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**Title 40 CFR Part 191  
Subparts B and C  
Compliance Recertification Application 2014  
for the  
Waste Isolation Pilot Plant  
Scope of Performance Assessments  
(40 CFR § 194.32)**



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

**Carlsbad Field Office  
Carlsbad, New Mexico**

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**Compliance Recertification Application 2014**  
**Scope of Performance Assessments**  
**(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
PA	performance assessment
SO-C	screened out-consequence
SO-P	screened out-probability
SO-R	screened out-regulatory
SP	Specific Procedure
UP	undisturbed performance
WIPP	Waste Isolation Pilot Plant

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1 **32.0 Scope of Performance Assessments (40 CFR § 194.32)**

2 **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."

3

4 **32.2 Background**

5 Performance Assessment (PA) is a process that assesses the likelihood that the Waste Isolation  
6 Pilot Plant (WIPP) will meet the release limits specified by 40 CFR 191.13 for 10,000 years after  
7 disposal. The PA process must consider both natural and man-made processes and events which  
8 have an effect on this disposal system.

9 Section 194.32 (U.S. EPA 1996) requires that PAs consider the effects of excavation mining,  
10 drilling fluid injection, and future development of leases. In addition, the PA must also consider  
11 the effects of current activities such as secondary oil recovery methods (waterflooding), disposal  
12 of natural brine, and solution mining to extract brine in the vicinity of the repository. Section  
13 194.32 requires identification of all features, events, and processes (FEPs), or sequences or  
14 combinations of processes and events that could occur during the regulatory time frame that may  
15 affect the repository, and documentation of why certain events or groups of events are not  
16 included, if so warranted.

17 Therefore, the PA methodology for the WIPP includes a process that compiles a comprehensive  
18 list of the FEPs that are relevant to disposal system performance. Those FEPs determined by  
19 screening analysis to have the potential to affect performance are represented in scenarios and

1 quantitative calculations using a system of linked computer models to describe the interaction of  
 2 the repository with the natural system, both with and without human intrusion. For the  
 3 Compliance Certification Application (CCA) (U.S. DOE 1996), the U.S. Department of Energy  
 4 (DOE) first compiled a comprehensive list of FEPs which was then subjected to a screening  
 5 process that eventually lead to the set of relevant FEPs used in PA to demonstrate the WIPP's  
 6 compliance with the long-term disposal standards.

7 The screening criteria shown below were used to determine whether to include FEPs into  
 8 conceptual models and performance scenarios:

- 9 • Screened Out-Regulation (SO-R): For example, future human-initiated events and  
 10 processes (EPs) may be excluded from consideration for regulatory reasons (e.g.,  
 11 deliberate drilling intrusions). 40 CFR § 194.25(a) requires that characteristics of the  
 12 future remain what they are at the time the compliance application is prepared, provided  
 13 that such characteristics are not related to hydrogeologic, geologic, or climatic conditions.
- 14 • Screened Out-Probability (SO-P): 40 CFR § 194.32(d) states that PA need not consider  
 15 processes and events that have less than 1 in 10,000 chance of occurring over 10,000  
 16 years.
- 17 • Screened Out-Consequence (SO-C): The DOE eliminated some FEPs based on their  
 18 consequences according to the following two criteria:
  - 19 - Insignificant Consequences. The DOE eliminated FEPs where there was a  
 20 reasonable expectation that the remaining probability distribution of cumulative  
 21 releases would not be significantly changed by such omissions. These FEPs are  
 22 designated SO-C.
  - 23 - Beneficial FEPs. FEPs that are potentially beneficial to disposal system or  
 24 subsystem performance were eliminated to simplify the analysis. This argument  
 25 may be used when there is uncertainty as to exactly how the FEP should be  
 26 incorporated into assessment calculations, or when incorporation would incur  
 27 unreasonable difficulties. This is considered a conservative decision. These FEPS  
 28 are designated SO-C Beneficial (e.g., the accumulation of radioactive  
 29 contaminants in soils).

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

- 33 • UP includes the predicted behavior of the disposal system assuming it is not disrupted by  
 34 human intrusion or the occurrence of unlikely natural events.
- 35 • DP includes the predicted behavior of the disposal system assuming disruption by human  
 36 intrusion or other actions, including future drilling and mining activities.

37

## 1 **32.3 1998 Certification Decision**

### 2 **32.3.1 40 CFR § 194.32(a)**

3 In the CCA, the DOE discussed the origin and development of the WIPP FEPs list, as well as  
4 well-defined screening criteria in the CCA, Appendix SCR. A list of the WIPP-relevant FEPs is  
5 also provided in the CCA, Chapter 6.0, Section 6.2. The DOE identified approximately 237 FEPs  
6 in three major categories: natural (N), waste- and repository-induced (W), and human-initiated  
7 (H). Of particular importance to the performance of the disposal system were those FEPs dealing  
8 with mining, deep drilling, and shallow drilling, because these FEPs have the greatest potential  
9 for disruption of the repository via inadvertent intrusion. The CCA and supporting documents  
10 illustrated the process used by the DOE to implement the FEPs in scenarios relevant to PA.

11 The U.S. Environmental Protection Agency (EPA) evaluated the adequacy of the natural FEPs  
12 appropriate to the disposal system and how these were considered in the PA. The EPA also  
13 evaluated the DOE's consideration of mining and drilling in the PA. The EPA performed a  
14 critical review of each step in the DOE FEP selection process for the CCA, including  
15 identification and listing of the potentially disruptive FEPs, screening of these FEPs,  
16 combination of FEPs to form scenarios, screening of scenarios, and the final formation of  
17 scenarios for use in the CCA PA.

18 The EPA concluded that the initial FEP list assembled by the DOE was sufficiently  
19 comprehensive. This list appropriately screened out EPs on the basis of probability,  
20 consequence, or regulatory requirements. The EPA concluded that the DOE considered and  
21 incorporated into PA numerous natural EPs, mining, and deep drilling. The EPA concluded that  
22 the DOE considered shallow drilling and appropriately screened it out on the basis of low  
23 consequence. The DOE also appropriately followed regulatory requirements when it did not  
24 consider future fluid injection activities (U.S. EPA 1998a).

