Sandia National Laboratories
Waste Isolation Pilot Plant

FEPs Assessment Analysis Plan

W.B.S. 1.3.5.3.1

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ACRONYMS

AP	Analysis Plan
CBFO	Carlsbad Field Office
DOE	Department of Energy
DP	Disturbed Performance
EPA	Environmental Protection Agency
FEPs	Features, Events, and Processes
NP	Nuclear Waste Management Program (NWMP) Procedure
NWMP	Nuclear Waste Management Program
PA	Performance Assessment
PD	Programmatic Decisions
QA	Quality Assurance
SNL	Sandia National Laboratories
SO-C	Screened Out-Consequence
SO-R	Screened Out-Regulatory Exclusion
SO-P	Screened Out-Probability
TRU	Transuranic
UP	Undisturbed Performance
WIPP	Waste Isolation Pilot Plant

1 Introduction and Objectives

This Analysis Plan (AP) describes the processes used to determine potential impacts on the Waste Isolation Pilot Plant (WIPP) Features, Events and Processes (FEPs) baseline due to changes proposed by the Department of Energy's Carlsbad Field Office (DOE/CBFO). The resulting information is intended to provide DOE with part of the necessary information used to justify to the Environmental Protection Agency (EPA) that a proposed change is acceptable.

1.1 Background

The EPA has certified the WIPP's compliance with their radioactive waste disposal standards which allows DOE to dispose of Transuranic (TRU) waste at WIPP. These disposal standards are stringent and state that the DOE must demonstrate a reasonable expectation that the probabilities of cumulative radionuclide releases from the disposal system during the 10,000 years following closure will fall below specified limits. The performance assessment (PA) analyses supporting this determination must be quantitative and must consider uncertainties caused by all significant FEPs that may affect the disposal system, including inadvertent human intrusion into the repository during the future. The Certification Criteria at 40 CFR § 194.32(e), state that:

> 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.

Therefore, the PA process is based on comprehensive consideration of the FEPs that are determined to be relevant to disposal system performance. The FEPs that were identified as potentially applicable to the WIPP were identified and compiled in the WIPP FEP list and included in the Compliance Certification Application (CCA) (DOE 1996). This list is considered part of WIPP's certification basis and is included here as Attachment 1. Those FEPs that were shown by screening analyses to have the potential to affect performance were included in quantitative calculations using a system of linked computer models to evaluate the interaction of the repository with the natural system, both with and without human intrusion. Therefore, when deciding if the performance of the disposal system may be affected by a proposed change to the WIPP disposal system, assessing the impact of a proposed change on FEPs is the first step.

FEPs assessment results may be used as part of the information needed to comply with EPA change reporting requirements[1] or as supporting information in a formal change

[1] 40 CFR Part 194.4(b)(3) states that the DOE "…shall report any planned or unplanned changes in activities or conditions pertaining to the disposal system that differ significantly from the most recent compliance application."

request to the EPA. The results of a FEPs impact assessment may conclude that there is no impact on the FEPs baseline and therefore implementation of the change would not significantly impact the decisions, assumptions, calculations, and conclusions of the current PA baseline used to demonstrate compliance with the WIPP disposal regulations. Conversely, the results may conclude that there are impacts and that additional analyses using the PA methodology are necessary to determine the impact(s) on the disposal system performance predictions. In either case, FEPs assessments are tools to be used by decision makers within the regulatory-based change management system for the WIPP and the results themselves cannot be used alone as justification and authorization for a proposed change. Changes can only be made within the scope of the regulations governing the WIPP project. Change authorization and implementation are outside the scope of this AP.

2 Approach

2.1 PA Methodology and FEP Analysis

As stated in the previous section, the PA process is based on comprehensive consideration of the FEPs that are relevant to disposal system performance. A process called "screening" is used to determine if a FEP is relevant and therefore accounted for within the PA framework. FEPs are screened out using specific rationale. These are:

Screened Out, Explicit Regulatory Exclusions	(SO-R)
Screened Out, Probability	(SO-P)
Screened Out, Consequence	(SO-C)

Those FEPs that are shown to have the potential to affect performance are accounted for in the development of scenarios and their resulting conceptual models. These "screened in" FEPs are classified based on the PA scenario to which they apply:

Screened in, Undisturbed Performance	(UP)
Screened in, Disturbed Performance	(DP)

Those FEPs classified as either UP or DP are represented in the appropriate scenarios, models, and assumptions in the PA system. Figure 1 presents the general PA methodology and the important steps in the PA process. A detailed description of the PA process is included in Chapter 6 of the CCA (DOE 1996).

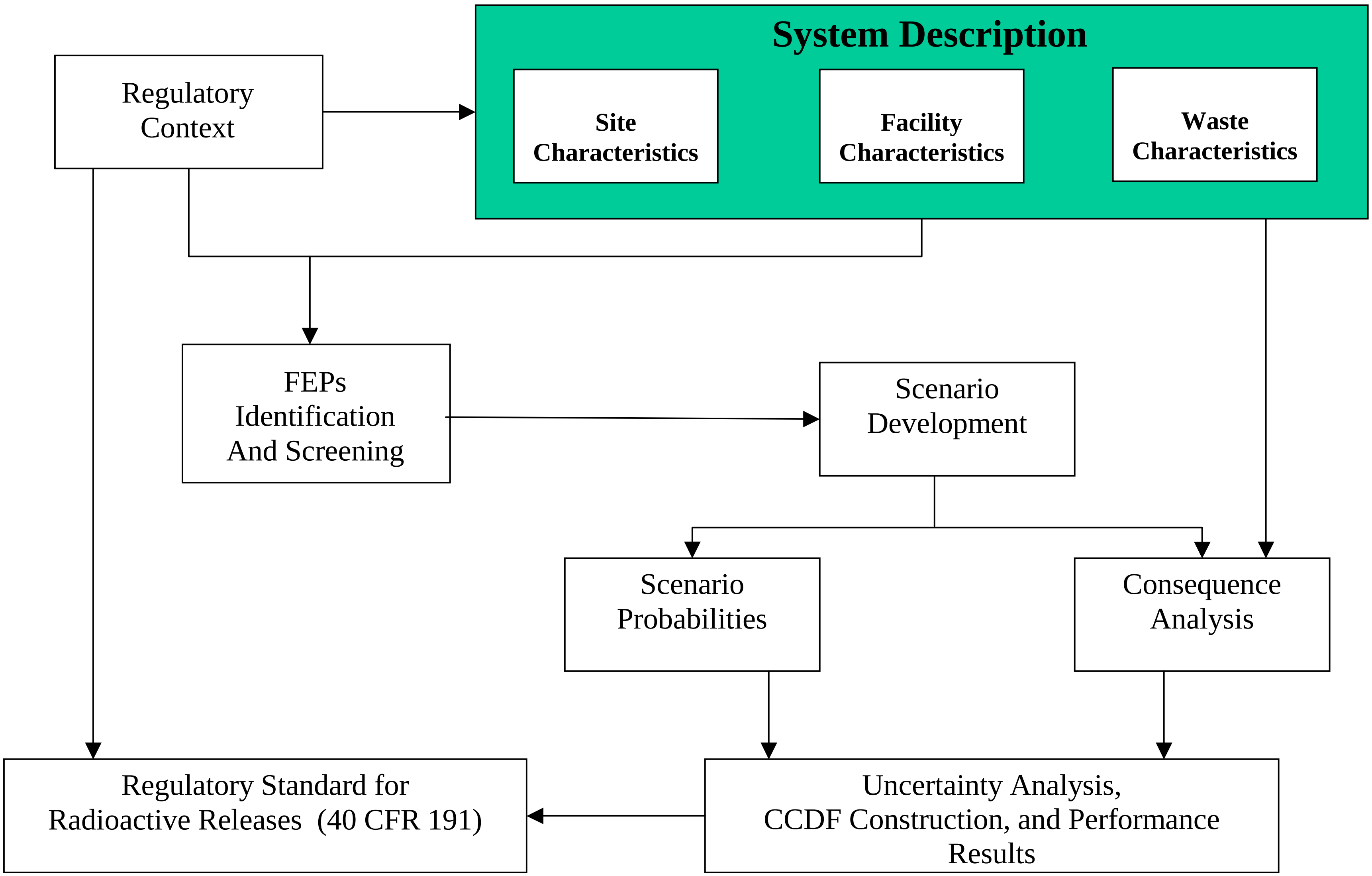

Figure 1. Methodology for the WIPP PA

As previously stated, certain FEPs are screened according to provisions in 40 CFR Part 191 and 40 CFR Part 194. In developing and demonstrating the feasibility of the 40 CFR Part 191 standard and the 40 CFR Part 194 criteria, the EPA considered and made conclusions on the relevance, consequence, and/or probability of occurrence of particular FEPs and, in so doing, allowed for some FEPs to be eliminated from consideration. FEPs of this nature have a screening designation of SO-R (screened out – regulation). For example, 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 one 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.

