



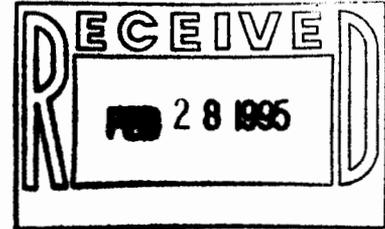
Department of Energy

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Lindsay A. Lovejoy, Jr.
Assistant Attorney General
P.O. Drawer 1508
Santa Fe, N.M. 87504-1508



10/20/94

Dear Mr. Lovejoy:

Thank you for your comments on the Scenario Position Paper. Your interest and participation in the Systems Prioritization Method (SPM) is greatly appreciated. Enclosed is the Carlsbad Area Office's response to the questions you have expressed regarding this paper.

If you have any questions regarding these responses, please contact Bob Bills of my staff at (505) 234-7481.

Sincerely,

Michael H. McFadden
Assistant Manager
Office of Regulatory Compliance

Enclosure

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SCENARIO POSITION PAPER QUESTIONS AND RESPONSES

The paper states that when EPA issues new compliance criteria, 40 CFR Part 194, the scenario development work will be reconsidered (at 2-2). The paper should make clear that when a public draft is issued by EPA, the scenario development process will be reviewed on the basis of such proposal. DOE stated in Mr. Dials's September 9, 1994 letter to me that "CAO plans to address the content of the 40 CFR 194 standard upon its issue for public comment in the form of a proposed rule." (Enc. II, at 11 ¶20a).

The project is aware of the draft content of 40 CFR Part 194 and we have adopted the drilling rates of the draft regulation. At the present time, we believe the other portions of the standard are in too great a state of flux upon which to base our program. The Carlsbad Area Office (CAO) will address the content of the new standard by providing comments to the Environmental Protection Agency (EPA) on the promulgated proposed regulation..

2. *The selection of FEP's and scenarios should not be limited by 40 CFR 191 Appendix C, which (a) is nonbinding and (b) is about to be replaced by 40 CFR Part 194.*

Prior to issuance of 40 CFR Part 194 in final form (see Comment 1 above), compliance with the standards in 40 CFR Part 191 will be assessed in accordance with the guidance in Appendix C, with the sole exception of drilling rates.

3. *The statement (at 2-3) that human intrusion need not be considered under 40 CFR §268.6 creates an inconsistency with the treatment of human intrusion under 40 CFR Part 191 and disregards EPA's draft no-migration guidance, which calls for consideration of "likely human-induced events" (July 1992 draft guidance, at 3-4).*

Your statement that human intrusion needs to be considered in the preparation of the No-Migration Petition is correct. The Office of Solid Waste expressed their position on this topic in the April 6, 1990, Proposed No-Migration Determination for WIPP. The agency explained that they believed that the question of human intrusion is best addressed through a consideration of likelihood of intrusion and the imposition of controls to make such intrusions remote to unlikely. After some discussion of the

passive institutional controls, the EPA states "These specific controls, and perhaps others, would constitute assurances against human intrusion for the No-Migration Variance Petition for permanent disposal." Consequently, the DOE is working under the assumption that the consideration of human intrusion is effectively obviated by the proposed institutional control strategy.

4. *The draft paper calls for "well-defined screening criteria" for screening of FEP's (at 2-4). The criteria must be clearly defined, and this has not been done. To screen a FEP from consideration eliminates the FEP from study in any later stages of PA. Thus, it is a drastic step. Screening cannot be done in anything less than a rigorous process.*

The screening of features, events, and processes (FEPs) on the basis of probability is based on the EPA bound of 10^{-4} per year over 10,000 years, although it is acknowledged that for many geological FEPs, a quantitative probability cannot be defined. In these cases, the geological setting and lack of occurrence of particular FEPs over extended periods of geological time are used as qualitative measures of probability. A quantitative criterion for screening on the basis of consequence is not defined by the EPA and each FEP screened, on this basis, is assessed in relation to the predicted behavior and associated uncertainties of the appropriate sub-system. FEPs that have consequences several orders of magnitude less than the range of uncertainty over sub-system behavior are screened out.

