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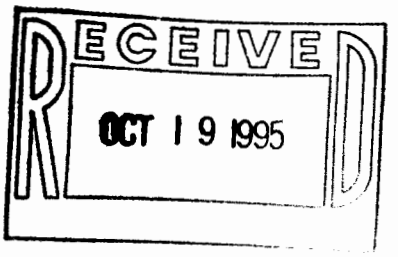

Environmental Protection Agency
Docket No. A-93-02, Air Docket
Room M-1500 (LE-131)
401 M Street, S.W.
Washington, D.C. 20460

To The Docket:

Pursuant to the Agency's notice dated August 16, 1995 (60 Fed. Reg. 42566) this office submits the following comments on the draft compliance certification application ("DCCA") submitted by the U.S. Department of Energy ("DOE") to the Agency ("EPA") in two segments on March 31 and July 31, 1995.

This office strongly objects to the Agency's receipt and consideration of the DCCA and to the Agency's plans to provide comments to DOE on the DCCA. As the Agency's own Federal Register notice says, the Agency does not regard the review of the DCCA as subject to the notice and comment requirements of the Administrative Procedure Act and will not respond to comments submitted by the public on the DCCA. Further, the 60 day comment period offered by the Agency is plainly inadequate in light of the complexity of the application and its importance. Nevertheless, the Agency intends to provide its own comments on the DCCA within the month of October 1995 and again in January 1996 (EPA WIPP Bulletin, no. 2, Spring 1995, at 2). It is clear that nothing stated by the Agency in such comments can be regarded as binding upon it in any subsequent proceedings, such as the issuance of compliance criteria or the determination of compliance with 40 CFR Part 191.

Moreover, the DCCA is prepared without the assistance of the compliance criteria required to be promulgated pursuant to §8(c) of the Waste Isolation Pilot Plant Land Withdrawal Act, Pub. L. 102-579. Thus, the DCCA has been prepared without knowledge of the rules which apply to an application. Moreover, the public must comment on the DCCA without knowledge of the applicable rules. And, obviously, the Agency must give its comments to DOE without knowing what rules apply. The entire process is without any legal sanction or framework.

The comment process is all the more difficult, in that DOE says that the DCCA is incomplete: "This second draft submittal does not constitute the completion of the Department's Compliance Certification Application. As the DOE finalizes work beyond this second submittal, separate reports describing this work will be transmitted to the EPA for its information." (July 1995 submittal, preface, at 2). Thus, the July version of the DCCA apparently is to be revised and expanded further on an unstated schedule. However, it is nearly impossible to comment usefully on a document whose proponent avows it is incomplete.

We have the following comments on the March 31, 1995 partial submittal:

Chapter 2: Site Characterization

There is a recurring problem in the DCCA in that DOE states repeatedly that ongoing work will result in further data or reports, which will be available only in the final compliance certification application ("CCA"). Thus, DOE itself does not regard the DCCA presentation as complete or sufficient in such areas. In such situations, it is clearly premature for the public to attempt to comment, and it is equally premature for the Agency to express its own opinion. For example, the loading-unloading history of the Culebra relates to the origins of the present system of Culebra fractures, which in turn involve the hydrologic properties of the Culebra. The DCCA is incomplete on this issue; a full interpretation will be furnished only in the final application (see DCCA at 2-63). It is therefore too soon to comment on this issue.

The cross-section referred to on page 2-67 should be cited to Appendix DEF, Fig. 7.3-3, if that is the correct reference.

The treatment of dissolution should account for the data presented by Prof. Phillips and Prof. Anderson at the February 14-16, 1995 EPA workshop, particularly the data as to groundwater age and the nature of dissolution fractures already found in the Culebra near the site. The discussion omits the type of dissolution discussed by Anderson, where fracture fillings are dissolved, altering the hydrologic characteristics of the Culebra.

The discussion of hydrology at 2-90 through 2-105 should cite specific data sources for the propositions made therein. To support this discussion with the Appendix HYDRO, which is more than ten years old and does not reflect considerable intervening work, is inadequate. There should be discussion of intervening and ongoing work. The DCCA should mention the hydrologic experiments ongoing at Hydropad H-19 and should state the schedule for

completion of this work and publication of reports. The DCCA correctly notes that the issue of the relation between geochemistry and flow patterns is unresolved and may be further studied in 3-D modeling (at 2-103). Here also, the existence of ongoing work makes it inappropriate to seek or to render comments.

The discussion of resources is supported by the Appendix DEL, which has not been provided. See p. 2-114. Again, the scheduling of comments is premature for that reason.

The discussion of climate (at 2-137 through 2-143) should include and account for the data presented by Prof. Anderson and Prof. Phillips at the Agency's technical workshop on February 14-16, 1995.

Chapter 3: Facility Description

The facility description is expressly subject to revision based upon the results of the engineered alternatives study (see p. 3-9). Further, DOE's examination of alternative strategies for dealing with RH-TRU may lead to revisions in the repository layout, dimensions, and procedures. See RH-TRU Disposal Strategy (DOE/WIPP-95-1090) (March 31, 1995). Thus, again, the submission is subject to change, and it is too soon to request comments.

Similarly, shaft seal design is subject to change, as experimental data lead to revisions in the design approach (see p. 3-16). Comment should be sought after the design is made final.

Chapter 4: Waste Description

Again, the DCCA does not present a definite DOE position which could be addressed with comments. This chapter is also expressly subject to revision, among other reasons, if DOE completes the waste characterization study called for by the proposed Part 194 (see 4.1).

The list of generating sites omits the small sites expected to generate waste for WIPP (see 4-1; compare Table 4-1, at 4-4).