FEPs can also be eliminated from PA calculations on the basis of insignificant consequence (SO-C) (screened out–consequence). Consequence can refer to effects on the repository or site or to radiological consequence. Therefore, the DOE has omitted events and processes from PA calculations where there is a reasonable expectation that the remaining probability distribution of cumulative releases would not be significantly changed by such omissions.

FEPs that are potentially beneficial to subsystem performance may be eliminated from PA calculations if necessary to simplify the analysis (SO-C). This argument may be used when there is uncertainty as to exactly how the FEP should be incorporated into PA calculations or when incorporation would incur unreasonable difficulties. This is considered a conservative position.

FEPs that are represented in the PA are classified as UP (screened-in, undisturbed performance, and DP (screened-in, disturbed performance).

2.2 FEPs Assessment Process Description

As stated in Section 1.1, FEPs are the starting point for a meaningful PA; therefore, it is logical that assessments of potential changes to the PA baseline begin with an evaluation of impacts that a given change might have on the current FEPs baseline. To begin this assessment, the current baseline FEP list is searched for FEPs that are *related* to the proposed change. This does not mean that a particular FEP is affected by the change, but simply a first order screen to identify those FEPs that *may be* affected. This step is done by reviewing the WIPP FEPs list (Attachment 1) and identifying those FEPs that may be related to the change. Once related FEPs are identified, further investigation may proceed which determines the potential impact, if any, of the proposed change. This investigation determines:

1 If the physical aspects and attributes related to the change are represented by the current baseline WIPP FEP list;
2 If the *screening arguments* in the baseline FEP list remain valid; and
3 If the *screening decisions* in the baseline FEP list remain valid.

The FEPs Assessment Process follows these steps:

Step 1: Determine if there are new FEPs associated with the proposed change that are not within the current WIPP FEP list; add as appropriate.
Step 2: Identify FEPs in the baseline that are related to the proposed change; this step identifies the areas of potential impact.
Step 3: Determine if the screening arguments and decisions for FEPs identified in Step 2 need revision to reflect aspects of the proposed change.
Step 4: Identify additional activities based on any revised screening arguments and/or decisions.
Step 5: Summarize potential impacts to the compliance baseline.

This process is also illustrated in Figure 2.

3 Documentation of FEPs Impact Assessments

FEPs Impact Assessments may be requested by the DOE or other WIPP project organization for a wide spectrum of proposed changes. The results of these assessments may be used in support of regulatory submittals requesting changes or modifications to the certification baseline. Therefore, the information related to these assessments must accurately record the activities conducted and the conclusion drawn during the assessment. This AP assumes that each FEPs assessment may potentially be used in a regulatory submittal and that the product of a FEPs assessment under this AP shall meet the minimum requirements for a regulatory submittal. The reports that document the results of the FEPs Impact Assessments must follow SNL document control requirements. FEPs Impact Assessments shall follow documentation protocol according to Appendix B of SNL procedure NP 9-1. In addition, SNL procedure NP 6-1 shall be used for document review and control. All records shall be placed in a unique records package. Distribution of the final document to the intended customer shall be under the SNL Project Manager’s letterhead.

FEPs Assessment Process
For Proposed Changes

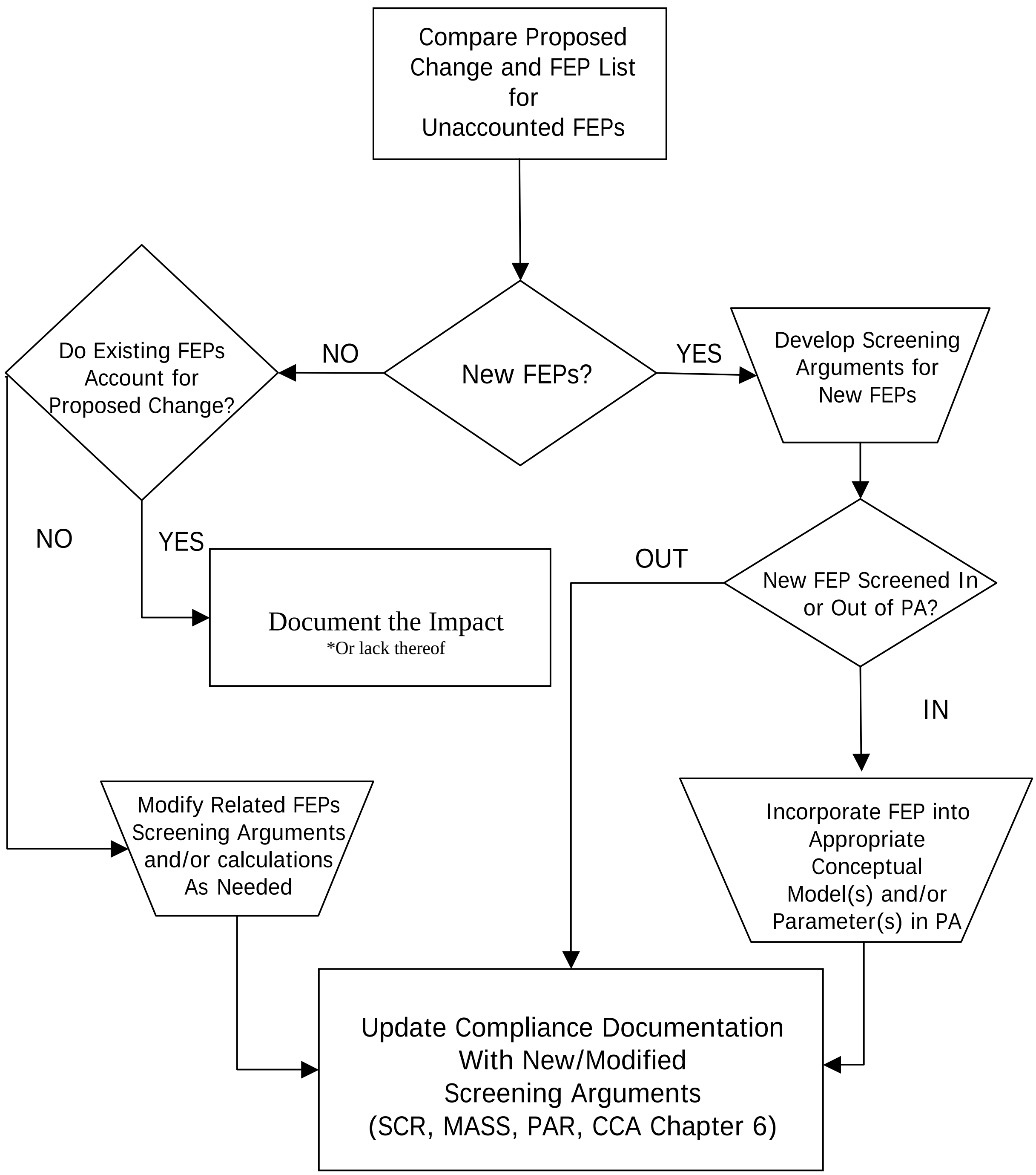

Figure 2: FEPs Assessment Process

4 Special Considerations

All analyses will be conducted in accordance with applicable quality assurance (QA) procedures, following the Programmatic Decisions (PD) requirements of NWMP QA procedure NP 9-1.

5 Applicable NWMP Procedures

NP 2-1 Qualification and Training
NP 6-1 Document Review Process
NP 6-2 Document Control Process
NP 9-1 Analyses
NP 9-2 Parameters
NP 17-1 Records
NP 19-1 Software Requirements

6 References

DOE (U.S. Department of Energy). 1996. *Compliance Certification Application*. DOE/CAO-1996-2184, Carlsbad Area Office, Carlsbad, NM.

EPA (U.S. Environmental Protection Agency). 1993. *40 CFR Part 191 Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes; Final Rule*, Federal Register. Vol. 58, no. 242, 66398-66416.

EPA (U.S. Environmental Protection Agency). 1996. *40 CFR Part 194: Criteria for the Certification and Re-Certification of the Waste Isolation Pilot Plant's Compliance With the 40 CFR Part 191 Disposal Regulations; Final Rule*, Federal Register. Vol. 61 no.28, 5224-5245.

EPA (U.S. Environmental Protection Agency). 1998. *Technical Support Document for Section 194.23: Sensitivity Analysis Report*. EPA Air Docket A-93-02, Entry V-B-13.