Screening of FEPs and scenario development are processes that need to be re-evaluated iteratively with the Performance Assessment (PA), with changes in regulations, and with changes in system design. Screening out of a particular FEP does not eliminate it from future consideration, if circumstances change or new evidence is brought to bear.

5. *The paper requires a statement of the system employed to analyze FEP's with regard to possible interactions with other FEP's. This also is critical. It is of some concern that, for example, repository processes such as caving are screened out, even though they are known to be a part of scenarios required to be examined in evaluating compliance.*

FEPs are not screened in isolation, but are assessed in terms of their contribution to sub-system behavior. Revisions to the text have been made in Version 4 (Chapter 4) to stress this procedure. The particular instance of screening highlighted in the comment has been rectified.

6. *The statement (at 3-7) that under some interpretations of 40 CFR Part 191, Appendix C, the E1E2 scenario need not be considered should either be dropped or justified. The E1E2 scenario has been a subject of intense analysis for some years, and most of those involved have agreed on the necessity of such study. That omission of this scenario should be considered raises serious concern.*

The following basis is provided in Chapter 8 for questioning whether the E1E2 scenario needs to be included in system-level analyses.

The E1E2 scenario requires two drilling events which are relatively close in space (intersecting the same waste panel). It is a reasonable assumption that once knowledge of the repository is regained (e.g., after an inadvertent intrusion), active and even passive institutional controls would be reinstated. In keeping with the guidance in 40 CFR Part 191, active institutional controls can be assumed to be effective for up to 100 years. Thus, creep closure of open boreholes may be effective in reducing the probability of E1E2 scenarios. Nonetheless, it is conceivable - until modeling of creep closure shows otherwise - that at least some boreholes will remain open for sufficiently long periods for E1E2 scenarios to occur. There is no reason not to question the inclusion of this, or any other, scenario in system-level PA modeling. However, the Position Paper concluded that the E1E2 scenario should be retained and the drilling rates of Draft 40 CFR 194 will determine the probability that this scenario occurs.

7. *The initial draft states that work is currently underway to improve understanding of the effect of certain FEP's (at 4-1). Stakeholders cannot appraise and respond to proposals as to the disposition of FEPs where the argument for such disposition has not been developed and stated.*

Scenario development and performance assessment are iterative processes and the final set of screening arguments will only be included in the final compliance application. Future drafts of the Position Paper will incorporate the appropriate arguments for all FEPs that are screened out.

8. *It is stated that the work in Chapters 5-7 is in progress and that the work in those chapters should be viewed as a progress report (at 4-1). When will the work be done and a final version submitted?*

See response to Comment 7 above. The next draft of the Position Paper will form part of the basis for the draft compliance documentation which is due for submission to the EPA in March 1995. The final Position Paper will be developed for the final compliance application. Stakeholders will be involved in the development of the final papers.

9. *The draft suggests that credibility and defensibility of the work would be enhanced by a formal expert elicitation process, superimposed on the existing work (at 4-3). I concur and inquire whether such a process is planned.*

It is not currently planned to undertake formal expert elicitation as part of the scenario development process. The need for formal elicitation, at least for parts of the process, will be re-evaluated in 1995 as part of the iterative PA/scenario development procedure.

10. *As stated above, the screening criteria (at 4-7) must be set forth more clearly. There is a quantification of the probability cutoff. There is no quantification of the consequence cutoff or the level of assurance with which it is to be demonstrated. Will both probability and consequences be estimated, as EPA (Jim Bennetti) has suggested? Further, reliance on Appendix C is erroneous, as stated above.*

FEPs were assessed in terms of regulatory guidance, consequence, and probability, in that order, and were screened out on the basis of the first appropriate criterion. Thus, the probability of FEPs existing, which can be screened out on the basis of either regulation or consequence, will not be evaluated. Neither the consequences nor the probability of FEPs existing that can be screened out on the basis of regulatory guidance will be evaluated. Text revisions have been included in Version 4 to clarify this procedure.

