Title 40 CFR Part 191
Subparts B and C
Compliance Recertification Application 2019
for the
Waste Isolation Pilot Plant
Scope of Performance Assessment
(40 CFR 194.32)

United States Department of Energy
Waste Isolation Pilot Plant

Carlsbad Field Office
Carlsbad, New Mexico

Compliance Recertification Application 2019
Scope of Performance Assessment
(40 CFR 194.32)

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Acronyms and Abbreviations

CARD	Compliance Application Review Document
CCA	Compliance Certification Application
CFR	Code of Federal Regulations
CRA	Compliance Recertification Application
DOE	U.S. Department of Energy
DP	disturbed performance
EP	event and process
EPA	U.S. Environmental Protection Agency
FEP	feature, event, and process
HCN	historic, current, and near-future
IB	inside boundary
OB	outside boundary
PA	performance assessment
SO-C	screened out-consequence
SO-P	screened out-probability
SO-R	screened out-regulation
UP	undisturbed performance
WIPP	Waste Isolation Pilot Plant

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32.0 Scope of Performance Assessment (40 CFR 194.32)

32.1 Requirements

§ 194.32 Scope of Performance Assessment

(a) "Performance assessments shall consider natural processes and events, mining, deep drilling, and shallow drilling that may affect the disposal system during the regulatory time frame."

(b) "Assessments of mining effects may be limited to changes in the hydraulic conductivity of the hydrogeologic units of the disposal system from excavation mining for natural resources. Mining shall be assumed to occur with a one in 100 probability in each century of the regulatory time frame. Performance assessments shall assume that mineral deposits of those resources, similar in quality and type to those resources currently extracted from the Delaware Basin, will be completely removed from the controlled area during the century in which such mining is randomly calculated to occur. Complete removal of such mineral resources shall be assumed to occur only once during the regulatory time frame."

(c) "Performance assessments shall include an analysis of the effects on the disposal system of any activities that occur in the vicinity of the disposal system prior to disposal and are expected to occur in the vicinity of the disposal system soon after disposal. Such activities shall include, but shall not be limited to, existing boreholes and the development of any existing leases that can be reasonably expected to be developed in the near future, including boreholes and leases that may be used for fluid injection activities."

(d) "Performance assessments need not consider processes and events that have less than one chance in 10,000 of occurring over 10,000 years."

(e) "Any compliance application(s) shall include information which:

(1) Identifies all potential processes, events or sequences and combinations of processes and events that may occur during the regulatory time frame and may affect the disposal system;

(2) Identifies the processes, events or sequences and combinations of processes and events included in performance assessments; and

(3) Documents why any processes, events or sequences and combinations of processes and events identified pursuant to paragraph (e)(1) of this section were not included in performance assessment results provided in any compliance application."

32.2 Background

Performance assessment (PA) is a process that assesses the likelihood that the Waste Isolation Pilot Plant (WIPP) will meet the release limits specified by 40 CFR 191.13 for 10,000 years after waste disposal. PA must consider both natural and human-initiated processes and events which have an effect on the WIPP disposal system.

Title 40 CFR 194.32 (U.S. EPA 1996) requires that PAs consider the effects of excavation mining, drilling fluid injection, and future development of leases. In addition, the PA must also consider the effects of current activities such as secondary oil recovery methods (waterflooding),

disposal of natural brine, and solution mining to extract brine in the vicinity of the repository. Title 40 CFR 194.32 requires identification of all features, events, and processes (FEPs), or sequences or combinations of processes and events that could occur during the regulatory time frame that may affect the repository, and documentation of why certain events or groups of events are not included, if so warranted.

Therefore, PA methodology for the WIPP includes a process that compiles a comprehensive list of the FEPs that are relevant to disposal system performance. Those FEPs determined by screening analysis to have the potential to affect performance are represented in scenarios and quantitative calculations using a system of linked computer models to describe the interaction of the repository with the natural system, both with and without human intrusion. This process began with the Compliance Certification Application (CCA) (U.S. DOE 1996), where the U.S. Department of Energy (DOE) first compiled a comprehensive list of FEPs which was then subjected to a screening process that led to the set of relevant FEPs used in PA to demonstrate the WIPP's compliance with the long-term disposal standards. The final set of FEPs used in the CCA became the WIPP FEPs baseline.