The DCCA correctly states that the Baseline Inventory Report ("BIR") is not a waste characterization document (at 4-2) and promises to update the BIR as characterization data are developed (id.). The schedule for completion of such characterization and updated reports is unstated, and whether such updates will comprise part of the final CCA is also not stated.

Most of the chapter consists of a conceptual description of the proposed development of waste acceptance criteria to serve the

needs of performance assessment. However, the analysis and development of such criteria have not been carried out (at 4-5 through 4-9). A conceptual description is insufficient to base a compliance determination or to call for comments.

The DCCA also points out that the calculation of radionuclide inventory in the DCCA itself is outdated and will continue to be revised (at 4-12). How and when the inventory will be established for the final CCA is not stated.

The discussion of analytical methods of waste characterization in section 4.4 contains no data supporting the asserted effectiveness of the methods discussed.

Chapter 5: Quality Assurance

This chapter states that several of the applicable QA documents are in a state of incompletion. For example, the Quality Assurance Program Plan, which sets standards for waste characterization, is being revised (at 5-7), which means that generator site plans--Quality Assurance Project Plans--are also incomplete. Further, it is understood that the system for qualification of existing data (section 5.6) is likely to be further revised upon the issuance of Part 194.

Chapter 6: Containment Requirements

This chapter is superseded by the July 31, 1995 update.

Chapter 7: Assurance Requirements

DOE candidly states that the proposed Part 194 "requires detailed information and plans which are not currently available." (at 7-1). Thus, the entire presentation on assurance requirements is subject to change after the issuance of the final Part 194.

The DCCA presentation is inadequate for other reasons. It presents only conceptual level information about compliance with the assurance requirements. The information about active institutional controls consists only of a "reference design .. upon which planning will be based" (at 7-4), and which will be periodically updated (id.). Plans for monitoring are far from complete (at 7-7 through 7-13). Passive institutional controls are the subject of a conceptual study only (at 7-13 through 7-26). Multiple barrier requirements have scarcely been addressed (at 7-26 through 28). The resource disincentive is discussed only in terms of the history of site selection and not in terms of the comparative performance of the site (see pp. 7-28 through 7-30). The Appendix on this subject (Appendix IRD) dates from before the

abandonment of plans for on-site tests and before the reissuance of Part 191 and is obsolete. As for waste removal, no plan is presented (see pp. 7-30 through 7-32).

DOE's statement in the DCCA that DOE believes that the possibility of human intrusion need not be considered in the CCDF (at 7-16) appears to contradict the Agency's statement that the possibility of human intrusion cannot be entirely eliminated (see 40 CFR Part 191, Appendix C) and should be deleted.

We have the following comments on the supplement dated July 31, 1995:

Chapter 6: Containment Requirements

DOE has declined to conform to the draft compliance criteria in calculating the Curie content of the waste inventory as of 100 years after disposal (at 6-2). Such is inconsistent with the regulation in the form most likely to be adopted.

6.1.1.3 Risk and the EPA Limits

DOE states that the mean curve is shown in Section 6.5 for preliminary comparison with the containment requirements (at 6-15) and claims that "[t]his approach is consistent with proposed 40 CFR Part 194." In fact, proposed Part 194 specifies a 95% level of statistical confidence that the mean of the population comprising all possible CCDFs is within the release limit (see proposed §194.34, 60 Fed. Reg. at 5789). Use of the simple mean of a family is not consistent with proposed 194.

6.2 Scenario Development and Selection

A large number of relevant scenarios have been screened from consideration on the basis of supposed regulatory exclusions (at 6-24). Such exclusions are predicated either on Appendix C to 40 CFR Part 191 or on references to documents reflecting EPA's risk assessments which preceded the issuance of 40 CFR Part 191 (id.). Exclusions on such grounds are not justified. Appendix C is expressly nonbinding, and the Agency has stated that it does not regard itself as bound to adhere to Appendix C (see 60 Fed. Reg. at 5776).

DOE's reliance on the risk assessments done in the early 1980's is likewise unfounded. In these risk assessments the Agency made clear that proposed repositories must be evaluated for compliance based on their individual risks and circumstances. The 1985 Background Information Document states that "the results of the risk calculations cannot purport to project the actual risk

expected at these particular sites; such projections will not be possible before the sites are fully characterized ..." (at 8-1).

It is very difficult to comment on the scenario selection issues raised by the DCCA. Certain scenarios are screened out in the DCCA in purported conformity with Appendix C to 40 CFR Part 191 and other background materials. Since the Agency is in the process of issuing Part 194, which will deal with the scenario question, it does not seem fruitful to analyze the application of Appendix C, which will soon be obsolete. However, Part 194 has not been issued, and its content is unresolved. Thus, it is not possible to analyze the application of Part 194 to the DCCA. It is not clear what test the Agency desires public commenters to apply to the DCCA or will itself apply.

It can be pointed out that we have previously commented on the 1992 Performance Assessment ("92PA"), the Compliance Status Report ("CSR"), and the Systems Prioritization Method ("SPM") scenario position paper (draft dated Sept. 9, 1994), and we and others have noted the need to assess the following scenarios in determining WIPP's compliance:

exploratory drilling, intrusive and nonintrusive
development drilling, intrusive and nonintrusive
resource (including water) extraction
brine slurry release
Castile brine release to surface during drilling
mining, including solution mining
construction of fluid storage facilities
well injection of fluids (waste disposal or hydrocarbon recovery)
dissolution and subsidence resulting from human intrusion
seal failure
irrigation
damming
human-induced explosions
climate change, hydrologic effects
nuclear criticality
deep dissolution
magmatic activity
tectonic activity

Moreover, the Agency itself has pointedly inquired as to the DOE's plans to develop the mining scenarios (EPA letter to DOE, Oct. 18, 1994; EPA CSR comment 185), and DOE promised "the most current documentation" in the DCCA (Response 185). (However, DOE now says that the mining issue is screened out (DCCA at 6-38, Table 6-5b).