See response to Comment 2 for the basis of screening on the grounds of regulatory guidance.

11. *As to low-probability screening, the draft says that there is a bound of 10^{-8} per year on the cumulative probability of all scenarios eliminated on probability grounds (at 4-8). Given that the probability of individual FEPs is difficult or impossible to estimate, it is not clear how this bound is to be applied.*

Scenario screening has not been rigorously described in the current draft of the Position Paper. The project view is that a bound of 10^{-8} per year for the cumulative probability of eliminated scenarios meets the intentions of the EPA. If a low probability FEP such as "volcanism" were retained and used in the definition of scenarios, then, any scenario including this event would have a probability at least as low as that of the FEP. Although the quantitative limit applied to FEP screening is 10^{-8} per year, the FEPs screened on a qualitative geological basis are considered to have a probability of occurrence orders of magnitude less than this. Although many FEPs have been screened out on the basis of low probability, not all of these would lead to distinct scenarios if they were retained. The cumulative probability of the scenarios that would have resulted from retention of these FEPs (pS_L in the terminology used in the PA methodology Position Paper) cannot be quantified but can be qualitatively assessed as less than 10^{-8} per year; this is adequate to

define the position of the Complementary Cumulative Distribution Functions (CCDFs) for comparison with the compliance criteria. Scenario screening will be discussed in detail in later drafts of this Position Paper or in other project documentation.

12. *Again, as to low-probability screening, the draft says that in most cases, it is "not possible to estimate a probability" (at 4-20). This raises concern, because the qualitative screening arguments advanced generally lack data. It is a drastic step to eliminate a FEP entirely from PA consideration at an early stage, and it should only be done in a very clear case.*

The project recognizes that not all of the arguments for screening out particular FEPs have been advanced in Version 3 of the Position Paper; these will be incorporated in future drafts. We defend, however, the use of low-probability as a screening argument for natural FEPs even when quantitative probability estimates cannot be made. In previous work, the term physical unreasonableness has been used for processes and events that the geological setting precludes. Because no event can be said to have a zero probability, this term is not used in the current Position Paper. Revisions to clarify the connection between low probability and physical unreasonableness have been made.

13. *There is an initial question as to the manner in which FEPs are discussed in Chapter 5. Chapter 5 addresses natural FEPs, but does so only from the perspective that PAs to date have shown no releases from an undisturbed repository. Individual FEPs appear to be considered in Chapter 5 largely without regard to their possible interaction with intrusive events. This is a limiting perspective, particularly when one considers that the environs of the WIPP have already been intruded upon by drilling, extraction, and water injection activities. Further, at the EPA technical exchange on September 22 it was suggested by EPA that current human activities in the area and their effects be incorporated in the base case, and I inquire what will be done along that line.*

It is not the intention of the Position Paper to discount interactions between natural FEPs and human actions. For example, the effects of changes in the groundwater system as a result of future human actions (intrusion or intersection of a brine pocket) have been retained for evaluation (Section 5.9 in Version 3). In addition, a discussion of the potential for existing human activities to affect the hydrogeological system has been included in Version 4 (Chapter 7).

14. *Several natural FEPs are screened out with the observation that work is underway to develop an argument that the FEP can be eliminated on grounds of low probability or low consequence. The complete argument, however, is not presented. This is the case as to the following:*

Regional tectonics
Magmatic activity
Fault movement
Fracture development
Seismic activity
Changes in the earth's magnetic field
Erosion/sedimentation
Infiltration/recharge changes
Vegetational change

FEPs within these categories must be retained unless a screening argument is properly made and supported.

We are aware that Version 3 did not present complete screening arguments for some natural FEPs. Many of the FEPs concerned have been screened out in previous assessments; no new evidence has been presented to cause these decisions to be revised but the screening argument would be strengthened by the inclusion of additional and/or more recent material. These additions are scheduled for forthcoming drafts. Some FEPs were screened out in Version 3, but nevertheless, they acknowledged ongoing modeling studies that would support the screening decision; these FEPs have been re-classified in Version 4 as retained for evaluation. Note, in particular, that infiltration/recharge changes have **not** been screened out in the scenario development process but are included in the analysis of scenarios that lead to releases from the Salado.