The screening criteria shown below are used to determine whether a specific FEP should be included in conceptual models and PA scenarios:

- Screened Out-Regulation (SO-R): For example, future human-initiated events and processes (EPs) may be excluded from consideration for regulatory reasons (e.g., deliberate drilling intrusions). 40 CFR 194.25(a) requires 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 (see also Section 25 of this Compliance Recertification Application [CRA]-2019).

- Screened Out-Probability (SO-P): 40 CFR 194.32(d) states that PA need not consider processes and events that have less than a 1 in 10,000 chance of occurring over 10,000 years.

- Screened Out-Consequence (SO-C): The DOE eliminated some FEPs based on their consequences according to the following two criteria:

  – Insignificant Consequences. The DOE eliminated FEPs where there was a reasonable expectation that the remaining probability distribution of cumulative releases would not be significantly changed by such omissions. These FEPs are designated SO-C.

  – Beneficial FEPs. FEPs that are potentially beneficial to disposal system or subsystem performance were eliminated to simplify the analysis. This argument may be used when there is uncertainty as to exactly how the FEP should be incorporated into assessment calculations, or when incorporation would incur unreasonable difficulties. This is considered a conservative decision. These FEPS are designated SO-C Beneficial (e.g., the accumulation of radioactive contaminants in soils).

The FEPs retained in PA are accounted for under calculations of either the undisturbed performance (UP) or disturbed performance (DP) (see the CCA, Chapter 6.0, Sections 6.2.2.2 and 6.2.2.3).

- UP includes the predicted behavior of the disposal system assuming it is not disrupted by human intrusion or the occurrence of unlikely natural events.

- DP includes the predicted behavior of the disposal system assuming disruption by human intrusion or other actions, including future drilling and mining activities.

At each recertification, new information relevant to the FEPs baseline is reviewed and incorporated as appropriate, thus assuring that the FEPs basis is current and up-to-date for each recertification cycle (U.S. DOE 2014). This FEPs basis has historically been maintained with each update to Appendix SCR (i.e., Appendix SCR-2004, Appendix SCR-2009, …) (U.S. DOE 2004, U.S. DOE 2009).

The DOE has deferred submittal of the CRA-2019 PA until after submission of the CRA-2019 (see Executive Summary 2019, Section 1.3). As such, the CRA-2014 PA continues to be the baseline calculation for the CRA-2019. As directed in 40 CFR 194.15(b), where information remains valid and has been submitted in previous recertification applications, such information may be summarized and referenced. Therefore, the information in this section is a summary of the associated CRA-2014 information, including Appendix SCR-2014. Information and data from previous compliance certification and recertification applications that form the basis of past DOE compliance positions and past EPA decision documents are found in the CRA-2014 (U.S. DOE 2014). The results of the deferred PA will be described in a second submission that will also include revisions, when appropriate, to the information submitted in March, 2019.

32.3 Changes or New Information Since the CRA-2014

There have been no changes to FEP screening classifications since the CRA-2014. The U. S. Environmental Protection Agency (EPA) requested additional information relating to the CRA-2014 during their completeness review. The DOE provided responses, which included changes and additions to the information in Appendix SCR-2014. However, DOE responses did not change FEP screening decisions or classifications. The EPA's Compliance Application Review Document (CARD) for section 32 documents the EPA's requests for additional information and their determination of compliance with 40 CFR 194.32 requirements (U.S. EPA 2017). The FEPs screening classifications remain the same as described in Appendix SCR-2014. There are currently 245 FEPs included in the WIPP FEPs baseline. Details regarding screening classifications and related screening arguments are presented in Appendix SCR-2014. Table 32-1 lists the CRA-2019 FEPs and their screening classifications.

32.3.1 40 CFR 194.32(a)

The WIPP FEPs baseline includes three primary categories of FEPs: Natural FEPs, human-initiated FEPs, and waste- and repository-induced FEPs. It is through these three categories that "…natural processes and events [Natural FEPs], mining, deep drilling, and shallow drilling [human-initiated FEPs] that may affect the disposal system [waste- and repository-induced

FEPs] during the regulatory time frame" are accounted for in PA. Those FEPs with screening classifications listed as UP and DP in Table 32-1 are implemented in PA models to directly address the criteria in 40 CFR 194.32(a). As mentioned above, a detailed presentation of FEPs screening is provided in Appendix SCR-2014.

