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

Future State Assumptions
(40 CFR 194.25)

United States Department of Energy
Waste Isolation Pilot Plant

Carlsbad Field Office
Carlsbad, New Mexico

Compliance Recertification Application 2026
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(40 CFR 194.25)

TABLE OF CONTENTS

25.0 FUTURE STATE ASSUMPTIONS (40 CFR 194.25) 25-1
25.1 Requirements 25-1
25.2 Background 25-1
25.3 Changes or New Information Since the CRA-2019 25-2
25.3.1 40 CFR 194.25(a) 25-2
25.3.2 40 CFR 194.25(b) 25-3
25.4 References 25-5

LIST OF TABLES

Table 25-1. FEPs Screened Out Using the 40 CFR 194.25(a) Criterion[a] 25-2
Table 25-2. FEPs Screened According to 40 CFR 194.25(b) 25-3

ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CRA	Compliance Recertification Application
DOE	U.S. Department of Energy
DP	Disturbed Performance
EPA	U.S. Environmental Protection Agency
FEP	feature, event, and process
PA	performance assessment
T-field	transmissivity field
UP	Undisturbed Performance
WIPP	Waste Isolation Pilot Plant

25.0 FUTURE STATE ASSUMPTIONS (40 CFR 194.25)

25.1 Requirements

§ 194.25 Future State Assumptions

(a) Unless otherwise specified in this part or in the disposal regulations, performance assessments and compliance assessments conducted pursuant to the provisions of this part to demonstrate compliance with § 191.13, § 191.15 and part 191, subpart C shall assume that characteristics of the future remain what they are at the time the compliance application is prepared, provided that such characteristics are not related to hydrogeologic, geologic or climatic conditions.

(b) In considering future states pursuant to this section, the Department shall document in any compliance application, to the extent practicable, effects of potential future hydrogeologic, geologic and climatic conditions on the disposal system over the regulatory time frame. Such documentation shall be part of the activities undertaken pursuant to § 194.14, Content of compliance certification application; § 194.32, Scope of performance assessments; and § 194.54, Scope of compliance assessments.

(1) In considering the effects of hydrogeologic conditions on the disposal system, the Department shall document in any compliance application, to the extent practicable, the effects of potential changes to hydrogeologic conditions.

(2) In considering the effects of geologic conditions on the disposal system, the Department shall document in any compliance application, to the extent practicable, the effects of potential changes to geologic conditions, including, but not limited to: Dissolution; near surface geomorphic features and processes; and related subsidence in the geologic units of the disposal system.

(3) In considering the effects of climatic conditions on the disposal system, the Department shall document in any compliance application, to the extent practicable, the effects of potential changes to future climate cycles of increased precipitation (as compared to the present conditions).

25.2 Background

Title 40 Code of Federal Regulations (CFR) 194.25 (U.S. EPA 1996) implements the containment requirements of 40 CFR 191.13, the individual protection requirements of 40 CFR 191.15, and 40 CFR 191 subpart C (groundwater protection) by mandating that the U.S. Department of Energy (DOE) considers future states in the compliance application. In the Supplemental Information to the Final Rule for 40 CFR 194, the U.S. Environmental Protection Agency (EPA) states that they find no acceptable methodology to predict the future state of society, science, languages, or other characteristics of mankind. However, the EPA does believe that established scientific methods can make plausible predictions regarding the future state of geologic, hydrogeologic, and climatic conditions. Therefore, 40 CFR 194.25 stipulates that the future state will resemble present conditions except for those relating to hydrogeologic, geologic, and climatic conditions. However, 40 CFR 194.25 requires that performance and compliance assessments include dynamic analyses of changes in the geology, hydrology, and climatic conditions during the regulatory performance period of 10,000 years.

Features, events, and processes (FEPs) considered in demonstrations of performance for the Waste Isolation Pilot Plant (WIPP) are maintained and updated based on relevant and newly identified information that relates to the disposal system. The DOE maintains the FEPs

according to a proceduralized methodology (Kirkes 2024) that assures any performance assessment (PA) calculations are conducted using a valid and up-to-date FEP basis.

According to 40 CFR 194.25(a), these FEPs are assumed to remain unchanged from their current state for the entirety of the performance period. Therefore, it is essential to stay informed about current human activities and implemented technologies that may affect the disposal system, as they are implemented consistently throughout the 10,000-year performance period. The current state of human activities that are applicable to WIPP performance demonstrations are implemented through a class of FEPs known as "human" FEPs. Updates and changes to this baseline may be due to the emergence of new information related to WIPP FEPs, experimental results, planned or unplanned changes, or EPA mandates. The FEP baseline is reevaluated prior to each PA conducted for compliance purposes and is documented in Appendix SCR.

25.3 Changes or New Information Since the CRA-2019

25.3.1 40 CFR 194.25(a)

For the 2026 Compliance Recertification Application (CRA-2026), no screening decisions previously made using the future state assumption in section 194.25(a) have changed[1]. There continue to be 16 FEPs screened out based on the provision of 40 CFR 194.25(a), as shown in Table 25-1.