### 25 **32.3.2 40 CFR § 194.32(b)**

26 The CCA described how mining is incorporated into the PA, including information on mining  
27 rates and probabilities, the application of institutional controls, hydraulic conductivity variations  
28 as a result of mining, and the extent of minable reserves (see the CCA, Chapter 6.0, Section  
29 6.4.6.2.3). The DOE identified potash as the only natural resource currently being mined near the  
30 WIPP. The DOE used the EPA-specified frequency of mining and probability when considering  
31 changes in hydraulic conductivity up to 1,000 times the base hydraulic conductivity of the  
32 Culebra Dolomite Member of the Rustler Formation (hereafter referred to as Culebra). In its  
33 calculation of the potash area to be mined, the DOE considered minable reserves inside and  
34 outside the controlled area (the CCA, Appendix DEL, Section DEL.4.2.4).

35 In reviewing the DOE's compliance with 40 CFR § 194.32(b), the EPA considered whether the  
36 CCA included a detailed, accurate, and comprehensive analysis of mined resources in the WIPP  
37 area and sufficient information to demonstrate how mining probability was determined.  
38 Specifically, the EPA examined the validity of the DOE's potash reserve estimates, including the  
39 DOE's assumptions regarding potash reserve location, quality, and minable horizons. The EPA  
40 also examined the CCA to determine how hydraulic conductivity in the supra-Salado Formation

1 units was modified to address changes that could be caused by mining over the 10,000-year  
2 regulatory period (U.S. EPA 1998a).

3 The EPA's review of minable reserves found that the DOE identified current minable  
4 thicknesses and horizons near the WIPP. The DOE's estimate roughly corresponds to that  
5 identified in an EPA technical memorandum (Peake 1996). The EPA recognized that this is not  
6 necessarily representative of the entire Delaware Basin, and it is conceivable that additional  
7 reserves could be mined in the WIPP area. However, speculation of this nature would extend to  
8 other horizons or reserves, which is beyond the intent of section 194.32(b). The EPA therefore  
9 concurred with the DOE's approach.

10 The EPA also found that the DOE assumed mined resources will be completely removed from  
11 the controlled area within the century in which mining occurs, and complete removal of mineral  
12 resources was assumed to occur only once over the regulatory time frame, in accordance with  
13 section 194.32(b). The DOE assumed that mining will be done via room and pillar or other  
14 conventional methods, and solution mining of potash will not take place because of  
15 mineralogical and economic constraints.

16 Finally, the EPA determined that mining was properly incorporated in PA through the  
17 application of the 1 to 1,000 multiplier for hydraulic conductivity in the calculated transmissivity  
18 field for the Culebra. The CCA, Appendix TFIELD and related documentation include  
19 information pertinent to this application of the transmissivity multiplier.

### 20 **32.3.3 40 CFR § 194.32(c)**

21 In the CCA, the DOE identified appropriate events and analyses of their effects on the disposal  
22 system, as well as the effects of existing boreholes. The EPA considered how these events  
23 affected the disposal system and whether the DOE addressed the potential for slant drilling. The  
24 EPA also examined whether the DOE addressed potentially exploitable existing leases.

25 The DOE concluded that oil and gas exploration and exploitation and water and potash  
26 exploration are the only human-initiated activities that need to be considered for PA (see the  
27 CCA, Chapter 6.0, Section 6.3.2). The DOE divided human-initiated activities into two  
28 categories: (1) those that have been Historic, Current, and Near-Future (HCN), and (2) those that  
29 may happen in the future after disposal (Future). Human-initiated activities included three  
30 different drilling-related intrusion scenarios used in PA based on the screening analysis,  
31 designated by the DOE as E1, E2, and E1E2 (see the CCA, Chapter 6.0, Section 6.3.2). The E1  
32 scenario assumed penetration of a panel by a borehole drilled through the repository, which then  
33 strikes a brine pocket present in the underlying Castile Formation. The E2 scenario included all  
34 future boreholes that penetrate a panel but do not strike an underlying brine pocket within the  
35 Castile. The E1E2 scenario was defined as the occurrence of multiple boreholes that intersect a  
36 single waste panel, with at least one of the events being an E1 occurrence.

37 The EPA evaluated the DOE's compliance with 40 CFR § 194.32(c) and determined that the  
38 DOE had used a reasonable approach to screen human-initiated activities that might impact the  
39 repository. The EPA concluded that, based on the discussion in the CCA, Appendix SCR, the  
40 DOE considered the appropriate issues, and the technical conclusions reached by the DOE

1 regarding screening of oil and gas exploration and extraction activities were valid (U.S. EPA  
2 1998a).

### 3 **32.3.4 40 CFR § 194.32(d)**

4 The DOE listed FEPs eliminated from PA based on probability, and described why they were not  
5 included. The DOE used this requirement to screen out FEPs such as nuclear criticality, galvanic  
6 coupling, formation of new faults, glaciation, and impact of large meteorites.

7 The EPA examined the screening arguments and information in the CCA, Appendix SCR to  
8 assess the traceability of assumptions, approximations, and measures of uncertainties. The EPA  
9 examined the DOE's approach to determine whether it was well documented and adequately  
10 justified. The EPA examined assigned probabilities to determine whether they were appropriate,  
11 documented, and in accordance with EPA regulatory requirements, and examined the sufficiency  
12 of all data in terms of quantity and adequacy. In conclusion, the EPA concurred with the events  
13 and processes that were screened out by the DOE using the low-probability criterion (U.S EPA  
14 1998a).