Table 32-1. FEPs Summary for CRA-2019

FEP I.D.[a, b, c, d]	FEP Name	Screening Decision Changed?	Screening[e] Classification
N1	Stratigraphy	No	UP
N2	Brine Reservoirs	No	DP
N3	Changes in Regional Stress	No	SO-C
N4	Regional Tectonics	No	SO-C
N5	Regional Uplift and Subsidence	No	SO-C
N6	Salt Deformation	No	SO-P
N7	Diapirism	No	SO-P
N8	Formation of Fractures	No	SO-P UP (Repository)
N9	Changes in Fracture Properties	No	SO-C UP (Near Repository)
N10	Formation of New Faults	No	SO-P
N11	Fault Movement	No	SO-P
N12	Seismic Activity	No	UP
N13	Volcanic Activity	No	SO-P
N14	Magmatic Activity	No	SO-C
N15	Metamorphic Activity	No	SO-P
N16	Shallow Dissolution	No	UP
N18	Deep Dissolution	No	SO-P
N20	Breccia Pipes	No	SO-P
N21	Collapse Breccias	No	SO-P
N22	Fracture Infills	No	SO-C Beneficial
N23	Saturated Groundwater Flow	No	UP
N24	Unsaturated Groundwater Flow	No	UP
N25	Fracture Flow	No	UP
N27	Effects of Preferential Pathways	No	UP
N26	Density Effects on Groundwater Flow	No	SO-C
N28	Thermal Effects on Groundwater Flow	No	SO-C

FEP I.D.[a, b, c, d]	FEP Name	Screening Decision Changed?	Screening[e] Classification
N29	Saline Intrusion (Hydrogeological Effects)	No	SO-P
N30	Freshwater Intrusion (Hydrogeological Effects)	No	SO-P
N31	Hydrological Response to Earthquakes	No	SO-C
N32	Natural Gas Intrusion	No	SO-P
N33	Groundwater Geochemistry	No	UP
N34	Saline Intrusion (Geochemical Effects)	No	SO-C
N35	Freshwater Intrusion (Geochemical Effects)	No	SO-C
N36	Changes in Groundwater Eh	No	SO-C
N37	Changes in Groundwater pH	No	SO-C
N38	Effects of Dissolution	No	SO-C
N39	Physiography	No	UP
N40	Impact of a Large Meteorite	No	SO-P
N41	Mechanical Weathering	No	SO-C
N42	Chemical Weathering	No	SO-C
N43	Aeolian Erosion	No	SO-C
N44	Fluvial Erosion	No	SO-C
N45	Mass Wasting (Erosion)	No	SO-C
N46	Aeolian Deposition	No	SO-C
N47	Fluvial Deposition	No	SO-C
N48	Lacustrine Deposition	No	SO-C
N49	Mass Wasting (Deposition)	No	SO-C
N50	Soil Development	No	SO-C
N51	Stream and River Flow	No	SO-C
N52	Surface Water Bodies	No	SO-C
N53	Groundwater Discharge	No	UP
N54	Groundwater Recharge	No	UP
N55	Infiltration	No	UP
N56	Changes in Groundwater Recharge and Discharge	No	UP
N57	Lake Formation	No	SO-C
N58	River Flooding	No	SO-C
N59	Precipitation (e.g., Rainfall)	No	UP
N60	Temperature	No	UP

FEP I.D.[a, b, c, d]	FEP Name	Screening Decision Changed?	Screening[e] Classification
N61	Climate Change	No	UP
N62	Glaciation	No	SO-P
N63	Permafrost	No	SO-P
N64	Seas and Oceans	No	SO-C
N65	Estuaries	No	SO-C
N66	Coastal Erosion	No	SO-C
N67	Marine Sediment Transport and Deposition	No	SO-C
N68	Sea Level Changes	No	SO-C
N69	Plants	No	SO-C
N70	Animals	No	SO-C
N71	Microbes	No	SO-C (UP - for colloidal effects and gas generation)
N72	Natural Ecological Development	No	SO-C
H1	Oil and Gas Exploration	No	SO-C (HCN) DP (Future)
H2	Potash Exploration	No	SO-C (HCN) DP (Future)
H4	Oil and Gas Exploitation	No	SO-C (HCN) DP (Future)
H3	Water Resources Exploration	No	SO-C (HCN) SO-C (Future)
H5	Groundwater Exploitation	No	SO-C (HCN) SO-C (Future)
H6	Archaeological Investigations	No	SO-R (HCN) SO-R (Future)
H7	Geothermal	No	SO-R (HCN) SO-R (Future)
H8	Other Resources	No	SO-C (HCN) DP (Future)
H9	Enhanced Oil and Gas Recovery	No	SO-C (HCN) DP (Future)
H10	Liquid Waste Disposal	No	SO-R (HCN) SO-R (Future)
H11	Hydrocarbon Storage	No	SO-R (HCN) SO-R (Future)
H12	Deliberate Drilling Intrusion	No	SO-R (HCN) SO-R (Future)
H13	Conventional Underground Potash Mining	No	UP (HCN) DP (Future)

