Recertification CARD No. 32
Scope of Performance Assessments

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 disposal. The PA process must consider both natural and man-made processes and events which have an effect on this disposal system.

Section 194.32 requires that the PA include the effects of excavation mining, drilling, fluid injection and future development of leases. The PA also must include the effects of current activities such as secondary oil recovery methods (waterflooding), disposal of natural brine, solution mining to extract brine, etc., in the vicinity of the repository. Section 194.32 requires identification of all processes, events, or sequences, and combinations of processes and events that may occur during the regulatory time frame that may affect the repository. The U.S. Department of Energy (DOE or Department) must document why any events or processes, or sequences are not included in the PA.

REQUIREMENTS

(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. PAs 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."

(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."

1998 CERTIFICATION DECISION

194.32(a)

The U.S. Environmental Protection Agency (EPA or Agency) expected the Compliance Certification Application (CCA) to contain a comprehensive and complete features, events and processes (FEPs) source list.

DOE presented a discussion of the screening process for FEPs in CCA Chapter 6.2. DOE identified approximately 237 FEPs, divided into three major categories: natural, waste - and repository-induced, and human -initiated. Of particular importance to the performance of the disposal system were those FEPs dealing with mining, deep drilling, and shallow drilling. The CCA and supporting documents illustrated the process used by DOE to select the features, events and processes (FEPs) and subsequent scenarios relevant to PA. DOE's methodology for demonstrating compliance with Section 194.32(a) was based on the general requirements for FEP and scenario identification stated in the Section 194.32(e). These requirements include the following:

1) Identifying FEPs relevant to the WIPP.
2) Classifying FEPs.
3) Screening FEPs.
4) Combining FEPs to form scenarios.
5) Screening scenarios
6) Selecting scenarios for implementation in the PA.

EPA evaluated the adequacy of the natural events and processes appropriate to the disposal system, and how these were considered in the PA. EPA also evaluated DOE's consideration of mining and drilling in the PA. EPA performed a critical review of each step of the DOE FEP selection process in the CCA, including: identification and listing of the potentially disruptive FEPs; screening of these FEPs; combination of FEPs to form scenarios, screening of scenarios, and the final formation of scenarios formulated for use in the CCA PA.

194.32 (b)

EPA expected the CCA to discuss how mining was incorporated into the performance assessment. This discussion included information on mining rates and probabilities, the application of institutional controls, hydraulic conductivity variations as a result of mining, and the extent of minable reserves. DOE identified potash as the only natural resource currently being mined near the WIPP. DOE used the EPA-specified frequency of mining and probability guidance (CAG p. 43-44) in considering changes in hydraulic conductivity up to 1000 times the base hydraulic conductivity of the Culebra. In its calculation of the potash area to be mined, DOE considered minable reserves inside and outside of the controlled area.

In reviewing DOE's compliance with Section 194.32(b), EPA considered whether the CCA included a detailed, accurate, and comprehensive analysis of mined resources in the WIPP area and sufficient information to demonstrate how mining probability was determined. Specifically, EPA examined the validity of DOE's potash reserve estimates, including DOE's assumptions regarding potash reserve location, quality, and minable horizons. EPA also examined the CCA to determine how hydraulic conductivity within supra-Salado units was modified relative to changes that could be caused by mining over the 10,000-year regulatory period.

194.32(c)

EPA expected the CCA to assess whether appropriate events were identified and considered by DOE and whether the CCA presented analysis of effects on the disposal system and the effects of existing boreholes. EPA considered how these events affected the disposal system and whether DOE addressed the potential for slant drilling. EPA also examined whether DOE addressed potentially exploitable existing leases.

DOE concluded that oil and gas exploration and exploitation and water and potash exploration are the only human-initiated activities that need to be considered for the PA (CCA Chapter 6.7.5). DOE divided human-initiated activities into three categories: (1) those that are currently occurring, (2) those that might be initiated in the operational phase, and (3) those that might be initiated after disposal. Human-initiated activities included three different drilling-related intrusion scenarios used in the PA, based upon the screening analysis, designated by DOE as E1, E2 and E1E2 (CCA Chapter 6, p. 6-77). The E1 scenario assumed penetration of a panel by a borehole drilled through the repository, which then strikes a brine pocket present in the underlying Castile Formation. The E2 scenario included all future boreholes that penetrate a panel but do not strike an underlying brine pocket within the Castile Formation. The E1E2 scenario was defined as the occurrence of multiple boreholes that intersected a single waste panel, with at least one of the events being an E1 occurrence. Refer to Section 194.33(a) in CCA CARD 33—Consideration of Drilling Events in Performance Assessments for additional discussion of the three different drilling-related intrusion scenarios. DOE's approach to mining is discussed in CCA CARD 32, Section 32.B.4.