A review of the Appendix SCR leads to the following further comments:

The discussion of seismic activity (SCR-14) acknowledges that fluid injection is used in oil recovery to cause hydrofracturing and that seismic activity in the Central Basin Platform may be associated with oil-field activities and mining operations (SCR-16). There is reference to a study of seismic risk using "conservative assumptions", which was the basis for screening out seismic activity. Without an opportunity to assess the assumptions, the Agency cannot accept such conclusion.

The deep dissolution discussion discounts the likelihood of this process affecting the WIPP site (SCR-17). The DCCA seems to assert that solution features will only form in association with the Capitan Reef or where the Delaware Mountain Group is close to the surface and the Rustler and Salado are absent. The illustration in Anderson, R.Y., Deep-seated Salt Dissolution in the Delaware Basin, Texas and New Mexico, N.M.G.S. Pub. No. 10, at 135, indicates major dissolution features within the central basin and east of the edge of the Salado salt. The occurrence of dissolution features has not been confined as asserted. Screening out is not justified.

The discussion of mineralogical changes states that studies of Rustler geochemistry imply that mineralogical characteristics have been stable or subject to minor changes for 0.6 million years (SCR-20). To conclude that the issue of mineralogical changes can be so easily dismissed ignores the presentations made to the Agency at its February 14-16, 1995 workshop concerning climate change. Prof. Anderson, in particular, pointed out that dissolution has moved eastward from Nash Draw during the last five major glacial phases and that the dissolution of fillings from fractures can be expected to continue and to accelerate with increased precipitation. The presentation by Prof. Phillips pointed out the rapidity and magnitude of climate changes in the past 100,000 years and that soil water at the WIPP site has a stable isotope composition consistent with modern recharge, indicating rapid flow from the surface (as would occur in a Karst environment). Such findings must be considered and accounted for in the scenario selection process.

Appendix SCR is plainly incomplete. Numerous FEPs are classed as "RB", i.e., retained for further consideration and neither screened out nor accounted for. As to FEPs so categorized, there is nothing for the public or the Agency to comment on.

Other FEPs, such as changes in infiltration and recharge, are said to be "accounted for," but in fact are subject to further work

(e.g., the three-dimensional flow model) and will only be fully documented in the final CCA (SCR-25). No support is cited for the assertion that possible future changes in groundwater chemistry, affecting retardation, are accounted for in the current spatial variability of groundwater chemistry (SCR-27). Appendix SCR concedes that current modeling has not sufficiently dealt with the potential thermal load of the repository, particularly the load attributed to decay of RH-TRU waste (SCR-37). Thermal load is known to affect the process of microbial gas generation (SCR-34). It may also affect fracturing, uplift, gas flow, and brine flow (SCR-36). The DCCA anticipates that the final CCA will show that these factors have low consequence, but the documentation has not yet been presented (SCR-36). Nuclear criticality, thermally-induced stress, seal performance, thermal convection, exothermic reactions, various physicochemical transport phenomena, and subsidence also have not been documented and must await the analysis in the final CCA (SCR-38, 40, 41, 42, 51, 57, 60).

In screening human-initiated processes and events DOE has imposed several constraints which would not be justified by any probable regulatory scheme. DOE wishes to exclude any human intrusion (a) more severe than inadvertent and intermittent exploratory drilling, (b) which has not occurred previously in the Delaware Basin, or (c) not considered by EPA in the risk assessment which preceded the adoption of 40 CFR Part 191 (SCR-62, 63). However, the Agency has already made clear that it is not bound by Appendix C. The elimination of activities which have not yet occurred in the Delaware Basin creates the risk that unduly narrow definitions of past activities will artificially constrain analysis.

Moreover, to exclude activities not considered in the risk assessments preceding Part 191 is quite unjustified, because the Agency never intended those generalized studies to set bounds to a compliance determination. The Agency stated in Population Risks from Disposal of High-Level Radioactive Wastes in Geologic Repositories (EPA-520/3-80-006)(Dec. 1982) that certain assumptions framed its risk assessment, such as the assumption that "institutional controls will prevent any human intrusion for the first 100 years" (at 95). Such an assumption clearly does not require the Agency in analyzing a specific site to assume that institutional controls will be effective for 100 years. To the contrary, the effectiveness of institutional controls at any period must be established as to the specific site. Further, the Agency's 1982 risk assessment was explicitly (see EPA-520/3-80-006 at 73, 95) based on the studies performed by A.D. Little, which studies assumed that the repository site has "no valuable resources" (id. 96). The WIPP site, however, does contain valuable resources and is located in a larger area that is resource-rich.

Thus, the Agency's 1982 study is entirely inappropriate as a source of assumptions for the determination of compliance by WIPP, and the Agency never intended that it would be used as such; indeed, the Agency prohibited such use: "Because of the generality and simplicity of this approach, these analyses cannot be used to judge the risks from a specific disposal system at a specific site." (at 4-5). DOE's attempt to limit the examination of WIPP on the basis of the optimistic assessments of the 1980's is totally without foundation.