FEP I.D.[a, b, c, d]	FEP Name	Screening Decision Changed?	Screening[e] Classification
H14	Other Resources (Mining For)	No	SO-C (HCN) SO-R (Future)
H15	Tunneling	No	SO-R (HCN) SO-R (Future)
H16	Construction of Underground Facilities (For Example, Storage, Disposal, Accommodation)	No	SO-R (HCN) SO-R (Future)
H17	Archaeological Excavations	No	SO-C (HCN) SO-R (Future)
H18	Deliberate Mining Intrusion	No	SO-R (HCN) SO-R (Future)
H19	Explosions for Resource Recovery	No	SO-C (HCN) SO-R (Future)
H20	Underground Nuclear Device Testing	No	SO-C (HCN) SO-R (Future)
H21	Drilling Fluid Flow	No	SO-C (HCN) DP (Future)
H22	Drilling Fluid Loss	No	SO-C (HCN) DP (Future)
H23	Blowouts	No	SO-C (HCN) DP (Future)
H24	Drilling-Induced Geochemical Changes	No	UP (HCN) DP (Future)
H25	Oil and Gas Extraction	No	SO-C (HCN) SO-R (Future)
H26	Groundwater Extraction	No	SO-C (HCN) SO-R (Future)
H27	Liquid Waste Disposal–Outside Boundary (OB)	No	SO-C (HCN) SO-C (Future)
H28	Enhanced Oil and Gas Production–OB	No	SO-C (HCN) SO-C (Future)
H29	Hydrocarbon Storage–OB	No	SO-C (HCN) SO-C (Future)
H30	Fluid-Injection Induced Geochemical Changes	No	UP (HCN) SO-R (Future)
H31	Natural Borehole Fluid Flow	No	SO-C (HCN) SO-C (Future, holes not penetrating waste panels) DP (Future, holes penetrating panels)
H32	Waste-Induced Borehole Flow	No	SO-R (HCN) DP (Future)
H34	Borehole-Induced Solution and Subsidence	No	SO-C (HCN) SO-C (Future)

FEP I.D.[a, b, c, d]	FEP Name	Screening Decision Changed?	Screening[e] Classification
H35	Borehole-Induced Mineralization	No	SO-C (HCN) SO-C (Future)
H36	Borehole-Induced Geochemical Changes	No	UP (HCN) DP (Future) SO-C (for units other than the Culebra)
H37	Changes in Groundwater Flow Due to Mining	No	UP (HCN) DP (Future)
H38	Changes in Geochemistry Due to Mining	No	SO-C (HCN) SO-R (Future)
H39	Changes in Groundwater Flow Due to Explosions	No	SO-C (HCN) SO-R (Future)
H40	Land Use Changes	No	SO-R (HCN) SO-R (Future)
H41	Surface Disruptions	No	UP (HCN) SO-C (Future)
H42	Damming of Streams or Rivers	No	SO-C (HCN) SO-R (Future)
H43	Reservoirs	No	SO-C (HCN) SO-R (Future)
H44	Irrigation	No	SO-C (HCN) SO-R (Future)
H45	Lake Usage	No	SO-R (HCN) SO-R (Future)
H46	Altered Soil or Surface Water Chemistry by Human Activities	No	SO-C (HCN) SO-R (Future)
H47	Greenhouse Gas Effects	No	SO-R (HCN) SO-R (Future)
H48	Acid Rain	No	SO-R (HCN) SO-R (Future)
H49	Damage to the Ozone Layer	No	SO-R (HCN) SO-R (Future)
H50	Coastal Water Use	No	SO-R (HCN) SO-R (Future)
H51	Sea Water Use	No	SO-R (HCN) SO-R (Future)
H52	Estuarine Water Use	No	SO-R (HCN) SO-R (Future)
H53	Arable Farming	No	SO-C (HCN) SO-R (Future)
H54	Ranching	No	SO-C (HCN) SO-R (Future)
H55	Fish Farming	No	SO-R (HCN) SO-R (Future)