15. *Fracture development resulting from natural forces cannot be screened out (at 5-7), in light of the acknowledged possibility of such effects resulting from mineralogical and geochemical changes. The viewgraphs presented to EPA on September 22-23 appear to recognize such possibility (at 7-9).*

The properties of fractures within the Rustler Formation and other units overlying the Salado have evolved since deposition of these units 245 million years ago. These changes include the response to the relatively rapid changes in climate, and consequent variations in the amount of infiltration and recharge, that have characterized the past half-million years or so. Variability in the original distribution of fractures and in their response to changes in groundwater flow and chemistry mean that there is marked spatial variability in fracture properties across the area. Because site characterization cannot analyze every fracture, there is also a degree of uncertainty as to the extent of this spatial variability. Spatial variability and associated uncertainties are accounted for in the groundwater modeling of the Culebra Dolomite through the generation of different transmission fields.

We acknowledge that changes in fracture properties will take place in response to future climate change, but the extent of these changes over

the next 10,000 years will be small in comparison to the changes that have taken place in the past. Treatment of the uncertainties associated with our understanding of present-day fracture properties will encompass these future changes. The screening out of fracture development on the grounds of low probability is thus based on the premise that there are no FEPs other than those operative over the past half-million years that would change the properties of the fracture system. Changes to the fracture system brought about through human actions, either current or future, are not screened out. Changes to the text to clarify the above points and to stress the distinction between natural and human-induced changes will be made in future drafts.

16. *Deep dissolution within the Salado and Castile formations should not be screened out at this stage without clarification of the debated issues of the formation of breccia pipes within the central basin and the origins of brecciated anhydrite in the Castile. There are indications of breccia structures in areas not underlain by the Capitan limestone. See Anderson, R. Y., Deep-Seated Salt Dissolution in the Delaware Basin, Texas and New Mexico, Environmental Geology and Hydrology in New Mexico, at 133-45 (1981); Anderson and Kirkland, Dissolution of salt deposits by brine density flow, Geology 8, 66-69 (1980). The origins of brecciated anhydrites in the Castile are debated, as the text itself states (at 5-9).*

The dissolution feature described by Anderson and Kirkland (1980) from within the Delaware Basin is postulated to have a similar origin to those overlying the Capitan Reef around the margins. In this example, however, it is dissolution of the Castile by low salinity waters within the Delaware Mountain Group (DMG) that has given rise to a breccia pipe. As Anderson and Kirkland illustrate, such low salinity waters are only present where the DMG is close to the surface, and hence close to a source of recharge. The DMG is close to the surface in the western part of the basin. In the vicinity of WIPP, groundwater within units beneath the Salado have too high a salinity (>150 g/l according to Figure 4 in Anderson and Kirkland [1980]) to cause extensive dissolution cavities and thence breccia pipes. Text revisions have been made in Version 4 to clarify this point.

Further discussion of the brecciated anhydrites within the Castile will be incorporated in future drafts.

17. *It is erroneous to screen out naturally-caused changes in mineralogy, if by that term DOE means to include dissolution of fracture fillings in the Rustler. The attached paper by Roger Y. Anderson explains that WIPP is located in a region of developing karst, rendering the site vulnerable to changes in climate. A major climate change could bring active dissolution to the WIPP site. Such a consequential FEP cannot be eliminated at this early stage.*

Natural mineralogical change, as discussed in Version 3, concentrates on possible changes in the type and nature of minerals present, and includes processes such as hydration, replacement and precipitation. Dissolution of evaporite minerals, affecting essentially the volume of particular minerals present, is discussed under a separate section. The screening decision for natural mineralogical changes is based on the same premise as that for fracture development discussed in response to Comment 15 above. It is acknowledged that changes will take place as a result of climate change over the next 10,000 years. This climate change will be within the range of climatic conditions already experienced in the region over the past half-million years and no more "severe" conditions are expected. Hence, if account is taken of the uncertainties inherent in characterizing the distribution and nature of minerals in fractures and in the matrix, the effects of future changes will also be accounted for. Modifications have been made to the text in Version 4 to clarify this point.