Attachment 1

WIPP FEATURES, EVENTS AND PROCESSES LIST

WIPP FEATURES, EVENTS AND PROCESSES LIST

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
N1	Stratigraphy	Disposition and properties of geological formations control system performance	UP		**SCR.1.1.1** Section 2.1.3 Section 6.4.2 Appendix GCR, Section 4.3 Appendix BH Appendix PAR, Table PAR-57
N2	Brine reservoirs	Pressurized brine reservoirs may be present in the Castile beneath the controlled area	DP		**SCR.1.1.1** Section 2.1.3 Section 6.4.12.6 Section 6.4.8 Appendix PAR, Parameters 27, 28, 29, and 31, and Table PAR-30
N3	Changes in regional stress	Tectonic activity on a regional scale may change levels of stress	SO-C		**SCR.1.1.2** Section 2.1.5
N4	Regional tectonics	Tectonic setting of the region governs current level of stress	SO-C		**SCR.1.1.2** Section 2.1.5 Appendix FAC, Section 6.4
N5	Regional uplift and subsidence	Tectonic activity on a regional scale could cause uplift and subsidence	SO-C		**SCR.1.1.2** Section 2.1.5
N6	Salt deformation	Salt formations may deform under gravity or other forces	SO-P	UP near repository.	**SCR.1.1.3.1** Section 2.1.6.1 Appendix DEF, Section 2.3
N7	Diapirism	Buoyancy forces may cause salt to rise through denser rocks	SO-P		**SCR.1.1.3.1** Appendix DEF, Section 3.1 Appendix DEF, Section 2
N8	Formation of fractures	Changes in stress may cause new	SO-P	UP near	**SCR.1.1.3.2**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		fracture sets to form		repository.	Section 2.1.5
N9	Changes in fracture properties	Changes in the local stress field may change fracture properties such as aperture and asperity	SO-C	UP near repository.	**SCR.1.1.3.2** Section 2.1.5.2 *Section 2.2.1* *Section 6.4.6.2*
N10	Formation of new faults	Tectonic activity on a regional scale could cause new faults to form	SO-P		**SCR.1.1.3.3**
N11	Fault movement	Movement along faults in the Rustler or in units below the Salado could affect the hydrogeology	SO-P		**SCR.1.1.3.3** *Section 2.1.5.2* Section 2.1.5.3 Appendix GCR, Section 4.4 Appendix FAC, Section 6.4
N12	Seismic activity	Groundshaking may give rise to cracking at free surfaces such as the roof of the repository	UP		**SCR.1.1.3.4** Section 2.6.2 Section 6.4.5.3 Appendix PAR, Table PAR-37 Appendix GCR, Section 5
N13	Volcanic activity	Igneous material feeding volcanoes or surface flows could affect disposal system performance	SO-P		**SCR.1.1.4.1** Appendix GCR, Section 3.5
N14	Magmatic activity	Subsurface intrusion of igneous rocks could affect disposal system performance	SO-C		**SCR.1.1.4.1** Section 2.1.5.4 Appendix GCR, Section 3.5
N15	Metamorphic activity	High pressures and/or temperatures could cause solid state recrystallization changes	SO-P		**SCR.1.1.4.2**
N16	Shallow dissolution	Percolation of groundwater and	UP		**SCR.1.1.5.1**

Table Legend

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Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		dissolution in the Rustler may increase transmissivity			Section 2.1.6.2 Appendix DEF, Section 3.3 Section 6.4.6.2 Appendix PAR, Parameters 35, 50, 51
N17	Lateral dissolution	Dissolution at the Rustler - Salado contact may create pathways and/or increase transmissivity	SO-C		**SCR.1.1.5.1** Section 2.1.6.2 Appendix DEF, Section 3.2 Appendix FAC, Sections 3.1.2 , 4.1.1 and 8.9
N18	Deep dissolution	Dissolution in the Castile or at the base of the Salado may create pathways	SO-P		**SCR.1.1.5.1** Section 2.1.6.2 Appendix DEF, Section 3.1
N19	Solution chimneys	Dissolution cavities in the Castile or at the base of the Salado may propagate towards the surface	SO-P		**SCR.1.1.5.1** Section 2.1.6.2 Appendix DEF, Section 3.1
N20	Breccia pipes	Formations above deep dissolution cavities may fracture	SO-P		**SCR.1.1.5.1** Section 2.1.6.2 Appendix DEF, Section 3.1
N21	Collapse breccias	Dissolution may result in collapse of overlying units	SO-P		**SCR.1.1.5.1** Section 2.1.6.2 Appendix DEF, Section 3.1 Appendix FAC, Section 7.2.4
N22	Fracture infills	Precipitation of minerals as fracture infills can reduce hydraulic conductivities	SO-C		**SCR.1.1.5.2** Appendix FAC, Section 8.8
N23	Saturated groundwater flow	Groundwater flow beneath the water table is important to disposal system performance	UP		**SCR.1.2.1** Section 2.2.1 Section 6.4.5 Section 6.4.6 Appendix HYDRO Appendix BRAGFLO, Sections 4.1 to 4.4

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
					Appendix SECOFL2D, Section 3
N24	Unsaturated groundwater flow	The presence of air or other gas phases may influence groundwater flow	UP	SO-C in Culebra.	**SCR.1.2.1** Section 2.2.1 Section 6.4.6 Appendix HYDRO Appendix BRAGFLO, Sections 4.8 and 4.9
N25	Fracture flow	Groundwater may flow along fractures as well as through interconnected pore space	UP		**SCR.1.2.1** Section 6.4.6.2 Appendix MASS, Section 15 Appendix SECOTP2D, Sections 2 and 3.4
N26	Density effects on groundwater flow	Spatial variability of groundwater density could affect flow directions	SO-C		**SCR.1.2.1** Section 2.2.1.4.1.2
N27	Effects of preferential pathways	Groundwater flow may not be uniform, and may occur along particular pathways	UP	UP in Salado and Culebra.	**SCR.1.2.1** Section 6.4.6.2 Appendix TFIELD, Sections 2.2 and 4 Appendix PAR, Parameters 35, 50, 51
N28	Thermal effects on groundwater flow	Natural temperature variability could cause convection or otherwise affect groundwater flow	SO-C		**SCR.1.2.2**
N29	Saline intrusion [hydrogeological effects]	The introduction of more saline water into the Rustler could affect groundwater flow	SO-P		**SCR.1.2.2**
N30	Freshwater intrusion [hydrogeological effects]	The introduction of freshwater into the Rustler could affect groundwater flow	SO-P		**SCR.1.2.2**
N31	Hydrological response to earthquakes	Fault movement can affect groundwater flow directions and pressure changes can affect	SO-C		**SCR.1.2.2** Section 2.6.2 Appendix GCR, Section 5

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
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Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		groundwater levels and movement			
N32	Natural gas intrusion	The introduction of natural gas from formations beneath the repository could affect groundwater flow	SO-P		**SCR.1.2.2** Section 2.3.1.2
N33	Groundwater geochemistry	Groundwater geochemistry influences actinide retardation and colloid stability	UP		**SCR.1.3.1** Section 2.2.1 Section 2.4 Section 6.4.3.4 Section 6.4.6.2 Appendix PAR, Parameters 36 to 47, 52 to 57, Table PAR-39
N34	Saline intrusion [geochemical effects]	The introduction of more saline water into the Rustler could affect actinide retardation and colloid stability	SO-C		**SCR.1.3.2**
N35	Freshwater intrusion [geochemical effects]	The introduction of freshwater into the Rustler could affect actinide retardation and colloid stability	SO-C		**SCR.1.3.2**
N36	Changes in groundwater Eh	Changes in oxidation potentials could affect radionuclide mobilization	SO-C		**SCR.1.3.2**
N37	Changes in groundwater pH	Changes in pH could affect colloid stability and the mobility of radionuclides	SO-C		**SCR.1.3.2**
N38	Effects of dissolution	Dissolution could affect groundwater chemistry and hence radionuclide transport	SO-C		**SCR.1.3.2**
N39	Physiography	The physiography of the area is a	UP		**SCR.1.4.1**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
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Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		control on the surface water hydrology			Section 2.1.4 Section 6.4.2 Appendix PAR, Table PAR-57
N40	Impact of a large meteorite	A large meteorite could fracture the rocks above the repository	SO-P		**SCR.1.4.2**
N41	Mechanical weathering	Processes such as freeze -thaw affect the rate of erosion	SO-C		**SCR.1.4.3.1**
N42	Chemical weathering	Breakdown of minerals in the surface environment affects the rate of erosion	SO-C		**SCR.1.4.3.1**
N43	Aeolian erosion	The wind can erode poorly consolidated surface deposits	SO-C		**SCR.1.4.3.2**
N44	Fluvial erosion	Erosion by rivers and streams could affect surface drainage	SO-C		**SCR.1.4.3.2**
N45	Mass wasting [erosion]	Gravitational processes can erode material on steep slopes	SO-C		**SCR.1.4.3.2**
N46	Aeolian deposition	Sand dunes and sheet sands may be deposited by the wind and affect surface drainage	SO-C		**SCR.1.4.3.3**
N47	Fluvial deposition	Rivers and streams can deposit material and affect surface drainage	SO-C		**SCR.1.4.3.3**
N48	Lacustrine deposition	Lakes may be infilled by sediment and change the drainage pattern	SO-C		**SCR.1.4.3.3**
N49	Mass wasting [deposition]	Land slides could block valleys and change the drainage pattern	SO-C		**SCR.1.4.3.3**
N50	Soil development	Vegetation and surface water movement is affected by the types	SO-C		**SCR.1.4.4**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
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Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		of soil present			
N51	Stream and river flow	The amount of flow in streams and rivers affects erosion and deposition	SO-C		**SCR.1.5.1** Section 2.2.2 Appendix GCR, Section 6.2.1
N52	Surface water bodies	The disposition of lakes is a control on the surface hydrology	SO-C		**SCR.1.5.2** Section 2.2.2 Appendix GCR, Section 6.2.1
N53	Groundwater discharge	The amount of water leaving the groundwater system to rivers, springs and seeps affects the groundwater hydrology	UP		**SCR.1.5.3** Section 2.2.1.1 Section 2.2.1.4 Section 2.2.2 Section 6.4.10.2 Appendix PAR, Parameter 35, Table PAR-30 Appendix TFIELD, Section 3
N54	Groundwater recharge	The amount of water passing into the saturated zone affects the groundwater hydrology	UP		**SCR.1.5.3** Section 2.2.1.1 Section 2.2.1.4 Section 6.4.6.2 Section 6.4.10.2 Appendix MASS, Section 14.2 Appendix PAR, Parameter 35, Table PAR-30 Appendix TFIELD, Section 3
N55	Infiltration	The amount of water entering the unsaturated zone controls groundwater recharge	UP	UP for climate change effects.	**SCR.1.5.3** Section 2.2.2 Section 6.4.10.2 Appendix PAR, Parameter 35, Table PAR-30 Appendix TFIELD, Section 3
N56	Changes in groundwater recharge and discharge	Changes in climate and drainage pattern may affect the amount of water entering and leaving the	UP		**SCR.1.5.4** Section 2.2.1.4 Section 2.5