FEP I.D.[a, b, c, d]	FEP Name	Screening Decision Changed?	Screening[e] Classification
H56	Demographic Change and Urban Development	No	SO-R (HCN) SO-R (Future)
H57	Loss of Records	No	NA (HCN) DP (Future)
H58	Solution Mining for Potash	No	SO-R (HCN) SO-R (Future)
H59	Solution Mining for Other Resources	No	SO-C (HCN) SO-C (Future)
H60	Liquid Waste Disposal–Inside Boundary (IB)	No	SO-R (HCN) SO-R (Future)
H61	Enhanced Oil and Gas Production–IB	No	SO-R (HCN) SO-R (Future)
H62	Hydrocarbon Storage–IB	No	SO-R (HCN) SO-R (Future)
W1	Disposal Geometry	No	UP
W2	Waste Inventory	No	UP
W3	Heterogeneity of Waste Forms	No	DP
W4	Container Form	No	SO-C Beneficial
W5	Container Material Inventory	No	UP
W6	Shaft Seal Geometry	No	UP
W7	Shaft Seal Physical Properties	No	UP
W8	Shaft Seal Chemical Composition	No	SO-C Beneficial
W9	Backfill Physical Properties	No	SO-C
W10	Backfill Chemical Composition	No	UP
W11	Post-Closure Monitoring	No	SO-C
W12	Radionuclide Decay and In-Growth	No	UP
W13	Heat from Radioactive Decay	No	SO-C
W14	Nuclear Criticality: Heat	No	SO-P
W15	Radiological Effects on Waste	No	SO-C
W16	Radiological Effects on Containers	No	SO-C
W17	Radiological Effects on Shaft Seals	No	SO-C
W18	Disturbed Rock Zone (DRZ)	No	UP

FEP I.D.[a, b, c, d]	FEP Name	Screening Decision Changed?	Screening[e] Classification
W19	Excavation-Induced Changes in Stress	No	UP
W20	Salt Creep	No	UP
W21	Changes in the Stress Field	No	UP
W22	Roof Falls	No	UP
W23	Subsidence	No	SO-C
W24	Large Scale Rock Fracturing	No	SO-P
W25	Disruption Due to Gas Effects	No	UP
W26	Pressurization	No	UP
W27	Gas Explosions	No	UP
W28	Nuclear Explosions	No	SO-P
W29	Thermal Effects on Material Properties	No	SO-C
W30	Thermally Induced Stress Changes	No	SO-C
W31	Differing Thermal Expansion of Repository Components	No	SO-C
W32	Consolidation of Waste	No	UP
W33	Movement of Containers	No	SO-C
W34	Container Integrity	No	SO-C Beneficial
W35	Mechanical Effects of Backfill	No	SO-C
W36	Consolidation of Shaft Seals	No	UP
W37	Mechanical Degradation of Shaft Seals	No	UP
W39	Underground Boreholes	No	UP
W40	Brine Inflow	No	UP
W41	Wicking	No	UP
W42	Fluid Flow Due to Gas Production	No	UP
W43	Convection	No	SO-C
W44	Degradation of Organic Material	No	UP
W45	Effects of Temperature on Microbial Gas Generation	No	UP
W46	Effects of Pressure on Microbial Gas Generation	No	SO-C