18. *The draft acknowledges the "considerable debate" (at 5-12) about the effects of global warming, and yet greenhouse induced changes are listed in Table 5-1 as screened out on grounds of low consequence. With the issue disputed, the FEP cannot be screened out.*

The text and the screening classification have been modified in Version 4 to reflect ongoing modeling studies of the effects of changes in recharge. General circulation models suggest that the southern United States will experience a slight decrease in precipitation under conditions of greenhouse gas induced warming. The effects of a decrease in recharge are anticipated to be less in terms of possible radionuclide transport than an increase in recharge resulting from longer term natural climate change. Hence, the FEP was screened out on the basis of low consequence. If greenhouse gas warming leads to an increase in precipitation and recharge, it would be less than that which will arise through natural climate change and, again, the FEP can be screened out on the basis of low consequence. Greenhouse gas induced climate change can therefore be screened out using qualitative arguments. However, since 3-D groundwater modeling studies are underway to demonstrate the effects of varying recharge, it will be possible to demonstrate the above assumptions quantitatively and the FEP has been retained for evaluation.

19. *The discussion of shallow dissolution and soil development (at 5-15) is unclear as to the extent of the FEP being discussed. For reasons explained in the Anderson paper attached, dissolution having effects on the hydrologic characteristics of the Rustler aquifer cannot be screened out. The draft refers to processes of deposition of the Rustler described by Holt and Powers (1988), but these are disputed in Snyder, R.P., Dissolution of Halite and Gypsum, and Hydration of Anhydrite to Gypsum, Rustler Formation, in the vicinity of the Waste Isolation Pilot Plant, Southeastern New Mexico, USGS-OFR-85-229*

(1985), who supports a dissolution interpretation, and neither theory is wholly satisfactory, as noted in Beauheim, R.L., Interpretations of Single-Well Hydraulic Tests Conducted At and Near the Waste Isolation Pilot Plant (WIPP) Site, 1983-87, SAND 87-0039 (1987), and Brinster, K. F., Preliminary Geohydrologic Conceptual Model for the Los Medaños Region Near the Waste Isolation Pilot Plant for the Purpose of Performance Assessment, SAND 89-7147 (1991). To exclude halite dissolution on the ground that processes leading to a breach of the repository would go too slowly to have an effect does not account for the process of dissolution altering the flow and transport characteristics of the Rustler, as described by Anderson in the attached paper.

Changes have been made to the text in Version 4 to clarify the FEPs under discussion in each section and to describe alternative models of the evolution of the Rustler Formation more clearly. Shallow dissolution is acknowledged as an on-going process that will continue over the next 10,000 years. As discussed in the response to Comments 15 and 17 above, dissolution of the Rustler Formation has been taking place over much of the last half-million years. Depositional heterogeneities combined with localized dissolution have resulted in marked spatial variability in the distribution of porosity and permeability and other properties affecting groundwater flow and radionuclide transport. Accounting for this variability and associated uncertainty is accomplished through generation of multiple transmissivity fields. Because the processes taking place over the next 10,000 will be the same as those operative in the past, and because this period is very much shorter than the period over which these processes have been active, it is argued that future changes will be accounted for through an adequate treatment of present-day uncertainties in the hydrologic characteristics of the Rustler Formation.

Your comments and the attached report are noted and we will review future drafts of the Position Paper to ensure that all of the issues raised are adequately treated.