### 15 **32.3.5 40 CFR § 194.32(e)**

#### 16 **32.3.5.1 40 CFR § 194.32(e)(1)**

17 40 CFR § 194.32(e)(1) specifies that all potential FEPs that may occur during the regulatory time  
18 period be identified and considered. In this criterion, a time frame of interest is applied to FEPs  
19 that may affect the disposal system. This criterion specifies "the regulatory time frame," which  
20 begins at repository closure and continues for 10,000 years in the future. This is in contrast to  
21 that specified in section 194.32(c), where the time period of interest is HCN.<sup>1</sup>

22 The CCA, Appendix SCR identified the processes and events, or sequences and combinations of  
23 processes and events, included in PA, including natural and human-initiated processes and  
24 events. The CCA, Appendix SCR provided a comprehensive analysis of all FEPs that may affect  
25 WIPP performance. In addition, the CCA, Appendix SCR and its attachments document the  
26 development of the WIPP FEPs list and describe its origin from over 1,200 FEPs identified  
27 through various international repository programs. The broad and comprehensive beginning of  
28 the WIPP FEPs list helps to assure that all potential WIPP-relevant FEPs can be properly  
29 identified. After refinement of the initial list, the DOE's FEP identification process resulted in  
30 approximately 237 FEPs that were retained for screening.

31 The EPA reviewed the DOE's initial FEPs list at each stage of development and review to  
32 determine whether it was comprehensive. In addition, the EPA examined information sources  
33 used by the DOE to compile the FEPs list for completeness and accuracy of technical  
34 information. The EPA concluded that the DOE identified those events and processes, and  
35 sequences or combinations of events and processes, that may occur during the regulatory time  
36 period and affect the repository. The EPA concluded that these FEPs represented those most  
37 critical in terms of affecting the disposal repository (U.S. EPA 1998a).

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<sup>1</sup> Human-initiated FEPs are screened for both the HCN and Future time periods (i.e., 194.32(c) and 194.32(e)(1)).

### 1 **32.3.5.2 40 CFR § 194.32(e)(2)**

2 40 CFR § 194.32(e)(2) states that compliance applications must identify the processes, events or  
3 sequences and combinations of processes and events included in PA. To accomplish this, the  
4 DOE formulated conceptual models and scenarios that incorporated each of the FEPs screened in  
5 during the screening processes detailed in the CCA, Appendix SCR. The DOE developed  
6 scenarios to represent both undisturbed and disturbed system performance. FEPs were included  
7 into scenarios ranging from the effects of deep and shallow drilling and mining to undisturbed  
8 disposal system performance. In the CCA, Chapter 6.0, Section 6.2, Table 6-6, the DOE  
9 identified the specific locations in the CCA where information on the modeling of the individual  
10 FEP can be found.

11 The EPA reviewed the CCA to determine whether FEPs and subsequent scenarios were  
12 appropriately screened, adequately justified, and completely supported. In addition, the EPA  
13 examined combinations of FEPs and scenarios included in PA. The EPA concluded that the DOE  
14 used a process, the Statens Kärnkraftinspektion (SKI) list (modified to suit conditions at the  
15 WIPP site), that identified the processes, events, or sequences, or combinations of processes and  
16 events (Stenhouse, Chapman, and Sumerling 1993). As part of this process, the DOE adequately  
17 addressed and evaluated the effects of mining, deep drilling, and shallow drilling. The DOE  
18 evaluated the FEPs and sequences of FEPs through calculations, estimates of probability, and  
19 comparisons to regulatory requirements. The EPA concluded that the DOE appropriately  
20 identified, listed, and discussed the FEPs and the effects of the sequences and combinations of  
21 FEPs that result in modeled scenarios (U.S. EPA 1998a).

### 22 **32.3.5.3 40 CFR § 194.32(e)(3)**

23 40 CFR § 194.32(e)(3) requires that FEPs not included in PA calculations be adequately  
24 documented and justified. The DOE identified approximately 237 FEPs in the CCA, Appendix  
25 SCR, and the CCA, Chapter 6.0, Section 6.3. For each FEP, the DOE provided a description and  
26 a generalized rationale for screening classifications. Of the 237 FEPs analyzed, 154 were  
27 screened out on the basis of regulations (SO-R), low consequence (SO-C), or probability (SO-P).  
28 The CCA, Appendix SCR included the DOE's screening rationale for each of the 237 CCA  
29 FEPs.

30 To verify the DOE's compliance with this section, the EPA reviewed the information in the  
31 CCA, Appendix SCR and also conducted audits to verify the proper execution of quality  
32 assurance programs for all items and activities important to the containment of waste in the  
33 repository, including items and activities related to FEPs. As a result of these EPA audits, the  
34 EPA concluded that quality assurance programs were properly executed for FEP-related items  
35 and activities, and that the DOE had demonstrated compliance with the requirements of section  
36 194.32 (U.S. EPA 1998a).

## 37 **32.4 Changes in the CRA-2004**

38 For the Compliance Recertification Application of 2004 (CRA-2004) (U.S. DOE 2004) and the  
39 subsequent Performance Assessment Baseline Calculation, the DOE reevaluated all WIPP FEPs  
40 to determine if any had changed or if new FEPs needed to be added. This reevaluation resulted in

1 only a few changes to the FEPs analysis. Wagner, Kirkes, and Martell (Wagner, Kirkes, and  
2 Martell 2003) concluded that of the original 237 FEPs included in the CCA, 106 did not change,  
3 120 required updates to their FEP descriptions and/or screening arguments, and 7 of the original  
4 baseline FEPs screening decisions required a change from their original screening decision. Four  
5 of the original baseline FEPs were deleted or combined with other closely related FEPs, and two  
6 new FEPs were added to the baseline. These two FEPs were previously addressed in an existing  
7 FEP; they were separated for clarity. Therefore, for the CRA-2004, reevaluation resulted in a  
8 new FEPs baseline consisting of 235 FEPs, but did not change the CCA conceptual models or  
9 the scenarios developed for PA.

## 10 **32.5 EPA's Evaluation of Compliance for the 2004 Recertification**

11 For the CRA-2004, the DOE applied the same approach that was used for the CCA to develop  
12 and screen the list of FEPs that may have an effect on the disposal system. Since the WIPP FEPs  
13 were previously evaluated and approved in the initial certification process, the EPA focused its  
14 recertification review on the FEPs that had changed since the 1998 Certification Decision (U.S.  
15 EPA 1998b). The EPA verified that the DOE's FEP development and review process was  
16 fundamentally the same as the CCA process, and verified that the DOE's reevaluation properly  
17 considered changes since the original certification decision in 1998. The EPA verified that any  
18 changes to FEP screening arguments or FEP-related discussions were reasonable, appropriate,  
19 and complete.