DOE included an assessment of the potential effects of existing boreholes as part of its FEPs screening analysis in the CCA. DOE concluded that natural borehole fluid flow through abandoned boreholes would be of little consequence during current and operational phase activities. In addition, DOE screened out the occurrence of flow through undetected boreholes

based on low probability. The CCA included CCA Appendix DEL, which described the oil and gas exploration and exploitation activities in the Delaware Basin and immediate WIPP area. This document showed the location of oil and gas wells in the Delaware Basin and WIPP area and included maps presenting the location of existing leases.

DOE provided additional information pertaining to brine extraction (solution mining) not included in the CCA. Although the brine extraction FEP was not explicitly addressed in the CCA, this additional information indicated that brine extraction (solution mining) will not have an impact on the PA, as any changes in disposal system hydraulics caused by brine extraction were already accounted for in Culebra transmissivity and hydraulic head uncertainties.

194.32(d)

EPA expected DOE to list those features, events and processes (FEPs) eliminated from the PA based on probability, and to discuss why they were not included. DOE used this requirement to screen out FEPs such as nuclear criticality, galvanic coupling, formation of new faults, glaciation, and impact of large meteorites.

194.32(e)

EPA expected the CCA to identify the processes and events or sequences and combinations of processes and events included in the performance assessment, including natural and human-initiated processes and events. Evaluations of mining, deep drilling and shallow drilling must be included. EPA expected the CCA to include linkages to PA codes and conceptual models and scenario development. Scenarios are combinations of

FEPs that may be pertinent to the WIPP disposal system. They include combinations pertinent to both disturbed and undisturbed repository performance.

DOE concluded in the CCA that 16 of the 70 natural FEPs should be retained for the PA, including stratigraphy, shallow dissolution, saturated groundwater, infiltration, precipitation, and climate change. Of the 108 waste and repository induced FEPs, DOE concluded that 50 of these should be retained for the PA, including disposal geometry, waste inventory, salt creep, backfill chemical composition, actinide solubility, spallings, and cavings. DOE concluded that 15 of the 57 human-initiated EPs should be retained for the PA, including oil and gas exploration.

DOE assessed scenarios ranging from the effects of deep and shallow drilling and mining to undisturbed disposal system performance. DOE retained the scenarios describing both undisturbed and disturbed system performance. Disturbed performance includes both mining and deep drilling (E1, E2, and E1E2 scenarios). In CCA Chapter 6, Table 6-6, DOE identified the specific locations in the CCA that related to modeling of the individual FEPs. These discussions focus on conceptual model development, but often link these conceptualizations with associated computational (computer) models.

EPA reviewed the CCA to determine whether FEPs and subsequent scenarios were appropriately screened, adequately justified, and completely supported. In addition, EPA

examined combinations of FEPs and scenarios included in the PA. EPA determined that DOE complied with the 40 CFR 194.32 requirements.

A complete description of EPA's 1998 Certification Decision for Section 194.32 can be obtained from Docket A-93-02, Items V-A-1 and V-B-2.

CHANGES IN THE CRA

For the 2004 Compliance Recertification Application (2004 CRA) and the new Performance Assessment Baseline Calculation (PABC), DOE reevaluated all FEPs related to WIPP to determine if any had changed or new FEPs needed to be added. DOE's reevaluation resulted in only a few changes to the FEPs analysis. Some FEPs have had more information added, a few FEPs were deleted and merged with other FEPs and a few new FEPs have been added (See Table 32.5 below).

Tables 32-1 to 32-4 list FEPs to which DOE applied the 40 CFR 194.32 (a) to (d) screening arguments (See CRA Appendix PA, Attachment SCR). DOE methods, screening arguments, and conclusions are essentially the same as the CCA results for the applied screening arguments for 40 CFR 193.32(a) through (d). See CCA CARD 32 and 2004 CRA, Chapter 6, Appendix PA and Attachment SCR for details of the methods used to do this evaluation.