Appendix SCR states that several of the currently ongoing human-initiated events and processes have not been screened; plainly the exclusion of these activities is not now justified (see Table SCR-3a, items marked "RB"). The text of the Appendix states that the exclusion of the following will be supported by materials submitted in the final CCA; such support has not yet been provided:

"other drilling-related events and processes" (loss of circulation fluid)
fluid extraction
fluid injection
flow through abandoned boreholes
mining

It is too soon for the Agency or the public to comment on the exclusion of these activities.

Numerous future human activities are incorrectly excluded. Table SCR-3b, listing future human-initiated processes and events, classes numerous activities as "SO-R"; these purported regulatory exclusions are without any justification. As stated above, the Agency's risk assessment was not designed to state regulatory limitations. Further, the Agency's risk assessment expressly states that activities considered for each repository type include:

"1. oil and gas exploration
2. water exploration
3. geothermal resources evaluation
4. brine injection or disposal of other wastes
5. mineral exploration
6. scientific investigation
7. fluid storage." (EPA-520/3-80-006 at 95).

Nevertheless, DOE excludes all but exploratory drilling for oil and gas from the draft application (see Table SCR-3b). In addition, the Agency's risk assessment expressly considers "near miss" drilling events, where the drill does not intersect waste (EPA-520/3-80-006, Table 7-3, at 155).

Thus, DOE's exclusion of the following future activities on purported regulatory grounds is without basis:

nonintrusive drilling
"other drilling-related events and processes"
fluid extraction
fluid injection
fluid flow through nonintrusive boreholes
borehole-induced solution and subsidence
mining
"other excavation activities"
irrigation
damming
"other surface activities"
underground explosions for resource recovery

Further, DOE's exclusion of events related to constructional, operational, and decommissioning errors rests on the assertion that the facility will be constructed without defects (SCR-81). This assertion lacks any foundation. The Agency can examine the validity and effectiveness of the DOE quality control procedures and make its own determination of the likelihood of error, but the possibility cannot be excluded by ipse dixit.

6.3 Determination of Scenario Probabilities

The DCCA does not tackle the issue of scenario construction, since it essentially retains only the undisturbed and the exploratory drilling scenarios for analysis. Thus, the discussion of scenario construction and probability determination is quite cursory (at 6-46, 53). However, if the now-excluded FEPs are to be brought into the analysis, DOE will encounter complex issues as to the construction of scenarios involving multiple FEPs of probability less than 1 and synergistic interactions among FEPs, raising the additional issue of the sequence in which FEPs occur. In future compliance documents it should be expected that the scenarios to be considered include events such as fluid injection, fluid extraction, underground mining, solution mining, nonintrusive drilling, and others. Some such activities interact with other activities. For instance, mining may enhance subsurface releases from drilling intrusions, if the mining has occurred before the drilling takes place. The explanations of scenario construction in the DCCA and even in publications such as Helton and Iuzzolino (1993) do not discuss the construction of scenarios with significant interactions and issues of sequence.

The DCCA says that consequence analysis used a sample size of 40 to analyze 53 variable parameters. (at 6-53). No defense or explanation of the sample size appears in the DCCA, except the

statement that the final application will contain "more" realizations (at 6-53). In its comments on the 1992 PA the Agency requested "evidence that 4/3 times the number of uncertain variables is sufficient for Latin Hypercube Sampling procedures." (EPA 92PA comment T158). DOE responded that "[t]here is no specific evidence that the 'four thirds' rule is sufficient for analyses of this type." The DCCA lacks any demonstration of its acceptability--assuming it will be used to prepare the final CCA.

The DCCA discussion of CCDF construction fails to address the numerous other issues which have been raised about DOE's approach, such as selection of variable parameters, treatment of covariance, measurement of sampling error, treatment of conceptual model uncertainty, formulation of probability distribution functions, and similar issues. As to many such issues, DOE has stated that more information will be provided in the final CCA. See DOE responses to EPA comments on the Compliance Status Report, items 172 (model development, scenario selection, analytical approach), 181 (discussion of level of confidence associated with mean CCDF), DOE responses to EPA comments on the 1992 Performance Assessment, items CL15 (conceptual model screening process), T010 (methods used to reduce uncertainty and to evaluate uncertainty), T027 (process for assigning probability distributions), T157 (methods for conversion of computational results into CCDF display format; uncertainties introduced), T158 (method for selecting variables for sampling). Plainly, the DCCA is not intended to, and does not, contain the information that the Agency has already determined is necessary for its evaluation of the repository.

The DCCA is demonstrably incomplete in other respects. It states that only variable parameter values and "major" codes are discussed and that more information will appear in the final CCA (at 6-53). Further, "justification of some aspects of the various models, data, and parameters used is not available at this time." (at 6-53). Further, "[t]he CCDF presented here is not in final form, because sufficient confidence in the conceptual models, mathematical models, numerical models, computer codes, experimental data or other supporting documentation, and model parameters used has not been established, quality assurance has not been completed, and the number of realizations executed was restricted." (at 6-54). In a word, the DCCA is not in form for review and comment by the Agency or the public.

6.4 Calculation of Scenario Consequences

Some observations can be made about the DCCA presentation of the model for consequence analysis:

6.4.3.1 Disposal Rooms and Creep Closure

The discussion of disposal rooms and creep closure states twice that additional detail will appear in the final application (as to the SANTOS code, at 6-65, and as to the comparisons supporting the porosity surface look-up table, at 6-66). Thus, it is to soon to comment on this aspect of the DCCA.