20 The EPA received one public comment related to the scope of PA. Some stakeholders proposed  
21 that karst (FEP N20) should be included in the PA conceptual model development. The EPA  
22 reevaluated karst issues raised by stakeholders from the CCA, as well as new information made  
23 available since the original certification decision. The EPA's review is discussed in the  
24 Technical Support Document for Section 194.14: Evaluation of Karst at the WIPP Site (U.S.  
25 EPA 2006a). After a thorough review, the EPA determined that karst should not be screened  
26 into the PA process.

27 Based on a review and evaluation of the CRA-2004 and supplemental information provided by  
28 the DOE, the EPA determined that the DOE continued to comply with the requirements for  
29 section 194.32 (U.S. EPA 2006b and U.S. EPA 2006c).

## 30 **32.6 Changes or New Information Between the CRA-2004 and the CRA-2009** 31 **(Previously: Changes or New Information Since the 2004 Recertification)**

32 For the CRA-2009 (U.S. DOE 2009), the DOE identified all PA changes implemented since the  
33 CRA-2004 and determined their impacts to the FEPs baseline (Kirkes 2008). This assessment  
34 was very similar to the process used for the CRA-2004. The FEPs baseline was maintained  
35 according to Sandia National Laboratories Specific Procedure (SP) 9-4, *Performing FEPs*  
36 *Baseline Impact Assessments for Planned and Unplanned Changes* (Kirkes 2006). Any changes  
37 that affect the FEPs baseline were detailed in Appendix SCR-2009. As a result of the  
38 reevaluation, 35 FEPs were updated with new information, one screening argument was changed  
39 to correct errors discovered during review, and the screening decision for one FEP was changed  
40 from SO-R to SO-C. This latter change had no impact on PA calculations because the FEP  
41 continued to be excluded from PA, albeit via different screening rationale. Finally, there were 10

1 FEPs that were split into 20 similar but more specific FEPs. For the CRA-2009, there were 70  
2 Natural FEPs, 61 Human-initiated EPs, and 114 Waste and Repository FEPs, resulting in 245  
3 WIPP FEPs.

#### 4 **32.7 EPA's Evaluation of Compliance for the 2009 Recertification**

5 For the CRA-2009, the EPA reviewed and verified the process that the DOE used to determine  
6 the set of FEPs that might have an effect on the disposal system. This process was essentially  
7 the same as used for the CCA and the CRA-2004, and resulted in 245 FEPs retained for  
8 evaluation in the CRA-2009. Since it had previously evaluated and approved this process, the  
9 EPA focused its 2009 recertification review on the FEPs that have changed since the 2004  
10 Recertification Decision. The EPA verified that any changes to FEP screening arguments or  
11 FEP-related discussions were reasonable, appropriate and complete, and determined that the  
12 DOE was in compliance with the requirements of 40 CFR § 194.32. The EPA received one  
13 public comment stating that karst (FEP N20) should be included in PA conceptual models. The  
14 EPA concurred with the DOE's position that karst at the WIPP should not be included in  
15 performance calculations (U.S. EPA 2010). Based on a review and evaluation of the CRA-2009  
16 and supplemental information provided by the DOE, the EPA determined that the DOE  
17 continued to comply with the requirements of section 194.32 (U.S. EPA 2010).

#### 18 **32.8 Changes or New Information since the CRA-2009**

##### 19 **32.8.1 40 CFR § 194.32(a)**

20 For the CRA-2014, changes to the WIPP baseline were identified and evaluated to determine  
21 their impact upon the WIPP FEPs baseline (Kirkes 2013a). The FEPs baseline continues to be  
22 maintained according to Sandia National Laboratories SP 9-4, *Performing FEPS Baseline Impact*  
23 *Assessments for Planned and Unplanned Changes* (Kirkes 2013b)<sup>2</sup>. This reevaluation process is  
24 the same process that was used for the CRA-2004 and CRA-2009 FEP assessments. For the  
25 CRA-2014, there are 70 Natural FEPs, 61 Human-initiated EPs, and 114 Waste and Repository  
26 FEPs, resulting in 245 WIPP FEPs. These are the same 245 FEPs retained for screening in the  
27 CRA-2009. There have been no additions or deletions. However, 61 of these FEPs have been  
28 updated in some way. The current FEPs baseline is presented in Appendix SCR-2014. Table  
29 32-1 lists the CRA-2014 FEPs and their screening decisions, and summarizes any changes to  
30 related information since the CRA-2009.

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<sup>2</sup> Note: Revision 3 of SP 9-4 was developed in response to EPA comments on the CRA-2009 Section 32, which identified inconsistencies in the documentation requirements as specified in SP 9-4 Revision 2.

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.</b> <sup>a,b,c,d</sup>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
N1	Stratigraphy	No change	No	UP
N2	Brine Reservoirs	Updated by new PA parameter GLOBAL:PBRI NE	No	DP
N3	Changes in Regional Stress	No change	No	SO-C
N4	Regional Tectonics	No change	No	SO-C
N5	Regional Uplift and Subsidence	No change	No	SO-C
N6	Salt Deformation	No change	No	SO-P
N7	Diapirism	No change	No	SO-P
N8	Formation of Fractures	No change	No	SO-P UP (Repository)
N9	Changes in Fracture Properties	No change	No	SO-C UP (Near Repository)
N10	Formation of New Faults	No change	No	SO-P
N11	Fault Movement	No change	No	SO-P
N12	Seismic Activity	Updated with new seismic data	No	UP
N13	Volcanic Activity	No change	No	SO-P
N14	Magmatic Activity	No change	No	SO-C
N15	Metamorphic Activity	No change	No	SO-P
N16	Shallow Dissolution	No change	No	UP
N18	Deep Dissolution	No change	No	SO-P
N20	Breccia Pipes	No change	No	SO-P
N21	Collapse Breccias	No change	No	SO-P
N22	Fracture Infills	No change	No	SO-C - Beneficial
N23	Saturated Groundwater Flow	No change	No	UP
N24	Unsaturated Groundwater Flow	No change	No	UP
N25	Fracture Flow	No change	No	UP
N27	Effects of Preferential Pathways	No change	No	UP
N26	Density Effects on Groundwater Flow	No change	No	SO-C
N28	Thermal Effects on Groundwater Flow	No change	No	SO-C
N29	Saline Intrusion (Hydrogeological Effects)	No change	No	SO-P