Table Legend		
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Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
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	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		groundwater system			Section 6.4.9 Appendix MASS, Section 14.2 Appendix PAR, Parameter 48
N57	Lake formation	Formation of new lakes will affect the surface hydrology	SO-C		**SCR.1.5.4**
N58	River flooding	Flooding will affect the area over which infiltration takes place	SO-C		**SCR.1.5.4**
N59	Precipitation [e.g. rainfall]	Rainfall is the source of water for infiltration and stream flow	UP		**SCR.1.6.1** Section 2.5 Section 6.4.9 Appendix PAR, Parameter 48
N60	Temperature	The temperature influences how much precipitation evaporates before it reaches streams or enters the ground	UP		**SCR.1.6.1** Section 2.5 Section 6.4.9 Appendix PAR, Parameter 48
N61	Climate change	Temperature and precipitation will vary as natural changes in the climate take place	UP		**SCR.1.6.2.1** Section 2.2.1.4 Section 2.5 Section 6.4.9 Appendix CLI Appendix PAR, Parameter 48
N62	Glaciation	Natural climate change could lead to the growth of glaciers and ice sheets	SO-P		**SCR.1.6.2.2** Appendix CLI
N63	Permafrost	The regions in front of advancing ice sheets will be subject to frozen ground preventing infiltration	SO-P		**SCR.1.6.2.2**
N64	Seas and oceans	The volume and circulation patterns in seas and oceans would	SO-C		**SCR.1.7.1**

Table Legend		
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Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		affect the distribution of radionuclides			
N65	Estuaries	Water movement in estuaries would affect the distribution of radionuclides	SO-C		**SCR.1.7.1**
N66	Coastal erosion	Coastal erosion could affect the local groundwater system	SO-C		**SCR.1.7.2**
N67	Marine sediment transport and deposition	Transport and deposition could affect the distribution of radionuclides	SO-C		**SCR.1.7.2**
N68	Sea level changes	Sea level change would affect coastal aquifers	SO-C		**SCR.1.7.3**
N69	Plants	Plants play a role in the hydrological cycle by taking up water	SO-C		**SCR.1.8.1** Section 2.4.1
N70	Animals	Burrowing animals can affect the structure of surface sediments	SO-C		**SCR.1.8.1** Section 2.4.1
N71	Microbes	Microbes can be important in soil development. Microbes in groundwater may sorb radionuclides	SO-C	UP for colloidal effects and gas generation	**SCR.1.8.1** Appendix MASS, Section 15.3.2
N72	Natural ecological development	Changes in climate may cause changes in the types of vegetation and animals present	SO-C		**SCR.1.8.2** Appendix CLI
W1	Disposal geometry	WIPP repository disposal geometry will influence flow and transport patterns	UP		**SCR.2.1.1** Section 3.2 Section 6.4.2.1 *Section 6.4.3*
W2	Waste inventory	The quantity and type of	UP		**SCR.2.1.2**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		radionuclides emplaced in the repository will dictate performance requirements			Section 4.1 Section 6.4.3.5 Section 6.4.3.3 Appendix BIR Appendix WCA, Sections 3.2, 8.2 and 8.3 Appendix PAR, Table PAR-41
W3	Heterogeneity of waste forms	The distribution of radionuclides within the different waste types could affect release patterns	DP		**SCR.2.1.2** Section 6.4.7 Section 6.4.12.4 Appendix WCA, Section 3.2.1
W4	Container form	The type and shape of waste container will affect heat dissipation and container strength	SO-C		**SCR.2.1.3** Appendix DVR, Section 12.2
W5	Container material inventory	Steel and other materials will corrode and affect the amount of gas generated	UP		**SCR.2.1.3** Chapter 4, Table 4-4 Section 6.4.3.3 Appendix BIR Appendix SOTERM, Section 2.2.3 Appendix PAR, Parameter 1, Table PAR-43
W6	Seal geometry	Size, location, and materials of shaft seals, and panel and drift closures will affect flow patterns and transport pathways	UP		**SCR.2.1.4** Section 3.3 Appendix SEAL Section 6.4.4 Appendix PAR, Figure PAR-2
W7	Seal physical properties	Porosity and permeability of seals will control flow rates	UP		**SCR.2.1.4** Section 3.3.1 Section 3.3.2 Appendix SEAL Section 6.4.4 Appendix PAR,

Table Legend		
Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
					Parameters 9 to 11, Tables PAR-16 to PAR-24
W8	Seal chemical composition	The chemistry of seal materials could affect actinide speciation and mobility	SO-C	Beneficial SO-C	**SCR.2.1.4** SCR.2.5.2
W9	Backfill physical properties	The amount and distribution of backfill could affect porosity and permeability in disposal rooms	SO-C		**SCR.2.1.5** Appendix BACK, Section 3.2
W10	Backfill chemical composition	The chemical behavior of the backfill will affect actinide speciation and mobility	UP		**SCR.2.1.5** Section 6.4.3.4 Appendix BACK, Section 1 Appendix SOTERM, Section 2.2.2 Appendix WCA, Sections 4.1.2, 8.9 and 8.10 Appendix PAR, Parameters 36 to 47, Table PAR-39
W11	Post-closure monitoring	Inappropriate monitoring after closure could affect performance	SO-C		**SCR.2.1.6** Appendix MON, Section 6
W12	Radionuclide decay and in-growth	Radioactive decay of waste will change and decrease the inventory with time	UP		**SCR.2.2.1** Section 6.4.12.4 Section 6.4.5.4.2 Appendix BIR, Section 3.2 Appendix NUTS, Section 4.3.7 Appendix SECOTP2D, Section 2 Appendix PANEL, Section 4.6
W13	Heat from radioactive decay	Radioactive decay of waste will generate heat in the repository	SO-C		**SCR.2.2.2**
W14	Nuclear criticality: heat	A sustained fission reaction would generate heat	SO-P		**SCR.2.2.3** *Section 6.4.6.2* *Section 6.4.5.2* *Appendix MASS*

Table Legend		
Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
W15	Radiological effects on waste	Radiation can change the physical properties of many materials	SO-C		**SCR.2.2.4** *Section 6.4.3.4* *Section 6.4.3.5* *Section 6.3.3.6*
W16	Radiological effects on containers	Radiation can change the physical properties of many materials	SO-C		**SCR.2.2.4** *Section 6.4.3.4* *Section 6.4.3.5* *Section 6.3.3.6*
W17	Radiological effects on seals	Radiation can change the physical properties of many materials	SO-C		**SCR.2.2.4** *Section 6.4.3.4* *Section 6.4.3.5* *Section 6.3.3.6*
W18	Disturbed rock zone	Repository construction has led to fracturing of rock around the opening	UP		**SCR.2.3.1** Section 3.3.1.5 Section 6.4.5.3 Appendix SEAL, Sections 7.5 and 8, Appendices C and D Appendix MASS, Section 13.4 Appendix PAR, Parameter 12, Tables PAR-2, PAR-3, PAR-37
W19	Excavation-induced changes in stress	Repository construction has led to changes in stress around the opening	UP		**SCR.2.3.1** Section 3.3.1.5 Section 6.4.3.1 Appendix SEAL, Section 7 Appendix PAR Table PAR-38 Appendix PORSURF, Attachment PORSURF-6
W20	Salt creep	Salt creep will consolidate seal components and close the disposal rooms, thereby compacting the	UP		**SCR.2.3.2** Section 6.4.3.1 Appendix BRAGFLO, Section 4.11

