental Protection Agency, to Mr. Reinhard Knerr, Manager, Carlsbad Field Office, Department of Energy. The Environmental Protection Agency has received and reviewed the

Department of Energy (DOE) Carlsbad Field Office's (CBFO) June 23, 2021 Planned Change Notice (PCN) and accompanying attachment to excavate five new main access drifts located to the west of the currently mined area of the Waste Isolation Pilot Plan (WIPP). October 13, 2021.*