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.</b> <sup>a,b,c, d</sup>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
N30	Freshwater Intrusion (Hydrogeological Effects)	No change	No	SO-P
N31	Hydrological Response to Earthquakes	No change	No	SO-C
N32	Natural Gas Intrusion	No change	No	SO-P
N33	Groundwater Geochemistry	No change	No	UP
N34	Saline Intrusion (Geochemical Effects)	No change	No	SO-C
N38	Effects of Dissolution	No change	No	SO-C
N35	Freshwater Intrusion (Geochemical Effects)	No change	No	SO-C
N36	Changes in Groundwater Eh	No change	No	SO-C
N37	Changes in Groundwater pH	No change	No	SO-C
N39	Physiography	No change	No	UP
N40	Impact of a Large Meteorite	No change	No	SO-P
N41	Mechanical Weathering	No change	No	SO-C
N42	Chemical Weathering	No change	No	SO-C
N43	Aeolian Erosion	No change	No	SO-C
N44	Fluvial Erosion	No change	No	SO-C
N45	Mass Wasting (Erosion)	No change	No	SO-C
N46	Aeolian Deposition	No change	No	SO-C
N47	Fluvial Deposition	No change	No	SO-C
N48	Lacustrine Deposition	No change	No	SO-C
N49	Mass Wasting (Deposition)	No change	No	SO-C
N50	Soil Development	No change	No	SO-C
N51	Stream and River Flow	No change	No	SO-C
N52	Surface Water Bodies	No change	No	SO-C
N53	Groundwater Discharge	No change	No	UP
N54	Groundwater Recharge	No change	No	UP
N55	Infiltration	No change	No	UP
N56	Changes in Groundwater Recharge and Discharge	No change	No	UP
N57	Lake Formation	No change	No	SO-C
N58	River Flooding	No change	No	SO-C
N59	Precipitation (e.g., Rainfall)	No change	No	UP
N60	Temperature	No change	No	UP
N61	Climate Change	No change	No	UP

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.</b> <sup>a,b,c,d</sup>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
N62	Glaciation	No change	No	SO-P
N63	Permafrost	No change	No	SO-P
N64	Seas and Oceans	No change	No	SO-C
N65	Estuaries	No change	No	SO-C
N66	Coastal Erosion	No change	No	SO-C
N67	Marine Sediment Transport and Deposition	No change	No	SO-C
N68	Sea Level Changes	No change	No	SO-C
N69	Plants	No change	No	SO-C
N70	Animals	No change	No	SO-C
N71	Microbes	No change	No	SO-C (UP - for colloidal effects and gas generation)
N72	Natural Ecological Development	No change	No	SO-C
H1	Oil and Gas Exploration	Updated with new drilling rate	No	SO-C (HCN) DP (Future)
H2	Potash Exploration	No change	No	SO-C (HCN) DP (Future)
H4	Oil and Gas Exploitation	Updated with new drilling rate	No	SO-C (HCN) DP (Future)
H8	Other Resources	No change	No	SO-C (HCN) DP (Future)
H9	Enhanced Oil and Gas Recovery	No change	No	SO-C (HCN) DP (Future)
H3	Water Resources Exploration	Updated with most recent monitoring information	No	SO-C (HCN) SO-C (Future)
H5	Groundwater Exploitation	Updated with most recent monitoring information	No	SO-C (HCN) SO-C (Future)
H6	Archaeological Investigations	No change	No	SO-R (HCN) SO-R (Future)
H7	Geothermal	No change	No	SO-R (HCN) SO-R (Future)
H10	Liquid Waste Disposal	No change	No	SO-R (HCN) SO-R (Future)
H11	Hydrocarbon Storage	No change	No	SO-R (HCN) SO-R (Future)

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.</b> <sup>a,b,c, d</sup>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
H12	Deliberate Drilling Intrusion	No change	No	SO-R (HCN) SO-R (Future)
H13	Conventional Underground Potash Mining	No change	No	UP (HCN) DP (Future)
H14	Other Resources (Mining For)	No change	No	SO-C (HCN) SO-R (Future)
H15	Tunneling	No change	No	SO-R (HCN) SO-R (Future)
H16	Construction of Underground Facilities (For Example, Storage, Disposal, Accommodation)	No change	No	SO-R (HCN) SO-R (Future)
H17	Archaeological Excavations	No change	No	SO-C (HCN) SO-R (Future)
H18	Deliberate Mining Intrusion	No change	No	SO-R (HCN) SO-R (Future)
H19	Explosions for Resource Recovery	No change	No	SO-C (HCN) SO-R (Future)
H20	Underground Nuclear Device Testing	No change	No	SO-C (HCN) SO-R (Future)
H21	Drilling Fluid Flow	No change	No	SO-C (HCN) DP (Future)
H22	Drilling Fluid Loss	No change	No	SO-C (HCN) DP (Future)
H23	Blowouts	Updated with new parameter GLOBAL:PBRI NE	No	SO-C (HCN) DP (Future)
H24	Drilling-Induced Geochemical Changes	No change	No	UP (HCN) DP (Future)
H25	Oil and Gas Extraction	No change	No	SO-C (HCN) SO-R (Future)
H26	Groundwater Extraction	No change	No	SO-C (HCN) SO-R (Future)
H27	Liquid Waste Disposal–Outside Boundary (OB)	No change	No	SO-C (HCN) SO-C (Future)
H28	Enhanced Oil and Gas Production–OB	No change	No	SO-C (HCN) SO-C (Future)
H29	Hydrocarbon Storage–OB	No change	No	SO-C (HCN) SO-C (Future)
H60	Liquid Waste Disposal–Inside Boundary (IB)	No change	No	SO-R (HCN) SO-R (Future)