There are several unanswered questions about the disposal room and creep closure models. To begin, it is unclear whether the DCCA is based on calculations done with the M-D Creep Model or the earlier Reference Creep Law. The stratigraphy used in the calculations is not known. Presumably, average waste properties are assumed in calculating closure; whether this is a realistic assumption or a sensitive one is not known. The SPM position paper on the disposal room model notes that the parameters in the model of waste compaction would need to be changed if the waste form or the mix of waste were changed (SPM position paper on disposal room and cuttings models, iteration 2, vol. 1, at 32).

There is also a question of the modeling of waste compaction for analysis of spallings releases. The SPM position paper notes that waste permeability is important to spallings releases (at 37) and states that a special adjustment would be made for analysis of such releases (at 62). Such adjustment would need to be justified. Further, Sandia has recently begun developing a detailed room model representing heterogeneity of the room contents to study flow (id. 45). Such model should be used to determine whether there is sensitivity to that factor. The position paper states that the flow model has been changed to add an "active brine flow fraction" (at 59) to address room heterogeneity. This appears to play a part in the DCCA calculations (based on the discussion under "Repository Fluid Flow" at 6-67,-68), but no justification is offered.

The SPM position paper on the disposal room and cuttings model also questions the calculation of waste permeability. It says that in the 1992 PA the assumption was made that the permeabilities of each component of the waste were distributed uniformly from minimum to maximum, so that the distribution of local (drum scale) permeability was the weighted sum of uniform distributions (id. 46). The position paper says that the single permeability value used in the 1992 PA represents the lowest value considered likely and is associated with the maximum compaction of the waste (id. 46). The DCCA seems to use a constant value of $5.584 \times 10^{-12} m^2$; the origin of this different value is not explained.

The disposal room position paper also observes that gas generation might make the waste more permeable and suggests that a log-normal uniform distribution of permeabilities might be more appropriate. It is not known whether the DCCA adopts these suggestions.

There are also questions as to the basis for assigning initial brine content and consideration of capillarity and wicking and the effects of heat from RH-TRU waste. In addition, it has been claimed that the uncoupled porosity surface approach has been verified by comparisons to properly represent closure (see id. 51), but these comparisons have not been published.

The Agency asked in its CSR comments about the assumption of waste heterogeneity and was told that the issue would only be addressed in the final CCA (DOE response to EPA CSR comment 144). EPA also inquired as to how gas generation and different waste forms may affect final porosity,and DOE said that current information would be provided in the DCCA and update (DOE Response to EPA CSR comment 157). There is no new information in the DCCA or the update on how different waste forms might affect porosity.

6.4.3.2 Repository Fluid Flow

The DCCA states that the two conceptual models of two-phase flow are sampled, for lack of better information (at 6-68). Some better justification of the choice of sampling frequency between the two models must be made.

6.4.3.3 Gas Generation

Gas generation--long an uncertain factor in performance assessment--receives only about a page of discussion in the DCCA (at 6-68). There are numerous unanswered questions. Most of these questions have been raised before, and DOE has failed to answer them. DOE has decided to use the average stoichiometry model of gas generation in lieu of the reaction path model, under development, in its compliance presentation. However, DOE has stated that the reaction path model is more defensible, technically, than the average stoichiometry model. Further, there is no comparison of the two models as to their impact on performance assessment and no showing that the model chosen by DOE is in all circumstances conservative. DOE's choice of an inferior model cannot be defended.

The SPM position paper on gas generation (Iteration 2, March 17, 1995) states that the reaction-path model is the most defensible gas generation model and is more defensible than the average-stoichiometry model used in the 1992 PA (at 9). The reaction-path model includes more processes, additional reactions, and interactions among processes. Therefore, the reaction-path model is more realistic (id.).

The Environmental Evaluation Group ("EEG") has raised several questions about the gas generation issue. For example, EEG's

comments on the 1992 PA inquire as to the treatment of radiolysis and methanogenesis. DOE responded that radiolysis is included in the reaction-path model and will be evaluated in SPM (response to EEG comment MI-10a), that methane production is included in the reaction-path model and would also be examined in SPM, and that current and planned experiments would examine microbial gas production under a range of conditions (DOE response to EEG 92PA comment MI-10b). However, neither radiolysis nor the reaction-path model were incorporated in SPM (see SPM-2 Report, Rev. 1, Vol. II, at §2.13). Nevertheless, SNL gas generation studies were terminated as a result of SPM (DOE-EPA technical exchange, August 30-31, 1995). The abandonment of this area of inquiry, without any showing of its insensitivity to compliance, leaves important questions unanswered.

DOE told the NAS WIPP committee on May 27, 1995 that the average stoichiometry model would be "enhanced" for use in the compliance application and that the reaction-path model would be completed and used "off-line, to check the use of the Average Stoichiometry Model in the compliance PA calculations." (J.T. Holmes presentation, May 27, 1995). The DCCA contains no information about an enhanced model nor about a comparison with the reaction-path model and thus remains incomplete in this respect also.

Comments by EEG on the SPM position paper on gas generation require a response. These include (1) the issue of the presence and concentration of microbes, (2) survival of microbes, (3) substrates and nutrients for the microbes, (4) limiting nutrients, (5) electron receptors to potentiate anaerobic metabolism, (6) presence of water or brine, (7) effect of microbial action on the water quantity, (8) sufficiency of brine to induce corrosion, (9), corrodible metals present, (10) substrates for radiolysis; relative significance of brine vs. organics, (11) nature of reactions and quantities of gas produced, (12) comparison with experimental results.