20. *The draft paper screens out on grounds of low consequence a FEP involving infiltration and recharge leading to hydrological changes (at 5-16, 5-26). The attached paper by Anderson illustrates that increased recharge due to climate changes may well affect the hydrology of the Rustler. The FEP cannot be excluded. Further, the draft itself says that the three-dimensional groundwater flow model suggests that an increase in recharge can lead to a change in flow direction in the Rustler (at 5-17), a phenomenon that has not been fully assessed. No early decision to exclude such phenomena should be made.*

The potential for infiltration and recharge to change over the next 10,000 years is acknowledged in the Position Paper. This FEP is included in the analysis of scenarios that lead to a release from the Salado and is not screened out. We acknowledge that confusion has arisen with regard to the FEP "hydrological change" that is screened out on the basis of low

consequence. In the list of FEPs presented in Appendix A, this FEP appears in the subcategory **8.6 Surface water flow and effects**. This FEP relates to changes in stream flow rather than to changes in groundwater flow. To eliminate confusion when the FEPs are listed without reference to the sub-system in which they operate, this FEP has been changed to "surface hydrological change" in Version 4.

21. *The statement (at 5-20) that "there are no naturally occurring events or processes that are expected to have a significant effect on the geometry of the flow system over the period of regulatory concern" is contradicted by the description of increased recharge leading to a change in flow direction (at 5-17) and should also be modified to take account of the dissolution effects following a climate change, as described in the Anderson paper.*

What we intended to convey was the fact that there are no naturally occurring events or processes that are expected to have a significant effect on the physical disposition of the lithological units. The way in which flow will take place within the system is dictated by boundary conditions such as the amount and location of recharge. It is therefore possible for changes in flow direction to take place within a system that retains the same geometry. The text has been modified in Version 4 to clarify this point. As discussed under Comment 15 above, changes in hydrogeological properties are expected, but these will be accounted for within the range of spatial variability and associated uncertainties already incorporated within the description of the groundwater system.

22. *It is unclear from the draft what treatment is to be applied to departures from the repository design. Possible modifications to backfill and seal systems (at 6-5) and to the waste and canister (at 6-4) are classified as RB. However, it is generally assumed in the draft that, once the design is made final and certified by EPA, the repository will be built as designed (at 7-14), and no intentional or unintentional changes will be made. In our view, FEPs involving departures from on-design construction must be retained. Such FEPs may be modeled in various ways, but it is erroneous to screen them out.*

It is our intention to build the repository as designed. If any intentional changes are made, they will be thoroughly researched and presented to all applicable agencies. Our quality assurance, along with generous assistance from oversight groups and regulatory agencies, should be sufficient to ensure that no unintentional changes are made.

23. *Caving should not be screened out as having low consequences (at 6-7). Modeling of disposal room closure includes the characterization of brittle behaviour of the Salado. Thus, caving is one of the inter-related processes to be incorporated in the base case.*

The classification of caving has been changed. Caving was not explicitly

modeled in the 1992 PA and has thus been classified as retained for evaluation in Version 4. Note that associated FEPs such as the "formation of cracks" and "host-rock fracturing" were included in the 1992 WIPP PA and were classified accordingly.

24. *Explosions affecting backfill and flow paths are screened on the ground of low consequence (at 6-10), but no argument for such screening has been presented.*

The screening argument was based on the assumption that the effects of explosions on backfill and host-rock would be no greater than the effects on seals. The effects of explosions on seals was defensibly screened out on the basis of information published in the 1991 WIPP PA. The text will be modified in future drafts to clarify this point.

25. *In interpreting the resource area disincentive of 40 CFR §191.14 (e) it is not correct that resource potential should be based on current or near-term projections of resource values (at 7-3). The regulations refer to "any material that is not widely available from other sources."*

If only those resources used by currently available technologies are considered, then the availability of resources and current or near-term projections of their values will be closely related. Thus, a resource that was not widely available would have a high value if it were required by some present day technology. Conversely, material that was restricted in its availability but had no widespread use would be of low value. Your comment with regard to the wording of the regulations is noted and the text will be modified accordingly in future drafts.

26. *The draft relies upon the 40 CFR 191 Appendix C limitations as to human intrusions to be considered (at 7-3). This appendix is nonbinding and will soon be replaced by 40 CFR Part 194. Reliance should not be placed upon it.*

The drilling rates specified in 40 CFR Part 194 will be used. Prior to issuance of 40 CFR Part 194 in final form (see also Comment 1 above), compliance with the other standards in 40 CFR Part 191 will be assessed in accordance with the guidance in Appendix C. A compliance application submitted prior to final promulgation of 40 CFR Part 194 will be based on these interpretations.