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.</b> <sup>a,b,c,d</sup>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
H61	Enhanced Oil and Gas Production–IB	No change	No	SO-R (HCN) SO-R (Future)
H62	Hydrocarbon Storage–IB	No change	No	SO-R (HCN) SO-R (Future)
H30	Fluid-Injection Induced Geochemical Changes	No change	No	UP (HCN) SO-R (Future)
H31	Natural Borehole Fluid Flow	Updated to reflect new plugging probabilities	No	SO-C (HCN) SO-C (Future, holes not penetrating waste panels) DP (Future, holes penetrating panels)
H32	Waste-Induced Borehole Flow	Updated to reflect new plugging probabilities	No	SO-R (HCN) DP (Future)
H34	Borehole-Induced Solution and Subsidence	No change	No	SO-C (HCN) SO-C (Future)
H35	Borehole-Induced Mineralization	No change	No	SO-C (HCN) SO-C (Future)
H36	Borehole-Induced Geochemical Changes	No change	No	UP (HCN) DP (Future) SO-C (for units other than the Culebra)
H37	Changes in Groundwater Flow Due to Mining	No change	No	UP (HCN) DP (Future)
H38	Changes in Geochemistry Due to Mining	No change	No	SO-C (HCN) SO-R (Future)
H39	Changes in Groundwater Flow Due to Explosions	No change	No	SO-C (HCN) SO-R (Future)
H40	Land Use Changes	No change	No	SO-R (HCN) SO-R (Future)
H41	Surface Disruptions	No change	No	UP (HCN) SO-C (Future)
H42	Damming of Streams or Rivers	No change	No	SO-C (HCN) SO-R (Future)
H43	Reservoirs	No change	No	SO-C (HCN) SO-R (Future)
H44	Irrigation	No change	No	SO-C (HCN) SO-R (Future)
H45	Lake Usage	No change	No	SO-R (HCN) SO-R (Future)

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.</b> <sup>a,b,c,d</sup>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
H46	Altered Soil or Surface Water Chemistry by Human Activities	No change	No	SO-C (HCN) SO-R (Future)
H47	Greenhouse Gas Effects	No change	No	SO-R (HCN) SO-R (Future)
H48	Acid Rain	No change	No	SO-R (HCN) SO-R (Future)
H49	Damage to the Ozone Layer	No change	No	SO-R (HCN) SO-R (Future)
H50	Coastal Water Use	No change	No	SO-R (HCN) SO-R (Future)
H51	Sea Water Use	No change	No	SO-R (HCN) SO-R (Future)
H52	Estuarine Water Use	No change	No	SO-R (HCN) SO-R (Future)
H53	Arable Farming	No change	No	SO-C (HCN) SO-R (Future)
H54	Ranching	No change	No	SO-C (HCN) SO-R (Future)
H55	Fish Farming	No change	No	SO-R (HCN) SO-R (Future)
H56	Demographic Change and Urban Development	No change	No	SO-R (HCN) SO-R (Future)
H57	Loss of Records	No change	No	NA (HCN) DP (Future)
H58	Solution Mining for Potash	Updated with information regarding solution mining activities in the region	No	SO-R (HCN) SO-R (Future)
H59	Solution Mining for Other Resources	Updated with new information regarding brine wells in the region	No	SO-C (HCN) SO-C (Future)
W1	Disposal Geometry	Updated with new information regarding additional mined area used for experiments	No	UP

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.</b> <sup>a,b,c, d</sup>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
W2	Waste Inventory	Updated to reflect the inventory data sources used for the CRA-2014 PA	No	UP
W3	Heterogeneity of Waste Forms	Updated to reflect the inventory data sources used for the CRA-2014 PA	No	DP
W4	Container Form	Updated to reflect the inventory data sources used for the CRA-2014 PA	No	SO-C – Beneficial
W5	Container Material Inventory	Updated to reflect the inventory data sources used for the CRA-2014 PA	No	UP
W6	Shaft Seal Geometry	No change	No	UP
W7	Shaft Seal Physical Properties	No change	No	UP
W109	Panel Closure Geometry	Updated with new information on panel closure design	No	UP
W110	Panel Closure Physical Properties	Updated with new information on panel closure design	No	UP
W8	Shaft Seal Chemical Composition	No change	No	SO-C Beneficial
W111	Panel Closure Chemical Composition	Updated with new information on panel closure design	No	SO-C Beneficial
W9	Backfill Physical Properties	No change	No	SO-C

**Table 32-1. FEPs Summary for CRA-2014**

EPA FEP I.D. <sup>a,b,c, d</sup>	FEP Name	Screening Argument Update?	Screening Decision Changed?	Screening Classification
W10	Backfill Chemical Composition	Updated to reflect implementation of water balance in PA	No	UP
W11	Post-Closure Monitoring	No change	No	SO-C
W12	Radionuclide Decay and In-Growth	No change	No	UP
W13	Heat from Radioactive Decay	Updated to reflect the inventory used for the CRA-2014 PA	No	SO-C
W14	Nuclear Criticality: Heat	Updated to reflect the inventory used for the CRA-2014 PA	No	SO-P
W15	Radiological Effects on Waste	Updated to reflect the inventory used for the CRA-2014 PA	No	SO-C
W16	Radiological Effects on Containers	Updated to reflect the inventory used for the CRA-2014 PA	No	SO-C
W17	Radiological Effects on Shaft Seals	Updated to reflect the inventory used for the CRA-2014 PA	No	SO-C
W112	Radionuclide Effects on Panel Closures	Updated to reflect the inventory used for the CRA-2014 PA	No	SO-C
W18	Disturbed Rock Zone (DRZ)	Updated to include new panel closure implementation	No	UP
W19	Excavation-Induced Changes in Stress	Updated to include new panel closure implementation	No	UP

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.<sup>a,b,c,d</sup></b>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
W20	Salt Creep	Updated to include new panel closure implementation	No	UP
W21	Changes in the Stress Field	Updated to include new panel closure implementation	No	UP
W22	Roof Falls	No change	No	UP
W23	Subsidence	No change	No	SO-C
W24	Large Scale Rock Fracturing	No change	No	SO-P
W25	Disruption Due to Gas Effects	No change	No	UP
W26	Pressurization	Updated to reference new corrosion experiments and associated parameters	No	UP
W27	Gas Explosions	No change	No	UP
W28	Nuclear Explosions	Updated to reflect the inventory used for the CRA-2014 PA	No	SO-P
W29	Thermal Effects on Material Properties	Updated to reflect the inventory used for the CRA-2014 and planned thermal experiments	No	SO-C
W30	Thermally Induced Stress Changes	Updated to reflect the inventory used for the CRA-2014 and planned thermal experiments	No	SO-C