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		waste			Appendix PAR Table PAR-38 Appendix PORSURF, Attachment PORSURF-6
W21	Changes in the stress field	Salt creep will affect the stress field around the repository opening	UP		**SCR.2.3.2** Section 6.4.3.1 Appendix BRAGFLO, Section 4.11 Appendix PAR Table PAR-38 Appendix PORSURF, Attachment PORSURF-6
W22	Roof falls	Instability of the DRZ could lead to roof falls	UP		**SCR.2.3.3** Section 6.4.5.3 Appendix PAR, Table PAR-37
W23	Subsidence	Salt creep and roof falls could lead to subsidence of horizons above the repository	SO-C		**SCR.2.3.4** *Section 2.2.1.4.1.2* *Appendix TFIELD*
W24	Large scale rock fracturing	Salt creep and roof falls could lead to fracturing between the repository and higher units or the surface	SO-P		**SCR.2.3.4**
W25	Disruption due to gas effects	Increased gas pressures may lead to fracturing of Salado interbeds	UP		**SCR.2.3.5** Section 6.4.5.2 Appendix BRAGFLO, Section 4.10 Appendix MASS, Section 13.3 and Attachment 13-2 Appendix PAR, Table PAR-36
W26	Pressurization	Increased gas pressures may slow the rate of salt creep	UP		**SCR.2.3.5** Section 6.4.3.1 Appendix BRAGFLO, Section 4.11 Appendix PORSURF, Attachment PORSURF-6
W27	Gas explosions	Explosion of gas mixtures in the repository could affect the DRZ	UP		**SCR.2.3.6** Section 6.4.5.3

Table Legend		
Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		repository could affect the DRZ			Appendix PCS, Section 2.2.3 Appendix PAR, Table PAR-37
W28	Nuclear explosions	A critical mass of plutonium in the repository could explode if rapidly compressed	SO-P		**SCR.2.3.6**
W29	Thermal effects on material properties	Temperature rises could lead to changes in porosity and permeability	SO-C		**SCR.2.3.7** Appendix SEAL, Section 7.4
W30	Thermally-induced stress changes	Elevated temperatures could change the local stress field and alter the rate of salt creep	SO-C		**SCR.2.3.7**
W31	Differing thermal expansion of repository components	Stress distribution and strain changes can depend on differing rates of thermal expansion between adjacent materials	SO-C		**SCR.2.3.7**
W32	Consolidation of waste	Salt creep and room closure will change waste permeability	UP		**SCR.2.3.8** Section 6.4.3.1 Section 6.4.3.2 Appendix WCA, Section 5.2 Appendix PAR, Table PAR-38 Appendix PORSURF, Attachment PORSURF-6
W33	Movement of containers	Density differences or temperature rises could lead to movement of containers within the salt	SO-C		**SCR.2.3.8**
W34	Container integrity	Long-lived containers could delay dissolution of waste	SO-C	Beneficial SO-C	**SCR.2.3.8** Section 6.5.4
W35	Mechanical effects of backfill	Backfill in disposal rooms will act to resist creep closure	SO-C		**SCR.2.3.8** Appendix BACK, Section 3.2

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
W36	Consolidation of seals	Salt creep will consolidate long-term seal components, reducing porosity and permeability	UP		**SCR.2.3.8** Section 6.4.4 Appendix SEAL, Appendix D Appendix PAR, Parameters 9 to 11 and 13, Tables PAR-16 to PAR-24
W37	Mechanical degradation of seals	Gas pressurization, clay swelling, and cracking of concrete could affect seal properties	UP		**SCR.2.3.8** Section 6.4.4 Appendix SEAL, Appendix A Appendix PAR, Parameters 9 to 11 and 13, Tables PAR-16 to PAR-24
W38	Investigation boreholes	Improperly sealed investigation boreholes near the repository could act as release pathways	SO-C		**SCR.2.3.8** *Section 6.4.4* Appendix DEL *Appendix MASS*
W39	Underground boreholes	Improperly sealed boreholes drilled from the repository could provide pathways to the interbeds	UP		**SCR.2.3.8** Section 6.4.5.3 Appendix PAR, Table PAR-37
W40	Brine inflow	Brine will enter the disposal rooms through the interbeds, impure halite and clay layers	UP		**SCR.2.4.1** Section 6.4.3.2 Appendix BRAGFLO, Section 4.8
W41	Wicking	Capillary rise is a mechanism for brine flow in unsaturated zones in the repository	UP		**SCR.2.4.1** Section 6.4.3.2 Section 6.4.3.3 Appendix MASS, Section 7 Appendix PAR, Parameter 8 Appendix BRAGFLO, Section 7.2.9
W42	Fluid flow due to gas production	Increases in gas pressure could affect the rate of brine inflow	UP		**SCR.2.4.2** Section 6.4.3.2 Appendix MASS, Section 7 Appendix BRAGFLO, Sections 4.8

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
W43	Convection	Temperature differentials in the repository could lead to convection cells	SO-C		**SCR.2.4.3**
W44	Degradation of organic material	Microbial breakdown of cellulosic material in the waste will generate gas	UP		**SCR.2.5.1.1** Section 6.4.3.3 Appendix SOTERM, Section 2.2.2 Appendix WCA, Section 5.1 Appendix BRAGFLO, Section 4.13 Appendix MASS, Section 8 and Attachment 8-2
W45	Effects of temperature on microbial gas generation	Temperature rises could affect the rate of microbial gas generation	UP		**SCR.2.5.1.1** *Section 6.4.3.3* Appendix PAR, Parameters 3 to 5, Table PAR-43
W46	Effects of pressure on microbial gas generation	Increases in gas pressure could affect microbial populations and gas generation rates	SO-C		**SCR.2.5.1.1**
W47	Effects of radiation on microbial gas generation	Radiation could affect microbial populations and, therefore, gas generation rates	SO-C		**SCR.2.5.1.1**
W48	Effects of biofilms on microbial gas generation	Biofilms serve to maintain optimum conditions for microbial populations and affect gas generation rates	UP		**SCR.2.5.1.1** *Section 6.4.3.3* Appendix PAR, Parameters 3 to 5, Table PAR-43
W49	Gases from metal corrosion	Anoxic corrosion of steel will produce hydrogen	UP		**SCR.2.5.1.2** Section 6.4.3.3 Appendix SOTERM, Section 2.2.3 Appendix WCA, Section 5.1 Appendix BRAGFLO, Section 4.13 Appendix MASS, Section 8 and Attachment 8-2
W50	Galvanic coupling	Potential gradients between metals	SO-P		**SCR.2.5.1.2**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		could affect corrosion rates			*Appendix GCR*
W51	Chemical effects of corrosion	Corrosion reactions will lower the oxidation state of brines and affect gas generation rates	UP		**SCR.2.5.1.2** *Section 6.4.3.3* Appendix WCA, Section 4.1.1 Appendix PAR, Parameter 1, Table PAR-43
W52	Radiolysis of brine	Alpha particles from decay of plutonium can split water molecules to form hydrogen and oxygen	SO-C		**SCR.2.5.1.3** Section 6.4.3.3 *Section 6.4.3.5* *Section 6.4.3.6* Appendix MASS, Section 8
W53	Radiolysis of cellulose	Alpha particles from decay of plutonium can split cellulose molecules and affect gas generation rates	SO-C		**SCR.2.5.1.3**
W54	Helium gas production	Reduction of alpha particles emitted from the waste will form helium	SO-C		**SCR.2.5.1.3** *Section 6.4.3.3* *Appendix BIR*
W55	Radioactive gases	Radon will form from decay of plutonium. Carbon dioxide and methane may contain radioactive ^{14}C	SO-C		**SCR.2.5.1.3** Appendix BIR
W56	Speciation	Speciation is the form in which elements occur under particular conditions. This form controls mobility and the reactions that are likely to occur	UP	UP in disposal rooms and Culebra. SO-C elsewhere, and beneficial SO-C in cementitious seals.	**SCR.2.5.2** Section 6.4.3.4 Section 6.4.3.5 Section 6.4.6.2.1 Appendix SOTERM, Sections 3 AND 4 Appendix PAR, Parameters 36 to 47, 52 to 57, Table PAR-39
W57	Kinetics of speciation	Reaction kinetics control the rate at which particular reactions occur	SO-C		**SCR.2.5.2**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		thereby dictating which reactions are prevalent in non-equilibrium systems			
W58	Dissolution of waste	Dissolution of waste controls the concentrations of radionuclides in brines and groundwaters	UP		**SCR.2.5.3** Section 6.4.3.5 Appendix PAR, Parameters 36 to 47, Table PAR-39
W59	Precipitation [secondary minerals]	Precipitation of secondary minerals could affect the concentrations of radionuclides in brines and groundwaters	SO-C	Beneficial SO-C	**SCR.2.5.3**
W60	Kinetics of precipitation and dissolution	The rates of dissolution and precipitation reactions could affect radionuclide concentrations	SO-C	Kinetics of waste dissolution is a beneficial SO-C	**SCR.2.5.3**
W61	Actinide sorption	Actinides may accumulate at the interface between a solid and a solution. This affects the rate of transport of actinides in brines and groundwaters	UP	UP in the Culebra and Dewey Lake. Beneficial SO-C elsewhere	**SCR.2.5.4** *Chapter 3* Section 6.4.3.6 Section 6.4.6.2.1 Section 6.4.6.6 *Appendix SEAL* Appendix MASS, Section 15.2 and Attachment 15-1 Appendix SECOTP2D, Section 2
W62	Kinetics of sorption	The rate at which actinides are sorbed can affect radionuclide concentrations	UP		**SCR.2.5.4** Appendix MASS, Section 15.2, Attachment 15-1 Appendix PAR, Parameters 47 and 52 to 57, Table PAR-39
W63	Changes in sorptive surfaces	Changes in mineralogy along fracture walls could change the extent of sorption	UP		**SCR.2.5.4** Appendix MASS, Section 15.2, Attachment 15-1 Appendix PAR, Parameters 47 and 52 to 57, Table PAR-39
		Metal corrosion will have an effect			**SCR.2.5.5**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
W64	Effect of metal corrosion	on chemical conditions in the repository by absorbing oxygen	UP		Section 6.4.3.5 Appendix SOTERM, Sections 2.2.3 and 4 Appendix WCA, Section 4.1.1 Appendix PAR, Parameters 36 to 47, Table PAR-39
W65	Reduction-oxidation fronts	Redox fronts may affect the speciation and hence migration of radionuclides	SO-P		**SCR.2.5.5**
W66	Reduction-oxidation kinetics	Reduction-oxidation reactions may not be in thermodynamic equilibrium thereby affecting speciation	UP		**SCR.2.5.5** Section 6.4.3.5 Appendix SOTERM, Sections 2.2.3 and 4 Appendix PAR, Parameters 36 to 47, Table PAR-39
W67	Localized reducing zones	Localized reducing zones, bounded by reduction-oxidation fronts, may develop on metals undergoing corrosion	SO-C		**SCR.2.5.5**
W68	Organic complexation	Aqueous complexes between radionuclides and organic materials may enhance the total dissolved radionuclide load	SO-C		**SCR.2.5.6** Section 6.4.3.5 Appendix SOTERM, Section 5 Appendix WCA, Section 4.1.3
W69	Organic ligands	Increased concentrations of organic ligands favor the formation of complexes	SO-C		**SCR.2.5.6** Section 6.4.3.5 Appendix SOTERM, Section 5 Appendix WCA, Sections 4.1.3, 8.11 and 8.12 Appendix BIR
W70	Humic and fulvic acids	High molecular weight organic ligands, including humic and fulvic acids may be present in soil waste	UP		**SCR.2.5.6** Section 6.4.3.6 Section 6.4.6.2.2 Appendix SOTERM, Section 6.3.3 Appendix PAR, Parameter 46, Table PAR-39
	Kinetics of organic	The rates of complex dissociation			