Table 32-1 FEPs 40 CFR 194.32(a) Applied

FEP ID	FEP Name	Screening Decision	Regulatory Citation	Attachment SCR Reference
H17	Archeological Excavations	SO-R(Future)	40 CFR 194.32(a)	5.1.2.4.3
H20	Underground Nuclear Device Testing	SO-R(Future)	40 CFR 194.32(a)	5.1.3.2.3.2
H39	Changes in Groundwater Flow due to Explosions	SO-R(Future)	40 CFR 194.32(a)	5.2.3.1.3.2
H42	Damming of Streams and Rivers	SO-R(Future)	40 CFR 194.32(a)	5.4.1.1.5
H43	Reservoirs	SO-R(Future)	40 CFR 194.32(a)	5.4.1.1.5
H44	Irrigation	SO-R(Future)	40 CFR 194.32(a)	5.4.1.1.5
H45	Lake Usage	SO-R(Future)	40 CFR 194.32(a)	5.4.1.2.5
H46	Altered Soil or Surface Water Chemistry by Human Actions	SO-R(Future)	40 CFR 194.32(a)	5.4.1.3.5
H50	Coastal Water Use	SO-R(Future)	40 CFR 194.32(a)	5.6.1.1.5
H51	Seawater Use	SO-R(Future)	40 CFR 194.32(a)	5.6.1.1.5
H52	Estuarine Water	SO-R(Future)	40 CFR 194.32(a)	5.6.1.1.5
H53	Arable Farming	SO-R(Future)	40 CFR 194.32(a)	5.7.1.1.5
H54	Ranching	SO-R(Future)	40 CFR 194.32(a)	5.7.1.1.5
H55	Fish Farming	SO-R(Future)	40 CFR 194.32(a)	5.7.1.1.5

Table 32-2 FEPs 40 CFR 194.32(b) Applied

FEP ID	FEP Name	Screening Decision	Regulatory Citation	Attachment SCR Reference
H37	Changes in Groundwater Flow due to Mining	DP(Future)	40 CFR 194.32(b)	5.2.2.1.4
H38	Changes in Geochemistry Due to Mining	SO-R(Future)	40 CFR 194.32(b)	5.2.2.2.3.3

Table 32-3 FEPs 40 CFR 194.32(c) Applied

FEP ID	FEP Name	Screening Decision	Regulatory Citation	Attachment SCR Reference
H40	Land Use Changes	SO-R(Future)	40 CFR 194.32(c)	5.3.1.1.4
H41	Surface Disruptions	SO-R(Future)	40 CFR 194.32(c)	5.3.1.2.4
H45	Lake Usage	SO-R(HCN)	40 CFR 194.32(c)	5.4.1.2.4
H50	Coastal Water Use	SO-R(HCN)	40 CFR 194.32(c)	5.6.1.1.4
H51	Seawater Use	SO-R(HCN)	40 CFR 194.32(c)	5.6.1.1.4
H52	Estuarine Water	SO-R(HCN)	40 CFR 194.32(c)	5.6.1.1.4
H55	Fish Farming	SO-R(HCN)	40 CFR 194.32(c)	5.7.1.1.4

Table 32-4 FEPs 40 CFR 194.32(d) Applied

FEP ID	FEP Name	Screening Decision	Regulatory Citation	Attachment SCR Reference
N6	Salt Deformation	SO-P	40 CFR 194.32(d)	4.1.3.1.1.1
N7	Diapirism	SO-P	40 CFR 194.32(d)	4.1.3.1.1.1
N8	Formation of Fractures	SO-P	40 CFR 194.32(d)	4.1.3.2.1.1
N10	Formation of New Faults	SO-P	40 CFR 194.32(d)	4.1.3.2.3.1
N11	Fault Movement	SO-P	40 CFR 194.32(d)	4.1.3.2.3.1
N13	Volcanic Activity	SO-P	40 CFR 194.32(d)	4.1.4.1.1
N15	Metamorphic Activity	SO-P	40 CFR 194.32(d)	4.1.4.2.4.1
N18	Deep Dissolution	SO-P	40 CFR 194.32(d)	4.1.5.3.1
N20	Breccia Pipes	SO-P	40 CFR 194.32(d)	4.1.5.3.1
N21	Collapse Breccias	SO-P	40 CFR 194.32(d)	4.1.5.3.1
N29	Saline Intrusion	SO-P	40 CFR 194.32(d)	4.2.2.2.1
N30	Fresh Water Intrusion	SO-P	40 CFR 194.32(d)	4.2.2.3.1
N32	Natural Gas Intrusion	SO-P	40 CFR 194.32(d)	4.2.2.5.1
N40	Impact of Large Meteorite	SO-P	40 CFR 194.32(d)	4.4.1.2.1
N62	Glaciation	SO-P	40 CFR 194.32(d)	4.6.1.3.1
N63	Permafrost	SO-P	40 CFR 194.32(d)	4.6.1.3.1
W14	Nuclear Criticality: Heat	SO-P	40 CFR 194.32(d)	6.2.1.4.1
W24	Large Scale Rock Fracturing	SO-P	40 CFR 194.32(d)	6.3.1.4.1
W28	Nuclear Explosions	SO-P	40 CFR 194.32(d)	6.3.3.2.1
W65	Reduction-Oxidation Fronts	SO-P	40 CFR 194.32(d)	6.5.5.2.1
W95	Galvanic Coupling (outside the repository)	SO-P	40 CFR 194.32(d)	6.7.4.2.1

Legend:

HCN historic, current, and near future human activities

SO-C screened-out low consequence
SO-P screened-out low probability
SO-R screened-out using regulatory requirements
DP disturbed performance scenario

DOE's reevaluation of FEPs did not change the CCA conceptual models or scenarios developed for the performance assessment in any way.