27. *The assumption that intruders will "soon detect" the incompatibility of their activities with WIPP (at 7-3) comes from the nonbinding Appendix C and should not be used to restrict PA analyses. Further, the assumption is premised in part on a demonstration of effective passive institutional controls, which has not been made. Moreover, the assumption is not supported by current practice. See the Berglund presentation at the February 22-24, 1994 DOE-EPA technical exchange.*

Prior to issuance of 40 CFR Part 194 in final form (see also Comment 1 above), compliance with the standards in 40 CFR Part 191, except for drilling rates, will be assessed in accordance with the guidance in Appendix C. In addition, where flexibility in interpretation of the standard is possible, current DOE interpretations, as expressed in the Compliance Status Report (USDOE, 1994) have been adopted (Section 7.2.1 of the Position Paper).

The assumption that "passive institutional controls or the intruders' own exploratory procedures are adequate ..." is derived from Appendix C of 40 CFR Part 191. Modeling of human intrusion scenarios does not in fact take into account passive institutional controls, although the potential benefit to be gained from long-term markers was illustrated in the 1992 WIPP PA.

There are ample opportunities for a driller to "soon-detect" the incompatibility of his activities within the area. These activities begin with drilling practices themselves and progress until a drill hole is abandoned and the site remediated. The DOE will evaluate each of these "opportunities" to determine if any benefit is gained.

28. *It is incorrect that any resource extraction would not be an inadvertent process and should be screened out (at 7-3, 7-4). Whether resource extraction may occur without constituting an intentional intrusion must be determined on the basis of the case factually made to support a screening decision -- not on the basis of pure assertion.*

Prior to issuance of 40 CFR Part 194 in final form (see also Comment 1 above), compliance with the standards in 40 CFR Part 191, except for drilling rates, will be assessed in accordance with the guidance in Appendix C. In addition, where flexibility in interpretation of the standard is possible, current DOE interpretations, as expressed in the Compliance Status Report (USDOE, 1994) have been adopted. This assumption is consistent with Appendix C.

29. *There is a reference to plugged and abandoned holes in the region (at 7-4). The characteristics of typical plugged and abandoned holes in the area -- if typical cases exist at all -- are still to be demonstrated. Prevailing practice is inconsistent. See U.S. Department of the Interior, OIG, Audit Report No. 90-18, Nov. 1989.*

It is acknowledged elsewhere in the Position Paper that borehole plugging procedures have not historically been standardized in the Delaware Basin. However, more recent experience is toward better enforcement of the regulatory standard for plugging. The EPA suggests in 40 CFR Part 191 (Appendix C) that plugs should be treated as having

the "permeability typical of a borehole filled by the soil or gravel that would normally settle into an open hole over time". This guidance is heeded in the modeling of scenarios.

30. *The draft notes alternative assumptions concerning oil and gas resource extraction and potash mining within the controlled area (at 7-4). The FEPs described should, in fact, be retained rather than screened out.*

The text referred to highlights the fact that Appendix C of 40 CFR Part 191 is guidance and thus open to alternative interpretations. Promulgation of 40 CFR Part 194 will provide criteria for WIPP certification to 40 CFR Part 191, which may change some of the guidance in Appendix C of 40 CFR Part 191. The FEPs relating to oil and gas resource extraction and potash mining are, in fact, retained for evaluation and have not been screened out. These future human actions within the controlled area are retained because of the potential for the intersection of contaminants that have migrated beyond the repository (7-7 in Version 3), or for the alteration of the groundwater flow pattern (7-9 in Version 3).

31. *The exclusion of human intrusion from RCRA no-migration analyses (at 7-5) is erroneous, see point 3 above.*

See response to point 3 above.