Table 25-1. FEPs Screened Out Using the 40 CFR 194.25(a) Criterion[a]

FEP I.D.	FEP Name	Change Summary
H6	Archeological investigations	None
H7	Drilling associated with thermal energy production	None
H10	Liquid waste disposal	None
H11	Hydrocarbon storage	None
H14	Mining for other resources (not potash)	None
H15	Excavation activities associated with tunneling	None
H16	Construction of underground facilities	None
H40	Changes in land use	None
H47	Anthropogenic climate change – Greenhouse gas effects	None
H48	Anthropogenic climate change – Acid rain	None
H49	Anthropogenic climate change – Damage to the ozone layer	None
H53	Changes in agricultural practices – Arable farming	None
H54	Changes in agricultural practices – Ranching	None
H55	Changes in agricultural practices – Fish farming	None
H56	Demographic change, urban developments, and technological developments	None
H58	Solution mining – Potash	None

[a] These screening decisions are consistent with current screening arguments and decisions as presented in Appendix SCR-2026.

[1] See Appendix SCR-2026 for a complete catalog of all 245 WIPP FEPs, their screening arguments and decisions.

25.3.2 40 CFR 194.25(b)

There are no changes to the screening decisions for those FEPs that represent the hydrogeologic, geologic, and climatic conditions in the future; they continue to be represented in performance calculations. Table 25-2 lists those FEPs that relate to the future state of the repository for hydrogeologic, geologic, and climatic conditions.

Table 25-2. FEPs Screened According to 40 CFR 194.25(b)

EPA FEP I.D.	FEP Name	Issue	Screening Decision	Method of Representation In PA
N1	**Stratigraphy**	Deposition and properties of geological formations in control of system performance.	Included in the Undisturbed Performance (UP) scenario	BRAGFLO grid incorporates relevant stratigraphic units.
N2	**Brine Reservoirs**	Pressurized brine reservoirs may be present in the Castile beneath the controlled area.	Included in the Disturbed Performance (DP) scenarios	The potential for intercepting a pressurized brine source during an inadvertent human intrusion is represented by the parameter PBRINE in the E1 scenario.
N16	**Shallow Dissolution**	Percolation of groundwater and dissolution in the Rustler may increase transmissivity.	UP	The effects of shallow dissolution, as in Nash Draw, on the transmissivity of the Culebra are represented in the Culebra transmissivity field (T-field) generation and calibration process.
N23	**Saturated Groundwater Flow**	Groundwater flow beneath the water table is important to disposal system performance.	UP	Groundwater flow is represented by the Culebra T-fields.
N24	**Unsaturated Groundwater Flow**	The presence of air or other gas phases may influence groundwater flow.	UP	Unsaturated flow is a precursor to recharge to the Culebra, which is accounted for in the boundary conditions for the Culebra T-fields.
N25	**Fracture Flow**	Groundwater may flow along fractures as well as through interconnected pore space.	UP	Fracture flow is represented by the dual-porosity Culebra transport model.

EPA FEP I.D.	FEP Name	Issue	Screening Decision	Method of Representation In PA
N27	**Effects of Preferential Pathways**	Groundwater flow may not be uniform, and may occur along particular pathways.	UP	Preferential pathways are accounted for in the calibration of Culebra T-fields to transient hydraulic test responses.
N33	**Groundwater Geochemistry**	Groundwater geochemistry influences actinide retardation and colloid stability.	UP	Salado and Castile brine geochemistry are accounted for in actinide solubility values. Culebra brine geochemistry is accounted for in the retardation factors used in PA calculations of actinide transport.
N39	**Physiography**	The physiography of the area is a control on the surface water hydrology.	UP	Relevant aspects of the physiography are incorporated in the Culebra T-fields.
N53	**Groundwater Discharge**	The amount of water leaving the groundwater system to rivers, springs, and seeps affects the groundwater hydrology.	UP	Groundwater discharge is accounted for in the boundary conditions for the Culebra T-fields.
N54	**Groundwater Recharge**	The amount of water passing into the saturated zone affects the groundwater hydrology.	UP	Groundwater recharge is accounted for in the boundary conditions for the Culebra T-fields.
N55	**Infiltration**	The amount of water entering the unsaturated zone controls groundwater recharge.	UP	Infiltration is accounted for in the boundary conditions for the Culebra T-fields.
N56	**Changes in Groundwater Recharge and Discharge**	Changes in climate and drainage pattern may affect the amount of water entering and leaving the groundwater system.	UP	Changes in groundwater recharge and discharge are accounted for in the Climate Index factor.
N59	**Precipitation (e.g., Rainfall)**	Rainfall is the source of water for infiltration and stream flow.	UP	Future variations in precipitation are accounted for in the Climate Index factor.

EPA FEP I.D.	FEP Name	Issue	Screening Decision	Method of Representation In PA
N60	**Temperature**	The temperature influences how much precipitation evaporates before it reaches streams or enters the ground.	UP	Future variations in temperature are accounted for in the Climate Index factor.
N61	**Climate Change**	Temperature and precipitation will vary as natural changes in the climate take place.	UP	Future climate change is accounted for in the Climate Index factor.

In summary, there are no changes to screening decisions for those FEPs that represent the hydrologic, geologic, and climate-related conditions for the WIPP. The DOE remains in compliance with the requirements of sections 194.25(b)(1), (b)(2), and (b)(3).

25.4 References

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

U.S. Environmental Protection Agency (EPA). 1996. 40 CFR Part 194: Criteria for the Certification and Recertification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191 Disposal Regulations; Final Rule. *Federal Register*, vol. 61 (February 9, 1996). 5223–5245.

Kirkes, R. 2024. Activity/Project Specific Procedure SP 9-4: Performing FEPs Baseline Impact Assessments for Planned or Unplanned Changes. Revision 6. March 28, 2024. Carlsbad, NM: Sandia National Laboratories. ERMS 581421.*