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
W71	complexation	may affect radionuclide uptake and other reactions	SO-C		**SCR.2.5.6**
W72	Exothermic reactions	Exothermic reactions, including concrete and backfill hydration, and aluminium corrosion, may raise the temperature of the disposal system	SO-C		**SCR.2.5.7** *Section 6.4.3.5* Appendix WCA, Section 5.3.1
W73	Concrete hydration	Hydration of concrete in seals will enhance rates of salt creep and may induce thermal cracking	SO-C		**SCR.2.5.7** Appendix SEAL, Section 7.4.1.1
W74	Chemical degradation of seals	Reaction of cement with brine and groundwater may affect seal permeability	UP		**SCR.2.5.8** Section 6.4.4 Appendix SEAL, Appendix A Appendix PAR, Parameter 10, Table PAR-19
W75	Chemical degradation of backfill	Reaction of the MgO backfill with CO_2 and brine may affect disposal room permeabilities	SO-C		**SCR.2.5.8** Appendix BACK, Section 3.2
W76	Microbial growth on concrete	Acids produced by microbes could accelerate concrete seal degradation	UP		**SCR.2.5.8** Appendix PAR, Parameter 10, Table PAR-19
W77	Solute transport	Radionuclides may be transported as dissolved species or solutes	UP		**SCR.2.6.1** Section 6.4.5.4 Section 6.4.6.2.1 Appendix MASS, Sections 13.5 and 15.2 Appendix NUTS, Section 4.3 Appendix SECOTP2D, Section 2
W78	Colloid transport	Colloid transport, with associated radionuclides, may occur at a different rate to dissolved species	UP		**SCR.2.6.2** Section 6.4.6.2.2 Appendix MASS, Section 15.3 and Attachments 15-2 and 15-8

Table Legend		
Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
					Appendix SECOTP2D, Section 2
W79	Colloid formation and stability	The formation and stability of colloids is dependent upon chemical conditions such as salinity	UP		**SCR.2.6.2** Section 6.4.3.6 Appendix SOTERM, Section 6 Appendix BACK, Section 3.4 Appendix WCA, Section 4.2 Appendix PAR, Parameter 46, Table PAR-39
W80	Colloid filtration	Colloids with associated radionuclides may be too large to pass through pore throats in some media	UP		**SCR.2.6.2** Section 6.4.6.2.2 Appendix MASS, Section 15.3 and Attachments 15-8 and 15-9
W81	Colloid sorption	Colloids with associated radionuclides may be physically or chemically sorbed to the host rock	UP		**SCR.2.6.2** Section 6.4.6.2.2 Appendix SECOTP2D, Section 2 Appendix MASS, Section 15.3 and Attachment 15-8 Appendix PAR, Parameters 52-57
W82	Suspensions of particles	Rapid brine flow could transport active particles in suspension	DP	SO-C for undisturbed conditions	**SCR.2.6.3** Section 6.4.7.1 Appendix CUTTINGS, Appendix A.2
W83	Rinse	Rapid brine flow could wash active particulates from waste surfaces	SO-C		**SCR.2.6.3**
W84	Cuttings	Waste material intersected by a drill bit could be transported to the ground surface	DP	Repository intrusion only	**SCR.2.6.3** Section 6.4.7.1 Appendix CUTTINGS, Appendix A.2
W85	Cavings	Waste material eroded from a borehole wall by drilling fluid could be transported to the ground surface	DP	Repository intrusion only	**SCR.2.6.3** Section 6.4.7.1 Appendix CUTTINGS, Appendix A.2

Table Legend		
Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
W86	Spallings	Waste material entering a borehole through repository depressurization could be transported to the ground surface	DP	Repository intrusion only	**SCR.2.6.3** Section 6.4.7.1 Appendix CUTTINGS, Appendix A.2
W87	Microbial transport	Radionuclides may be bound to or contained in microbes transported in groundwaters	UP		**SCR.2.6.4** Section 6.4.6.2.2 Appendix SOTERM, Section 6.3.4 Appendix MASS, Section 15.3 and Attachment 15-9
W88	Biofilms	Biofilms may retard microbes and affect transport of radionuclides	SO-C	Beneficial SO-C	**SCR.2.6.4**
W89	Transport of radioactive gases	Gas phase flow could transport radioactive gases	SO-C		**SCR.2.6.5** SCR.2.5.1.3
W90	Advection	Dissolved and solid material can be transported by a flowing fluid	UP		**SCR.2.7.1** Section 6.4.5.4 Section 6.4.6.2 Appendix NUTS, Sections 4.3.1 and 4.3.2 Appendix SECOTP2D, Section 2
W91	Diffusion	Dissolved and solid material can be transported in response to Brownian forces	UP		**SCR.2.7.2** Section 6.4.6.2 Section 6.4.5.4 Appendix MASS, Attachment 15-3 Appendix SECOTP2D, Section 2 Appendix NUTS, Section 4.3.3
W92	Matrix diffusion	Dissolved and solid material may be transported transverse to the direction of advection in a fracture and into the rock matrix	UP		**SCR.2.7.2** Section 6.4.6.2 Appendix MASS, Attachment 15.6 Appendix SECOTP2D, Sections 2, 3.5 and 3.6
W93	Soret effect	There will be a solute flux proportional to any temperature	SO-C		**SCR.2.7.3**