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.</b> <sup>a,b,c, d</sup>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
W31	Differing Thermal Expansion of Repository Components	Updated to reflect the inventory used for the CRA-2014 and planned thermal experiments	No	SO-C
W72	Exothermic Reactions	Updated to reflect the inventory used for the CRA-2014 and planned thermal experiments	No	SO-C
W73	Concrete Hydration	Updated to reflect the inventory used for the CRA-2014 and planned thermal experiments	No	SO-C
W32	Consolidation of Waste	No change	No	UP
W36	Consolidation of Shaft Seals	No change	No	UP
W37	Mechanical Degradation of Shaft Seals	No change	No	UP
W39	Underground Boreholes	No change	No	UP
W113	Consolidation of Panel Closures	Updated screening argument with new information regarding panel closure composition	No	UP
W114	Mechanical Degradation of Panel Closures	Updated screening argument with new information regarding panel closure composition	No	UP
W33	Movement of Containers	Updated to reference new inventory data	No	SO-C
W34	Container Integrity	No change	No	SO-C Beneficial

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.<sup>a,b,c,d</sup></b>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
W35	Mechanical Effects of Backfill	No change	No	SO-C
W40	Brine Inflow	Updated to reflect water balance implementation in PA	No	UP
W41	Wicking	Updated to reflect water balance implementation in PA	No	UP
W42	Fluid Flow Due to Gas Production	Updated to reflect water balance implementation in PA and new steel corrosion rates	No	UP
W43	Convection	Updated to reflect planned thermal experiments	No	SO-C
W44	Degradation of Organic Material	Updated to reference new inventory data	No	UP
W45	Effects of Temperature on Microbial Gas Generation	Updated to reference new inventory data	No	UP
W48	Effects of Biofilms on Microbial Gas Generation	Updated to reference new inventory data	No	UP
W46	Effects of Pressure on Microbial Gas Generation	No change	No	SO-C
W47	Effects of Radiation on Microbial Gas Generation	Updated with new radionuclide inventory and information related to the EPA request for additional information on CRA-2009	No	SO-C

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.</b> <sup>a,b,c,d</sup>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
W49	Gases from Metal Corrosion	Updated to reference new corrosion experiments and inventory	No	UP
W51	Chemical Effects of Corrosion	Updated to reference new corrosion experiments and inventory	No	UP
W50	Galvanic Coupling (Within the Repository)	No change	No	SO-C
W52	Radiolysis of Brine	No change	No	SO-C
W53	Radiolysis of Cellulose	Screening argument updated with new radionuclide inventory	No	SO-C
W54	Helium Gas Production	Screening argument updated with new radionuclide inventory	No	SO-C
W55	Radioactive Gases	Updated to reference new inventory data	No	SO-C
W56	Speciation	Reference made to new solubility calculations based on new inventory components	No	UP in disposal rooms and Culebra. SO-C elsewhere, and SO-C Beneficial in cementitious seals
W57	Kinetics of Speciation	No change	No	SO-C
W58	Dissolution of Waste	No change	No	UP
W59	Precipitation of Secondary Minerals	No change	No	SO-C Beneficial
W60	Kinetics of Precipitation and Dissolution	No change	No	SO-C
W61	Actinide Sorption	No change	No	UP in the Culebra and Dewey Lake; SO-C—Beneficial in the disposal room, shaft seals, panel closures, and other geologic units.

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.</b> <sup>a,b,c,d</sup>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
W62	Kinetics of Sorption	No change	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 change	No	UP
W64	Effects of Metal Corrosion	No change	No	UP
W66	Reduction-Oxidation Kinetics	No change	No	UP
W65	Reduction-Oxidation Fronts	No change	No	SO-P
W67	Localized Reducing Zones	No change	No	SO-C
W68	Organic Complexation	Updated to reflect implementation of variable brine volume in PA	No	UP
W69	Organic Ligands	Updated to reflect implementation of variable brine volume, new inventory data	No	UP
W71	Kinetics of Organic Complexation	No change	No	SO-C
W70	Humic and Fulvic Acids	No change	No	UP
W74	Chemical Degradation of Shaft Seals	No change	No	UP
W76	Microbial Growth on Concrete	No change	No	UP
W115	Chemical Degradation of Panel Closures	Updated screening argument with new panel closure materials	Yes	SO-P
W75	Chemical Degradation of Backfill	No change	No	SO-C
W77	Solute Transport	No change	No	UP
W78	Colloid Transport	No change	No	UP
W79	Colloid Formation and Stability	No change	No	UP

**Table 32-1. FEPs Summary for CRA-2014**

<b>EPA FEP I.D.</b> <sup>a,b,c, d</sup>	<b>FEP Name</b>	<b>Screening Argument Update?</b>	<b>Screening Decision Changed?</b>	<b>Screening Classification</b>
W80	Colloid Filtration	No change	No	UP
W81	Colloid Sorption	No change	No	UP
W82	Suspensions of Particles	No change	No	DP
W83	Rinse	No change	No	SO-C
W84	Cuttings	No change	No	DP
W85	Cavings	Updated with new waste shear strength data	No	DP
W86	Spallings	Updated with new water balance implementation	No	DP
W87	Microbial Transport	No change	No	UP
W88	Biofilms	No change	No	SO-C Beneficial
W89	Transport of Radioactive Gases	Updated to reference CRA-2014 inventory data	No	SO-C
W90	Advection	No change	No	UP
W91	Diffusion	No change	No	UP
W92	Matrix Diffusion	No change	No	UP
W93	Soret Effect	Updated based on new inventory data	No	SO-C
W94	Electrochemical Effects	No change	No	SO-C
W95	Galvanic Coupling (Outside the Repository)	No change	No	SO-P
W96	Electrophoresis	No change	No	SO-C
W97	Chemical Gradients	No change	No	SO-C
W98	Osmotic Processes	No change	No	SO-C
W99	Alpha Recoil	No change	No	SO-C
W100	Enhanced Diffusion	No change	No	SO-C
W101	Plant Uptake	No change	No	SO-R (for section 191.13) SO-C (for section 191.15)
W102	Animal Uptake	No change	No	SO-R (for section 191.13) SO-C (for section 191.15)