Our office also raised several question about the first iteration of the SPM position paper on gas generation that have not been answered (letter, Dec. 14, 1994 to Robert Bills, DOE). DOE has chosen to proceed using the gas generation rates in the June 18, 1993 memo from Larry Brush to Martin Tierney, Appendix E to the SPM position paper. As to those rates and their derivation, we have these questions (references are to the first iteration of the gas generation position paper):

1. Does the project maintain that radiolysis of cellulosics, plastics, and rubbers will be insignificant? (p. B-19).

2. It is stated that the Lappin et al. (1989) estimates of anoxic corrosion omitted the contribution of RH TRU canisters and plugs (at C-4); presumably roof supports were also omitted. Omission of these factors creates a concern. What is planned to account for the contributions of these components in the average-stoichiometry and reaction-path models?

3. What is the scientific justification for assigning a uniform distribution between 0 and 1 to parameter x in the formula for anoxic corrosion in the average-stoichiometry model (draft at C-5)?

4. It is stated that Ph, CO_2, and H_2S may affect corrosion of Fe-base materials significantly and that Brush (1991) attempts to take some such factors into account (draft at C-6, lines 16-18). Is the proposed approach to such factors defensible under SPM standards, and what is the defense?

5. In calculating microbial gas production it is also stated that a parameter x is sampled from a uniform distribution of between 0 and 1 (draft at C-7, top of page). Please provide the scientific justification for this range, which is said to neglect reaction B.13.

6. It is stated that factors such as the number and types of microbes, concentrations of nutrients and electron acceptors, Ph, and concentrations of partial pressures of byproduct gases may significantly affect microbial activity (draft at C-7, lines 29-34). Is the proposed approach to such factors defensible under SPM standards, and what is the defense?

7. It is assumed for the 1991 and 1992 PA's that microbial activity has no effect on the water content of the repository (draft at C-7, lines 36-39). Is this position defensible, and what is the defense?

8. The corrosion rates assumed for the purposes of SPM-2 are said to be supported by Appendix E. The best estimate inundated rate (explained at draft E-8 et seq.) is reduced from the 1991-92 estimates based on 24 month data. What is the basis to assume that the 24 month rate will prevail over extended periods?

9. The draft "arbitrarily" assumes that the corrosion rate seen in one reaction applies to other reactions (draft at E-9). This does not appear to be a defensible assumption. At any rate, it has not yet been defended. Please comment.

10. There is a minimum estimate of a zero corrosion rate, loosely attributed to passivation (draft at E-9, E-10). This

conclusion is stated despite (a) the fact that higher pressures call for additional CO_2 to bring about passivation, (b) the speculative nature of predictions of additional passivation mechanisms, (c) the evidence of depassivation. Please explain why the minimum figure is justified.

11. The maximum anoxic corrosion estimate of 20 $mol/m^2/yr$ is derived by accounting for Ph and pressure (draft at E-10, E-11). Is the pressure adjustment (4x) sufficiently justified, based only on data using a N_2 partial pressure of 73 atm? Since these are maximum figures, should they not be rounded up instead of down?

12. The temperature adjustment likewise results in a rounding down. (draft at E-12). Should the figure not be rounded up?

13. The humid corrosion rates are also "arbitrarily" stated or adjusted (draft at E-12). Please justify the figures used.

14. Are the proposed rates for microbial degradation adequately based, since they are derived from data involving cellulosic degradation only and do not consider degradation of rubber or plastics (draft at E-13)?

15. It is stated that certain simplified formulas for aerobic microbial degradation are adequate for the average-stoichiometry model but may not be for the reaction-path model (draft at E-14). How can such simplifications be deemed defensible?

16. Insufficient information is provided in the draft concerning the data underlying estimates of the rate of anaerobic microbial reactions (draft at E-15). The estimates are therefore not defensible.

17. Similarly, the projections of humid microbial action are not supported by data and are said to be arbitrary (draft at E-15, E-16).

18. The proposed radiolysis rates are based only on data involving dissolved Pu239, and given the questionable nature of actinide solubility data in general, can they be defended? It is stated that if the inventory and dissolved concentrations of Pu239 are high enough, gas production may locally exceed those from corrosion or microbial degradation (draft at E-19).

19. The draft says that it "may be more difficult to defend estimates of the maximum rates of gas production from brine radiolysis." (draft at E-20). Given the stated uncertainties, the figures do not appear to be defensible. It is not possible, for instance, to justify use of the same probability distribution used by the expert panel for Pu(V) solubilities, since that expert panel's judgments have been correctly deemed indefensible in the draft (at E-20). Why are the figures stated in the carryover paragraph on page E-21 not appropriate as defensible maxima?

20. In any case, the draft does not explain the derivation of the radiolysis estimates contained in Table 2 (at E-31). Please explain why these figures are defensible.

6.4.3.4 Dissolved Actinides

The DCCA parameters for dissolved and colloidal actinides are said to be "based on projected outcomes of experimental activities in progress." (at 6-70) The derivation of these values is not explained. It is not possible to comment, except to say that a final CCA clearly cannot rest upon projected outcomes. DOE recognizes this; it has told the Agency that "[t]he current plan is to use this experimentally based actinide concentrations model to support the compliance application." (DOE response to EPA comment T137 on 92PA).

6.4.4 Shafts and Shaft Seals

The DCCA values for shaft seal permeability are said to be based on "elicited outcomes of experimental activities." (Appx. PAR-215). Thus, permeability of shaft seal systems "is the subject of ongoing experimental activities, which will be documented in the CCA." (id.). DOE previously told the Agency that the results of the Large-Scale Seal Tests will be included in the compliance documentation and that "tests are currently being planned which will evaluate the degree of compaction that can be achieved." (DOE Responses to EPA 92PA comments T053 and T055).