32. *The draft excludes exploitation drilling that intersects the repository (at 7-6). As stated, this is erroneous. What should be excluded is intentional intrusion, as characterized on the basis of actual or projected drilling practices.*

Resource exploitation is preceded by exploration. The EPA's guidance in Appendix C 40 CFR Part 191 is that the "... intruders' own exploratory procedures are adequate for the intruders to soon detect, or be warned of, the incompatibility of the area with their activities". Intrusion following such detection or warning is thus regarded as deliberate and screened out on regulatory grounds. Changes to this guidance in 40 CFR Part 194 cannot be anticipated.

33. *Geothermal exploration and development activities are excluded on the ground that the regulatory interpretation confines consideration to resource activities in the recent past (at 7-7). The focus should be broader and should consider any prospective exploration for or development of scarce or easily accessible resources or any material not widely available from other sources. If that focus would include geothermal sources, the FEP should not be screened out.*

No scarce or easily accessible resources, other than potash, oil, and gas have been identified in the WIPP area. This is corroborated by an Environmental Evaluation Group (EEG) report. Thus, resource

38. *It is not clear why mining which leads to intrusion of the repository should be excluded (at 7-9). Intersection of the repository would not in all cases be intentional intrusion. Perhaps an argument exists on grounds of low probability due to the location of extractable potash, but the argument has not yet been made.*

Resource exploitation is preceded by exploration. The EPA guidance in Appendix C 40 CFR Part 191 is that the "... intruders' own exploratory procedures are adequate for the intruders to soon detect, or be warned of, the incompatibility of the area with their activities." Intrusion following such detection or warning is thus regarded as deliberate and screened out on regulatory grounds. If the repository were constructed in an horizon containing extractable potash or other economic resources, then it is conceivable that mining along a seam could lead to direct intrusion. In practice, exploration along the seam ahead of the mine would probably be undertaken which would provide a warning. Text, to clarify this argument and the lack of exploitable resources at the repository horizon, will be added in future drafts.

39. *Numerous other underground activities are screened out on the basis of low probability (at 7-10). The treatment is so cursory that it is difficult to appraise it. More should be said by way of argument, particularly concerning mining for resources other than potash.*

No excavation activities, other than those associated with resource exploitation or the creation of the WIPP repository, are known to have taken place in the WIPP area in the past (e.g., construction of underground storage facilities/dwellings, tunnelling). Further, no reasons have been identified for undertaking such activities in the immediate vicinity of the WIPP as opposed to any other region with similar characteristics. Thus, it is reasonable to assume that the probabilities of such activities taking place in the WIPP area in the future are low. This argument will be reinforced in later drafts of the Position Paper.

Mining, other than for potash, can be screened out on grounds of low probability, because no scarce or easily accessible resources (other than potash) have been identified in the WIPP area. This reasoning will be elaborated in later drafts of the Position Paper.

40. *Similarly, the exclusion of other surface activities (at 7-11) requires further explanation and support. Human activities affecting recharge may have significant consequences. One example given by EPA is surface excavation of caliche, sand and gravel.*

Surface activities that could potentially affect recharge have been re-classified in Version 4 and retained for evaluation. Three dimensional groundwater modeling is currently underway which will address the significance of these FEPs.

41. *The screening of explosives used in resource recovery requires further argument in support (at 7-12). What is the probable location of such efforts and the area affected?*

Details of current practice in the use of explosives for resource recovery will be included in future drafts.

42. Finally, we are concerned that there is no description of the manner in which scenarios are to be constructed from the retained FEPs. The process implicates considerations of aggregation and resolution. Further, there is the issue of expressing the uncertainty of numerous natural and human-induced events and the possible need for multilevel probability analyses (e.g., exploration followed by development activities). These issues should be discussed in the forthcoming draft.

Scenario screening (that is the reduction of the set of scenarios incorporating retained FEPs to a set of computational scenarios) has not been undertaken in this Position Paper. The approach to PA and scenario development is iterative. The issues raised in the comment will be addressed in the design of system-level calculations initially for the SPM and, following any necessary re-screening of FEPs, in future performance assessments.

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