EVALUATION OF COMPLIANCE FOR RECERTIFICATION

For the 2004 CRA, DOE applied the same approach to developing and screening the list of FEPs that may have an effect on the disposal system as was used for the CCA. Since EPA previously evaluated and approved this process, EPA focused its recertification review on the FEPs that have changed since the 1998 Certification Decision (See Table 32.5 for a list of changes). EPA examined 2004 CRA, Chapter 6, Section 6.2, Appendix PA, and Appendix PA, Attachment SCR to verify DOE's continued compliance with 40 CFR 193.32. See Docket Numbers A-98-49, Items II-B1-11 FEPs Review, and II-B1-10 Human Intrusion FEPs review for more information on the reevaluation of 2004 CRA FEPs.

EPA verified that DOE's FEP development and review process was fundamentally the same as the CCA process and verified that DOE's reevaluation properly considered things that have changed since the original certification decision in 1998. EPA verified that any changes (See Table 32-5 below) to FEP screening arguments or FEPs related discussions were reasonable, appropriate and complete.

EPA received one public comment related to the Scope of the Performance Assessment. Some stakeholders proposed that karst (FEP N20) needs to be included in the performance assessment conceptual model development. EPA reviewed the karst issues in the original CCA and concluded the following:

"Karst features, such as Nash Draw, have formed via shallow (surface down) dissolution in the WIPP area. The DOE has indicated that the development of karst features near and above the WIPP has been the subject of considerable study, and concluded that development of karst does not pose a threat to the containment capabilities of the disposal system. Examination of information presented within the CCA, as well as other information, indicates that karst features are present in the WIPP area (particularly Nash Draw). Although evidence of karst development at WIPP-33 is discussed only briefly in the CCA, as are opinions by others regarding the development of karst features, the EPA has reviewed all available data and concurs that the lack of pervasive WIPP-site karst, dry climate (including future precipitation projections), and pervasive Mescalero Caliche supports the DOE's conclusion with regard to karst." (Docket No: A-93-02 Item V-B-21)

For the 2004 CRA, EPA reevaluated our CCA review related to karst and any new information made available since our original certification decision. EPA's review is discussed in Technical Support Document for Section 194.14: Evaluation of Karst at the WIPP Site (Docket A-98-49, Item II-B1-15). After a thorough review the Agency determined that karst

should not be screened into the performance assessment process because, even though karst may be present in Nash Draw karst is not prevalent near the WIPP site.

Table 32.5 – FEPs Changed Since the CCA

FEP I.D.	FEP Name	Summary of Change
		FEPs Combined with other FEPs
N17	**Lateral Dissolution**	Combined with N16, **Shallow Dissolution**. N17 removed from baseline.
N19	**Solution Chimneys**	Combined with N20, **Breccia Pipes**, N19 removed from baseline.
H33	**Flow Through Undetected Boreholes**	Combined with H31, **Natural Borehole Fluid Flow**. H33 removed from baseline.
W38	**Investigation Boreholes**	Addressed in H31, **Natural Borehole Fluid Flow**, and H33, **Flow Through Undetected Boreholes**. W38 removed from baseline.
		FEPs With changed Screening Decisions
W50	**Galvanic Coupling**	SO-P to SO-C
W68	**Organic Complexation**	SO-C to UP
W69	**Organic Ligands**	SO-C to UP
H27	**Liquid Waste Disposal**	SO-R to SO-C
H28	**Enhanced Oil and Gas Production**	SO-R to SO-C
H29	**Hydrocarbon Storage**	SO-R to SO-C
H41	**Surface Disruptions**	SO-C to UP (HCN)
		New FEPs for CRA
H58	**Solution Mining for Potash**	Separated from H13, **Potash Mining**
H59	**Solution Mining for Other Resources**	Separated from H13, **Potash Mining**

From 2004 CRA Appendix PA, Attachment SCR, Table SCR-1

RECERTIFICATION DECISION

Based on a review and evaluation of the 2004 CRA and supplemental information provided by DOE (FDMS Docket ID No. EPA-HQ-OAR-2004-0025, Air Docket A-98-49), EPA

determines that DOE continues to comply with the requirements for Section 194.32