Table Legend		
Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		gradient			
W94	Electrochemical effects	Potential gradients may exist as a result of electrochemical reactions and groundwater flow and affect radionuclide transport	SO-C		**SCR.2.7.4**
W95	Galvanic coupling	Potential gradients may be established between metal components of the waste and containers and affect radionuclide transport	SO-P		**SCR.2.7.4** Appendix GCR
W96	Electrophoresis	Charged particles and colloids can be transported along electrical potential gradients	SO-C		**SCR.2.7.4**
W97	Chemical gradients	Chemical gradients will exist at interfaces between different parts of the disposal system and may cause enhanced diffusion	SO-C	p. SCR-87 incorrectly states that gradients are UP.	**SCR.2.7.5**
W98	Osmotic processes	Osmosis may allow diffusion of solutes across a salinity interface	SO-C	Beneficial SO-C	**SCR.2.7.5**
W99	Alpha recoil	Recoil of the daughter nuclide upon emission of an alpha-particle during radioactive decay at the surface of a solid may eject the daughter into groundwater	SO-C		**SCR.2.7.5**
W100	Enhanced diffusion	Chemical gradients may locally enhance rates of diffusion	SO-C		**SCR.2.7.5**
W101	Plant uptake	Radionuclides released into the biosphere may be absorbed by plants	SO-R	SO-C for 40 CFR § 191.15	**SCR.2.8.1** Section 6.5.3 Figure 6.41

Table Legend		
Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
W102	Animal uptake	Animals may eat or drink radionuclides released into the biosphere	SO-R		**SCR.2.8.1** Section 6.5.3 Figure 6.41
W103	Accumulation in soils	Radionuclides released into the biosphere may accumulate in soil	SO-C	Beneficial SO-C	**SCR.2.8.1** Section 6.5.3 Figure 6.41
W104	Ingestion	Humans may receive a radiation dose from radionuclides in food or drink	SO-R	SO-C for 40 CFR § 191.15	**SCR.2.8.2** Section 8.1.1 Section 8.1.2 *Section 8.2.3*
W105	Inhalation	Humans may receive a radiation dose from air taken into the lungs	SO-R	SO-C for 40 CFR § 191.15	**SCR.2.8.2** Section 8.1.1 Section 8.1.2 *Section 8.2.3*
W106	Irradiation	Humans may receive a radiation dose from radionuclides external to the body	SO-R	SO-C for 40 CFR § 191.15	**SCR.2.8.2** Section 8.1.1 Section 8.1.2 *Section 8.2.3*
W107	Dermal sorption	Humans may receive a radiation dose from radionuclides absorbed through the skin	SO-R	SO-C for 40 CFR § 191.15	**SCR.2.8.2** Section 8.1.1 Section 8.1.2 *Section 8.2.3*
W108	Injection	Humans may receive a radiation dose from radionuclides injected beneath the skin	SO-R	SO-C for 40 CFR § 191.15	**SCR.2.8.2** Section 8.1.1 Section 8.1.2 *Section 8.2.3*
H1	Oil and gas exploration	Oil and gas exploration is a reason for drilling in the Delaware Basin	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste and boreholes that	**SCR.3.2.1** Section 2.3.1.2 *Section 6.4.7* Section 6.4.12.2

Table Legend		
Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
				penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	Appendix GCR, Section 8.4.8 Appendix DEL, Sections 4.2 and 7.4 Appendix PAR, Table PAR-53
H2	Potash exploration	Potash exploration is a reason for drilling in the Delaware Basin	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste and boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	**SCR.3.2.1** Section 2.3.1.1 *Section 6.4.7* Section 6.4.12.2 Appendix GCR, Section 8.4.7 Appendix DEL, Sections 4.2 and 7.4 Appendix PAR, Table PAR-53
H3	Water resources exploration	Water resources exploration is a reason for drilling in the Delaware Basin	SO-C (HCN) SO-C (Future)		**SCR.3.2.1** Section 2.3.1.3 Appendix DEL, Sections 4.2 and 7.4 Appendix USDW, Section 3
H4	Oil and gas exploitation	Oil and gas exploitation is a reason for drilling in the Delaware Basin	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste and boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	**SCR.3.2.1** Section 2.3.1.2 Section 2.3.2.2 *Section 6.4.7* Section 6.4.12.2 Appendix DEL, Sections 4.2 and 7.4 Appendix PAR, Table PAR-53
	Groundwater	Groundwater exploitation is a	SO-C (HCN)		**SCR.3.2.1**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
H5	exploitation	reason for drilling in the Delaware Basin	SO-C (Future)		Section 2.3.1.3 Appendix DEL, Sections 4.2 and 7.4 Appendix USDW, Section 3
H6	Archeological investigations	Archeological investigations could be a reason for drilling	SO-R (HCN) SO-R (Future)		**SCR.3.2.1** Section 2.3.2.3
H7	Geothermal	Geothermal energy could be a reason for drilling	SO-R (HCN) SO-R (Future)		**SCR.3.2.1**
H8	Other resources	Exploration for other resources could be a reason for drilling	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste and boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	**SCR.3.2.1** Section 2.3.1.3 *Section 6.4.7* Section 6.4.12.2 Appendix GCR, Section 8.4 Appendix DEL, Sections 4.2 and 7.4 Appendix PAR, Table PAR-53
H9	Enhanced oil and gas recovery	Enhanced oil and gas recovery is a reason for drilling in the Delaware Basin	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste and boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	**SCR.3.2.1** Section 2.3.1.2 *Section 6.4.7* Section 6.4.12.2 Appendix DEL, Sections 5.4 and 7.4 Appendix PAR, Table PAR-53
H10	Liquid waste disposal	Liquid waste disposal could be a reason for drilling	SO-R (HCN) SO-R (Future)		**SCR.3.2.1** Appendix DEL Section 5.4
H11	Hydrocarbon storage	Hydrocarbon storage could be a	SO-R (HCN)		**SCR.3.2.1**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		reason for drilling	SO-R (Future)		
H12	Deliberate drilling intrusion	Deliberate investigation of the repository could be a reason for drilling	SO-R (HCN) SO-R (Future)		**SCR.3.2.1**
H13	Potash mining	Potash mining is a reason for excavations in the region around WIPP	UP (HCN) DP (Future)	UP for mining outside the controlled area. DP for mining inside the controlled area.	**SCR.3.2.2** Section 2.3.1.1 Section 6.4.6.2.3 Section 6.4.12.8 Section 6.4.13.8 Appendix DEL, Section 7.4 Appendix MASS, Attachment 15-4 Appendix PAR, Parameter 34
H14	Other resources	Mining of other resources could be a reason for excavations	SO-C (HCN) SO-R (Future)		**SCR.3.2.2**
H15	Tunneling	Tunneling could be a reason for excavations	SO-R (HCN) SO-R (Future)		**SCR.3.2.2**
H16	Construction of underground facilities (for example storage, disposal, accommodation)	Construction of underground facilities could be a reason for excavations	SO-R (HCN) SO-R (Future)		**SCR.3.2.2**
H17	Archeological excavations	Archeological investigations could be a reason for excavations	SO-C (HCN) SO-R (Future)		**SCR.3.2.2** Section 2.3.2.3
H18	Deliberate mining intrusion	Deliberate investigation of the repository could be a reason for excavations	SO-R (HCN) SO-R (Future)		**SCR.3.2.2**
H19	Explosions for resource recovery	Underground explosions could affect the geological characteristics of surrounding units	SO-C (HCN) SO-R (Future)		**SCR.3.2.3.1**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
H20	Underground nuclear device testing	Underground nuclear device testing could affect the geological characteristics of surrounding units	SO-C (HCN) SO-R (Future)		**SCR.3.2.3.2**
H21	Drilling fluid flow	Drilling within the controlled area could result in releases of radionuclides into the drilling fluid.	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste. SO-C for other future drilling.	**SCR.3.3.1.1** Section 6.3.2.2 Section 6.4.7.1 Appendix DEL Sections 5.1.3 and 6.1.2.1, and Attachment 1 Appendix CUTTINGS, Appendix A.2.2 Appendix MASS, Attachment 16-2
H22	Drilling fluid loss	Borehole circulation fluid could be lost to thief zones encountered during drilling	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste. SO-C for other future drilling.	**SCR.3.3.1.1** Section 6.4.7.1.1 Appendix PAR, Parameters 1 and 3, Table PAR-43
H23	Blowouts	Fluid could flow from pressurized zones through the borehole to the land surface	SO-C (HCN) DP (Future)	DP for boreholes that penetrate the waste and boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future drilling.	**SCR.3.3.1.1** Section 2.2.1.3 Section 6.4.12.6 Section 6.4.7.1.1 Appendix DEL, Section 7.5 Appendix CUTTINGS, Appendix A.2.4.1 Appendix MASS, Attachment 16-2
H24	Drilling-induced geochemical changes	Movement of brine from a pressurized zone, through a borehole, into potential thief zones such as the Salado interbeds or the Culebra, could result in geochemical changes	UP (HCN) DP (Future)	SO-C for units other than the Culebra.	**SCR.3.3.1.1** *Section 6.4.3.6* Section 6.4.6.2 Section 6.4.6.6 Appendix MASS, Section 15.2 and Attachment 15-1 Appendix PAR Parameters 47 and 52 to 57, Table