**Table 32-1. FEPs Summary for CRA-2014**

EPA FEP I.D. <sup>a,b,c,d</sup>	FEP Name	Screening Argument Update?	Screening Decision Changed?	Screening Classification
W103	Accumulation in Soils	No change	No	SO-C Beneficial (for section 191.13) SO-C (for section 191.15)
W104	Ingestion	No change	No	SO-R SO-C (for section 191.15)
W105	Inhalation	No change	No	SO-R SO-C (for section 191.15)
W106	Irradiation	No change	No	SO-R SO-C (for section 191.15)
W107	Dermal Sorption	No change	No	SO-R SO-C (for section 191.15)
W108	Injection	No change	No	SO-R SO-C (for section 191.15)

<sup>a</sup> N = Natural FEP

<sup>b</sup> H = Human-induced event and process (EP)

<sup>c</sup> W = Waste- and Repository-induced FEP

<sup>d</sup> 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.

1

2 **32.8.2 40 CFR § 194.32(b)**

3 The requirements of section 194.32(b) specify assumptions regarding the implementation of  
 4 mining in PA calculations. The PA modeling system used for the mining scenario is similar to  
 5 that developed for the undisturbed repository scenario, but with a modified Culebra  
 6 transmissivity field in the controlled area to account for the mining effects. Implementation of  
 7 the mining scenario has not changed since the CRA-2009 Performance Assessment Baseline  
 8 Calculation. Details regarding how mining processes are represented in PA models are described  
 9 in Appendix PA-2014, Section PA-2.3.2.2.1, and Appendix MASS-2014, Section MASS-15.1.  
 10 FEPs related to the presence of resources are described and considered in Appendix SCR-2014,  
 11 Section SCR-5.0.

12 **32.8.3 40 CFR § 194.32(c)**

13 Section 194.32(c) provides specific time frames for the evaluation of activities that may affect  
 14 the disposal system. This requirement focuses on activities that have occurred in the past, are  
 15 occurring, or are expected to occur in the near future. The DOE classifies this time frame as  
 16 HCN. Because section 194.32(e)(1) requires the evaluation of human-initiated EPs during the

1 regulatory time period, the DOE evaluates human-initiated FEPs for the period of time spanning  
 2 from closure of the repository to 10,000 years into the future as well (Future) (see human-  
 3 initiated EPs in Table 32-1). Human-initiated EPs are described and considered for both the  
 4 HCN and Future time frames in Appendix SCR-2014, Section SCR-5.0. Therefore, the DOE is  
 5 in compliance with the requirements of section 194.32(c).

6 **32.8.4 40 CFR § 194.32(d)**

7 Low-probability events can be excluded on the basis of the criterion provided in 40 CFR  
 8 § 194.32(d), which states, “performance assessments need not consider processes and events that  
 9 have less than one chance in 10,000 of occurring over 10,000 years.” In practice, for most FEPs  
 10 screened out on the basis of low probability of occurrence, it has not been possible to estimate a  
 11 meaningful quantitative probability. In the absence of quantitative probability estimates, a  
 12 qualitative argument was used. One FEP has been added to this screening classification since the  
 13 CRA-2009. W115 Chemical Degradation of Panel Closures has been reclassified from UP to  
 14 SO-P due to the newly designed panel closure system and its run-of-mine salt composition.  
 15 Therefore, there are 22 FEPs screened using the SO-P criterion for the CRA-2014. FEPs  
 16 screened out on the basis of low probability are listed in Table 32-2.

17 **Table 32-2. FEPs Classified SO-P for the CRA-2014**

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

18

1 **32.8.5 40 CFR § 194.32(e)**

2 The requirements in section 194.32(e) are met by the analyses of FEPs as documented in  
3 Appendix SCR-2014. Table 32-1 lists the CRA-2014 FEPs and summarizes any changes to  
4 screening decisions and arguments.

5 Section 194.32, “Scope of Performance Assessment,” requires the identification, selection,  
6 screening, and incorporation of all significant processes and events into PA. The DOE has taken  
7 a comprehensive approach in meeting the requirements of the section as documented here and in  
8 Appendix SCR-2014. The process used is consistent with evaluations of WIPP FEPs in past  
9 compliance applications. Any new information that relates to WIPP FEPs is identified and  
10 incorporated into PA as appropriate.

11 In summary, based on the information in Section 32.8, the DOE continues to comply with all the  
12 requirements in section 194.32 for the CRA-2014.

13 **32.9 References**

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

15 Kirkes, G.R. 2006. *Activity/Project Specific Procedure SP 9-4: Performing FEPs Baseline*  
16 *Impact Assessments for Planned or Unplanned Changes* (Revision 1, June 6). ERMS 543625.  
17 Carlsbad, NM: Sandia National Laboratories.

18 Kirkes, G.R. 2008. *Features, Events and Processes Assessment for the Compliance*  
19 *Recertification Application—2009* (Revision 0). ERMS 550489. Carlsbad, NM: Sandia  
20 National Laboratories.

21 Kirkes, G.R. 2013a. *Features, Events and Processes Assessment for the Compliance*  
22 *Recertification Application—2014* (Revision 0). ERMS 560488. Carlsbad, NM: Sandia  
23 National Laboratories.\*

24 Kirkes, G.R. 2013b. *Activity/Project Specific Procedure SP 9-4: Performing FEPs Baseline*  
25 *Impact Assessments for Planned or Unplanned Changes* (Revision 3, June 19). ERMS 560371.  
26 Carlsbad, NM: Sandia National Laboratories.

27 Peake, Tom. 1996. Memorandum to Docket (Subject: *Examination of Mining and Hydraulic*  
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