In response to comments by this office, DOE has stated that "[c]alculations that include brine inflow, representation of the DRZ, reconsolidation of salt, and other features are being conducted on a schedule to support the Compliance Certification Application (CCA) and the NMVP." (DOE response to NMAG CSR comment 36). Baseline and projected permeability values were presented to the NASA WIPP committee on April 27, 1995; the "projected" values seem to correspond to the values in the DCCA. However,at present, there are no data on which a judgment could be expressed. Thus, it is too early to comment.

6.4.5 The Salado Formation

The DCCA treatment of the Salado Formation can be viewed in relation to the report furnished to the NAS WIPP committee on February 9, 1995. Peter Davies then stated that (a) brine inflow needed to be studied further by means of a "side-bar" assessment, by 3D modeling, of the 2D modeling of 3D processes of brine inflow, and that (b) brine outflow needed to be studied through experiments to analyze two-phase flow properties of the Salado. The Agency may ask whether these tasks have been completed.

The Agency might also inquire whether the issue of the flow model applicable to the Salado, an issue debated at length before and during the formulation of the SPM baseline, has been adequately explained and resolved.

The DCCA states that BRAGFLO modeling of the Salado includes a single spatially uniform region to represent the intact "halite-rich" (an undefined term) Salado and included interbeds and that a comparison has been made with more detailed and complex stratigraphy. However, the comparison will apparently not be published until the final CCA (at 6-72). Therefore, no comment can be sought or made on the modeling approach.

The DCCA also says that the threshold pressure of gas penetration of liquid-saturated Salado rock has not been measured (at 6-72). Thus, values used in the DCCA are estimates (at 6-73). The DCCA says that the values used in the final CCA will be described therein (id.). Evidently, experimental data will be obtained but is not yet in existence. Thus, it cannot be reviewed and commented on.

6.4.5.2 Salado Interbeds

Concerning the Salado interbeds, the DCCA states that the model of pressure-dependent fracturing ("changes in permeability") is supported by several experiments which will be described in the final CCA (at 6-73). Further, "the values to be used in the final compliance calculations will be described." (at 6-74). Thus, it is again premature to request comment on this part of the model. The DOE response to the Agency's comments on the 1992 PA point out that "[a] laboratory program is underway to measure anhydrite porosity, both in an unloaded state and as a function of stress." (EPA 92PA comment T090). Thus, "PA treatment of Salado anhydrite permeability and porosity will be explained and justified in the CCA and other relevant compliance submittals." (DOE response to EPA CSR comment 17).

6.4.5.4 Disturbed Rock Zone

PA treatment of the DRZ includes an increase in permeability, despite the effects of creep closure (at 6-75). The DCCA does not fully describe the factors affecting DRZ permeability. Further, it is said that the DRZ is the subject of a modeling study and "assumptions and treatment of this region may be different in the final [CCA]." (at 6-76). Since the results of the study and the final modeling approach are not available, it is too soon to comment.

6.4.5.5 Salado Brine Outflow Model for Performance Assessment

The DCCA also describes the tentative approach for modeling brine outflow through the Salado (at 6-76). It acknowledges the need to consider stratigraphic dip, channeling and fingering in fractures, and directional propagation of fractures. It describes a "simple model" (at 6-77) to account for these processes while noting the desirability of another approach which employs parameter variation and gives an estimate of the distribution of radionuclides in the disposal system. Both models are the subject of a current study which may lead to changes in the representation of these aspects of brine flow in the CCA (at 6-77).

In addition, the parameters of the simplified model are not justified. Appendix PAR states that the "values used in the distribution in this analysis are based on the SPM-2 elicited outcomes of experiments which will not be conducted. The treatment of brine outflow for CCA calculations will be described in the CCA." (at PAR-109). The basis for the critical parameter C_b is not described in terms of any data or literature search. DOE does not present the DCCA approach as a final and defensible model. Again, with the final model to be made public only in the CCA, it is premature for the Agency or the public to comment.

It should be noted that as a result of the SPM-2 studies DOE has decided to terminate measurements in the laboratory and the field of anhydrite and halite hydrologic properties (viz.: permeability, porosity, two-phase flow properties, far-field halite pore pressure, fingering, channeling, pressure fracturing) (DOE/EPA technical exchange, Aug. 30-31, 1995). However, there are ongoing supporting studies to determine the validity of assumptions as to various flow characteristics of the Salado (viz.: radial symmetry and uniform flow, anhydrite interbed alteration, wicking and puddling of brine in the repository, dissolved gas in brine, and dynamic DRZ development) (id.). Further, certain processes (dip, gas exsolution, 3-dimensional effects, and fracture-matrix interactions) are being examined in a new "separate FEP's" calculation; brine inflow model uncertainties are being handled by a broad selection of permeability parameters, and brine outflow volumes and pathways are captured by a geometrical brine storage

model with "revised modeling approach that is currently under development." (id.). Thus, DOE's approach to the final CCA has changed in various respects from that shown in the DCCA. With the DOE position in flux, it is inappropriate to request that the public or the Agency comment.

6.4.6 Rustler Formation

The DCCA material about Culebra flow and transport demonstrates the incompleteness of the DCCA. As to each significant item, the work is not completed, and the public will have to await the CCA, in which DOE will lay out its position.

DOE explains that the GRASP-INV code is used to generate random transmissivity fields, each of which is calibrated to actual Culebra head data (at 6-79). However, how GRASP-INV works to generate an entire family of transmissivity fields to use with the Latin hypercube sampling vectors is not explained; rather, "[d]etails about GRASP-INV will be included in the final [CCA]." (at 6-80). Thus, the approach is not documented and cannot be commented upon.