FEP I.D.[a, b, c, d]	FEP Name	Screening Decision Changed?	Screening[e] Classification
W47	Effects of Radiation on Microbial Gas Generation	No	SO-C
W48	Effects of Biofilms on Microbial Gas Generation	No	UP
W49	Gases from Metal Corrosion	No	UP
W51	Chemical Effects of Corrosion	No	UP
W50	Galvanic Coupling (Within the Repository)	No	SO-C
W52	Radiolysis of Brine	No	SO-C
W53	Radiolysis of Cellulose	No	SO-C
W54	Helium Gas Production	No	SO-C
W55	Radioactive Gases	No	SO-C
W56	Speciation	No	UP in disposal rooms and Culebra. SO-C elsewhere, and SO-C Beneficial in cementitious seals
W57	Kinetics of Speciation	No	SO-C
W58	Dissolution of Waste	No	UP
W59	Precipitation of Secondary Minerals	No	SO-C Beneficial
W60	Kinetics of Precipitation and Dissolution	No	SO-C
W61	Actinide Sorption	No	UP in the Culebra and Dewey Lake; SO-C Beneficial in the disposal room, shaft seals, panel closures, and other geologic units.
W62	Kinetics of Sorption	No	UP in the Culebra and Dewey Lake; SO-C Beneficial in the disposal room, shaft seals, panel closures, and other geologic units.
W63	Changes in Sorptive Surfaces	No	UP
W64	Effects of Metal Corrosion	No	UP
W65	Reduction-Oxidation Fronts	No	SO-P
W66	Reduction-Oxidation Kinetics	No	UP

FEP I.D.[a, b, c, d]	FEP Name	Screening Decision Changed?	Screening[e] Classification
W67	Localized Reducing Zones	No	SO-C
W68	Organic Complexation	No	UP
W69	Organic Ligands	No	UP
W70	Humic and Fulvic Acids	No	UP
W71	Kinetics of Organic Complexation	No	SO-C
W72	Exothermic Reactions	No	SO-C
W73	Concrete Hydration	No	SO-C
W74	Chemical Degradation of Shaft Seals	No	UP
W75	Chemical Degradation of Backfill	No	SO-C
W76	Microbial Growth on Concrete	No	UP
W77	Solute Transport	No	UP
W78	Colloid Transport	No	UP
W79	Colloid Formation and Stability	No	UP
W80	Colloid Filtration	No	UP
W81	Colloid Sorption	No	UP
W82	Suspensions of Particles	No	DP
W83	Rinse	No	SO-C
W84	Cuttings	No	DP
W85	Cavings	No	DP
W86	Spallings	No	DP
W87	Microbial Transport	No	UP
W88	Biofilms	No	SO-C Beneficial
W89	Transport of Radioactive Gases	No	SO-C
W90	Advection	No	UP
W91	Diffusion	No	UP
W92	Matrix Diffusion	No	UP
W93	Soret Effect	No	SO-C
W94	Electrochemical Effects	No	SO-C
W95	Galvanic Coupling (Outside the Repository)	No	SO-P
W96	Electrophoresis	No	SO-C
W97	Chemical Gradients	No	SO-C
W98	Osmotic Processes	No	SO-C
W99	Alpha Recoil	No	SO-C

FEP I.D.[a, b, c, d]	FEP Name	Screening Decision Changed?	Screening[e] Classification
W100	Enhanced Diffusion	No	SO-C
W101	Plant Uptake	No	SO-R (for section 191.13) SO-C (for section 191.15)
W102	Animal Uptake	No	SO-R (for section 191.13) SO-C (for section 191.15)
W103	Accumulation in Soils	No	SO-C Beneficial (for section 191.13) SO-C (for section 191.15)
W104	Ingestion	No	SO-R SO-C (for section 191.15)
W105	Inhalation	No	SO-R SO-C (for section 191.15)
W106	Irradiation	No	SO-R SO-C (for section 191.15)
W107	Dermal Sorption	No	SO-R SO-C (for section 191.15)
W108	Injection	No	SO-R SO-C (for section 191.15)
W109	Panel Closure Geometry	No	UP
W110	Panel Closure Physical Properties	No	UP
W111	Panel Closure Chemical Composition	No	SO-C Beneficial
W112	Radionuclide Effects on Panel Closures	No	SO-C
W113	Consolidation of Panel Closures	No	UP
W114	Mechanical Degradation of Panel Closures	No	UP
W115	Chemical Degradation of Panel Closures	No	SO-P

a N = Natural FEP

b H = Human-induced event and process (EP)

c W = Waste- and Repository-induced FEP

d FEPs in this column that are not separated by rows represent FEPs that are similar in nature and are discussed and screened as a common group.

e Historic, current, and near-future (HCN)

32.3.2 40 CFR 194.32(b)

The requirements of 40 CFR 194.32(b) specify assumptions regarding the implementation of mining in PA calculations. The PA modeling system used for the mining scenario is similar to that developed for the undisturbed repository scenario, but with a modified Culebra transmissivity field in the controlled area to account for the mining effects. Implementation of the mining scenario has not changed since the CRA-2014. Details regarding how mining processes are represented in PA models are presented in Appendix PA-2014, Section PA-2.3.2.2.1, and Appendix MASS-2014, Section MASS-14.4.