Table Legend		
Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		geochemical changes			PAR-39 *Appendix SOTERM*
H25	Oil and gas extraction	Extraction of oil and gas could alter fluid-flow patterns in the target horizons, or in overlying units as a result of a failed borehole casing. Removal of confined fluids from oil- or gas-bearing units can cause compaction, potentially resulting in subvertical fracturing and surface subsidence	SO-C (HCN) SO-R (Future)		**SCR.3.3.1.2**
H26	Groundwater extraction	Groundwater extraction from formations above the Salado could affect groundwater flow	SO-C (HCN) SO-R (Future)		**SCR.3.3.1.2** Section 2.2.1.4.2.1 Section 2.3.1.3 Section 6.4.6.6 Section 8.2
H27	Liquid waste disposal	Injection of fluids could alter fluid flow patterns in the target horizons or, if there is accidental leakage through a borehole casing, in any other intersected hydraulically conductive zone	SO-C (HCN) SO-R (Future)		**SCR.3.3.1.3** *Section 2.3.1.1* Section 6.4.7.2 Appendix DEL, Sections 5.5 and 6
H28	Enhanced oil and gas production	Injection of fluids could alter fluid flow patterns in the target horizons or, if there is accidental leakage through a borehole casing, in any other intersected hydraulically conductive zone	SO-C (HCN) SO-R (Future)		**SCR.3.3.1.3** *Section 2.3.1.1* Section 6.4.7.2 Appendix DEL, Sections 5.5 and 6
H29	Hydrocarbon storage	Injection of fluids could alter fluid	SO-C (HCN)		**SCR.3.3.1.3**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		flow patterns in the target horizons or, if there is accidental leakage through a borehole casing, in any other intersected hydraulically conductive zone	SO-R (Future)		
H30	Fluid-injection induced geochemical changes	Injection of fluids through a leaking borehole could affect geochemical conditions in thief zones, such as the Culebra or the Salado interbeds	UP (HCN) SO-R (Future)	SO-C for units other than the Culebra	**SCR.3.3.1.3** Section 6.4.6.2 Section 6.4.6.6 Appendix MASS, Section 15.2 and Attachment 15-1 Appendix PAR, Parameters 47 and 52 to 57, Table PAR-39
H31	Natural borehole fluid flow	Natural borehole flow through abandoned boreholes could alter fluid pressure distributions	SO-C (HCN) DP (Future)	DP for boreholes that penetrate Castile brine underlying the waste disposal region. SO-C for other future boreholes.	**SCR.3.3.1.4** Section 6.4.7.2 Section 6.4.8 *Section 6.4.12.2* Section 6.4.12.7 Appendix MASS, Section 16.3 and Attachments 16-1 and 16-3 Appendix DEL, Sections 5.5 and 6 Appendix BRAGFLO, Section 4.8
H32	Waste-induced borehole flow	Abandoned boreholes that intersect a waste panel could provide a connection for transport away from the repository horizon	SO-R (HCN) DP (Future)	DP for boreholes that penetrate the waste. SO-C for other future boreholes.	**SCR.3.3.1.4** Section 6.4.7 Section 6.4.2.1 Section 6.4.12.7 Appendix MASS, Section 16.3 and Attachments 16-1 and 16-3 Appendix DEL, Sections 5.5 and 6 Appendix BRAGFLO, Section 4.8
H33	Flow through undetected boreholes	Undetected boreholes that are inadequately sealed could provide pathways for radionuclide	SO-P (HCN) NA (Future)		**SCR.3.3.1.4**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		transport			
H34	Borehole-induced solution and subsidence	Boreholes could provide pathways for surface-derived water or groundwater to percolate into formations containing soluble minerals. Large-scale dissolution through this mechanism could lead to subsidence and to changes in groundwater flow patterns	SO-C (HCN) SO-C (Future)		**SCR.3.3.1.4** Section 3.3.4 Section 6.4.7.2 Appendix DEL, Sections 5.5 and 6
H35	Borehole-induced mineralization	Fluid flow through a borehole between hydraulically conductive horizons could cause mineral precipitation to change permeabilities	SO-C (HCN) SO-C (Future)		**SCR.3.3.1.4**
H36	Borehole-induced geochemical changes	Movement of fluids through abandoned boreholes could change the geochemistry of units such as the Salado interbeds or Culebra	UP (HCN) DP (Future)	SO-C for units other than the Culebra	**SCR.3.3.1.4** *Section 6.4.3.6* Section 6.4.6.2 Section 6.4.6.6 Appendix MASS, Section 15.2 and Attachment 15-1 Appendix PAR, Parameters 47 and 52 to 57, Table PAR-39
H37	Changes in groundwater flow due to mining	Fracturing and subsidence associated with excavations may affect groundwater flow patterns through increased hydraulic conductivity within and between units	UP (HCN) DP (Future)	UP for mining outside the controlled area. DP for mining inside the controlled area.	**SCR.3.3.2** Section 2.3.1.1 Section 6.4.6.2.3 Section 6.4.12.8 Section 6.4.13.8 Appendix CCDFGF, Section 3.2 Appendix DEL, Section 4.2.4 Appendix PAR, Parameter 34
H38	Changes in	Fluid flow and dissolution	SO-C (HCN)		**SCR.3.3.2**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
	geochemistry due to mining	associated with mining may change brine densities and geochemistry	SO-R (Future)		Section 2.3.1.1
H39	Changes in groundwater flow due to explosions	Fracturing associated with explosions could affect groundwater flow patterns through increased hydraulic conductivity within and between units	SO-C (HCN) SO-R (Future)		**SCR.3.3.3**
H40	Land use changes	Land use changes could have an effect upon the surface hydrology	SO-R (HCN) SO-R (Future)		**SCR.3.4.1**
H41	Surface disruptions	Surface disruptions could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.4.1**
H42	Damming of streams or rivers	Damming of streams or rivers could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.5.1**
H43	Reservoirs	Reservoirs could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.5.1**
H44	Irrigation	Irrigation could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.5.1**
H45	Lake usage	Lake usage could have an effect upon the surface hydrology	SO-R (HCN) SO-R (Future)		**SCR.3.5.1**
H46	Altered soil or surface water chemistry by human activities	Surface activities associated with potash mining and oil fields could affect the movement of radionuclides in the surface environment	SO-C (HCN) SO-R (Future)		**SCR.3.5.1**
H47	Greenhouse gas effects	Changes in climate resulting from increase in greenhouse gases could change the temperature and the	SO-R (HCN) SO-R (Future)		**SCR.3.6.1**

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
		amount of rainfall			
H48	Acid rain	Acid rain could change the behavior of radionuclides in the surface environment	SO-R (HCN) SO-R (Future)		**SCR.3.6.1**
H49	Damage to the ozone layer	Damage to the ozone layer could affect the flora and fauna and their response to radioactivity	SO-R (HCN) SO-R (Future)		**SCR.3.6.1**
H50	Coastal water use	Coastal water usage could affect the uptake of radionuclides by animals and humans	SO-R (HCN) SO-R (Future)		**SCR.3.7.1**
H51	Sea water use	Sea water usage could affect the uptake of radionuclides by animals and humans	SO-R (HCN) SO-R (Future)		**SCR.3.7.1**
H52	Estuarine water use	Estuarine water usage could affect the uptake of radionuclides by animals and humans	SO-R (HCN) SO-R (Future)		**SCR.3.7.1**
H53	Arable farming	Arable farming could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.8.1**
H54	Ranching	Ranching could have an effect upon the surface hydrology	SO-C (HCN) SO-R (Future)		**SCR.3.8.1** Section 2.3.2.2
H55	Fish farming	Fish farming could affect the uptake of radionuclides by animals and humans	SO-R (HCN) SO-R (Future)		**SCR.3.8.1**
H56	Demographic change and urban development	Demographic change and urban development could have an effect upon the surface hydrology	SO-R (HCN) SO-R (Future)		**SCR.3.8.2** Section 2.3.2.1
H57	Loss of records	Loss of records could change the effectiveness of institutional controls	NA (HCN) DP (Future)		**SCR.3.8.2** Section 6.3 Section 6.4.7

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	

EPA FEP No.	FEP Name	Issue	Screening Classification (see legend)	Comments on Classification	CCA Cross References
					Section 6.4.12.1 Section 6.4.12.2 Section 7.3 Appendix EPIC, Section 6 Appendix PAR, Table PAR-53

Table Legend

Natural FEPs – **N**	Screened-Out/Consequence – **SO-C**	Historical, Current and Near-Future Events & Process – **HCN**
Waste-related FEPs – **W**	Screened-Out/Regulation – **SO-R**	Future human-initiated Events & Processes – **Future**
Human-induced FEPs – **H**	Screened-Out/Probability – **SO-P**	
	Undisturbed Performance – **UP**	
	Disturbed Performance – **DP**	