32.3.3 40 CFR 194.32(c)

Title 40 CFR 194.32(c) provides specific time frames for the evaluation of activities that may affect the disposal system. This requirement focuses on activities that have occurred in the past, are occurring, or are expected to occur in the near future. The DOE classifies this time frame as HCN. Because 40 CFR 194.32(e)(1) requires the evaluation of human-induced FEPs during the regulatory time period, the DOE evaluates human-induced FEPs for the period of time spanning from closure of the repository to 10,000 years into the future as well (Future) (see human-initiated FEPs in Table 32-1). Human-initiated EPs are described and considered for both the HCN and Future time frames in Appendix SCR-2014, Section SCR-5.0. The time frames considered in this CRA have not changed from previous applications. Therefore, the DOE is in compliance with the requirements of 40 CFR 194.32(c).

32.3.4 40 CFR 194.32(d)

Low-probability events can be excluded on the basis of the criterion provided in 40 CFR 194.32(d), which states, "performance assessments need not consider processes and events that have less than 1 chance in 10,000 of occurring over 10,000 years." In practice, for most FEPs screened out on the basis of low probability of occurrence, it has not been possible to estimate a meaningful quantitative probability. In the absence of quantitative probability estimates, a qualitative argument must be used. Therefore, there are 22 FEPs screened out using the SO-P criterion for the CRA-2019. There have been no changes to the FEPs screened out on the basis of low probability for the CRA-2019. FEPs screened out on the basis of low probability are listed in Table 32-2.

Table 32-2. FEPs Classified SO-P for the CRA-2019

FEP I.D.	FEP Name
N6	Salt Deformation
N7	Diapirism
N8	Formation of Fractures
N10	Formation of New Faults
N11	Fault Movement
N13	Volcanic Activity
N15	Metamorphic Activity
N18	Deep Dissolution

N20	Breccia Pipes
N21	Collapse Breccias
N29	Saline Intrusion (Hydrogeological Effects)
N30	Freshwater Intrusion (Hydrogeological Effects)
N32	Natural Gas Intrusion
N40	Impact of a Large Meteorite
N62	Glaciation
N63	Permafrost
W14	Nuclear Criticality: Heat
W24	Large Scale Rock Fracturing
W28	Nuclear Explosions
W65	Reduction-Oxidation Fronts
W95	Galvanic Coupling (Outside the Repository)
W115	Chemical Degradation of Panel Closures

32.3.5 40 CFR 194.32(e)

The requirements in 40 CFR 194.32(e) are met by the identification and screening steps as documented in Appendix SCR-2014.

Title 40 CFR 194.32, "Scope of Performance Assessment," requires the identification, selection, screening, and incorporation of all significant processes and events into PA. The DOE has taken a comprehensive approach in meeting the requirements of the section as documented here and in Appendix SCR-2014. The process used is consistent with evaluations of WIPP FEPs in past compliance applications.

In summary, based on the information summarized here, and in detail in Appendix SCR-2014, the DOE continues to comply with all the requirements in 40 CFR 194.32 for the CRA-2019.

32.4 References

(*Indicates a reference than 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. Carlsbad, NM: Carlsbad Area Office. DOE/CAO 1996-2184.

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

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

U.S. Department of Energy (DOE). 2014. Title 40 CFR Part 191 Subparts B and C. Compliance Recertification Application for the Waste Isolation Pilot Plant (March). Carlsbad, NM: Carlsbad Field Office. DOE/WIPP 2014-3503.*

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.

U.S. Environmental Protection Agency (EPA). 2017. 2014 Compliance Recertification Application (2014 CRA) Compliance Application Review Document (CARD for Section 194.32) Scope of Performance Assessment. Washington, DC: Office of Radiation and Indoor Air. EPA Docket FDMS Docket ID No. EPA-HQ-OAR-2014-0609-0074.*