Other issues about flow are not even suggested in the DCCA. There is a question as to the resolution of the grid used to generate the 70 transmissivity fields, which DOE has said it will study (DOE response to EPA 92PA comment T080). The geostatistics expert group ("GXG") has expressed concerns about the subjectivity inherent in the manual calibration and assignment of transmissivities and has undertaken to test various inverse methods to solve the calibration problem. The GXG has not yet issued its report, which document will clearly bear upon the treatment of transmissivity data in the final CCA (DOE response to NMAG CSR comment 10). DOE has stated that "[a] recalculation of the transmissivity field using transmissivity and head data that has been measures [sic] since the 1992 PA will be conducted for the final compliance document." (DOE response to NMAG 92PA comment 14j). This has not been done. Further, based on the GXG studies, "a decision will be made as to whether GRASP-INV or another inverse method is used for future generation of transmissivity field realizations." (id.).

The 3D flow model is also being used to examine sensitivity to boundary conditions (DOE response to EPA 92PA comment T081). The Agency has noted the poor constraints upon post-Salado discharge and recharge points, and DOE has responded that the issues are being studied through a 3D groundwater flow model, which studies are not yet complete (DOE response to EPA 92PA comment T074).

In addition, DOE is now conducting seven-well tracer tests at the H-19 hydropad (DOE-EPA technical exchange, Aug. 30-31, 1995). DOE has stated that the model of Culebra flow may change as a result (DOE response to EEG CSR comment 11), and certainly the data from the H-19 test must be considered in conjunction with the application. Thus, comment on the DCCA is premature for this reason also.

Concerning the flow model, the Agency has pointed out the question whether dissolution may continue to affect "the occurrence/destruction of fracture filling material, and could definitely affect the WIPP for the human intrusion scenario. Also, there has been no assessment to date of the potential impacts of mining activity adjacent to the site relative to dissolution." DOE responded that the most current information on these issues is in the DCCA, but no information is provided (DOE response to EPA CSR comment 148). DOE has said that its position on the related issue of climate change will only be made available in the final CCA (DOE response to NMAG CSR comments 65, 93). Further discussion of DOE's resolution of the issues of Karst topography, shallow dissolution, breccia pipes, and deep dissolution has also been postponed until the final CCA (DOE response to NMAG CSR comment 24).

There is a longstanding question about the possible inconsistency between the hydrochemical facies of Culebra waters and the postulated north-south flow direction. DOE is using a regional 3D model to determine whether vertical flow or other factors explain the data and will present the results of such study in the final CCA (DOE response to EEG CSR comment 12). Thus, comment on the DCCA is again premature. EEG has also pointed out the insufficiency of DOE's analysis to date of the uranium isotope disequilibrium data, and DOE has said that it will discuss this subject in detail in the final CCA (DOE response to EEG CSR comment 140), again showing that DOE has not presented its entire position in the DCCA.

The Agency has pointed out to DOE the need to analyze gas transport as dissolved gas, and DOE has acknowledged the need for such analysis (DOE response to EPA 92PA comment T179). The Agency also noted the need to assess the effects of temperature gradients on release of radionuclides (id. comment T180).

Retardation factors are known to be a critical element in the analysis of disturbed performance. However, DOE says only that "K_d values used in performance assessment are based on the expected outcome of experiments that are currently underway. Documentation of the outcome of the experiments and any changes in performance assessment assumptions cause will be included in the final [CCA]." (at 6-80). The Agency has said that it "strongly agrees with the

State of New Mexico that distribution coefficients (K_d's) be based on 'experimentally justified data' and not based solely on expert panel judgment." (EPA 92PA comment T009). DOE has told EPA that it will provide laboratory data on the sorptive properties of the Culebra in the final CCA. (DOE response to EPA CSR comment 195). Again, there is no defensible presentation to discuss in comments.

DOE plans, among other things, column tests of ground mineral constituents of the Culebra, which it expects to show will be representative of retardation phenomena in intact Culebra rock. Such representativeness will be shown by other experiments. (DOE response to EPA 92PA comment T088).

DOE advised the Agency at the August 30-31, 1995 technical exchange that Culebra chemical retardation experiments would include mechanistic adsorption experiments, semi-empirical batch sorption experiments, and core column flow experiments. Further, the separate colloid program will provide to PA (a) the maximum actinide concentrations resulting from each type of potential colloidal particle, by type of colloid, K_d for colloidal particles by type, and diffusivity for colloidal particles by type (DOE-EPA technical exchange, August 30-31, 1995). No results of such experiments are yet available. It is too soon to comment.

EEG has pointed the weakness of the scientific support for assertions of clay fracture fillings in the Culebra (EEG CSR comment 9). The Agency has similarly called upon DOE to present better data characterizing clay fracture fillings, and DOE has said that such data exist, have not been published, and will be published at a future date (DOE response to EPA 92PA comment T111).

Colloid transport is another key issue in performance assessment. The DCCA discusses the problem at length (at 6-83, 84) but concludes: "The DOE is currently studying the transport of colloidal actinides, and the results will form the basis for their treatment in the final [CCA]."(at 6-84; see also DOE response to EPA 92 PA comment T017). Thus, there is again nothing to comment on.

6.4.9 The Exploration Borehole

Concerning the rate of intrusion, the DCCA is singularly unworthy of comment. The Agency has already pointed out that the Guidance (Appendix C) required DOE to use "a constant drilling rate of 30 Boreholes/km^2 per 10,000 years for comparison with the containment requirement." (EPA 92PA comment CL10). Part 194 will certainly address the rate of intrusion, but the rule is not yet final, and its content is not yet known. The DCCA is prepared on a basis that is consistent neither with the proposed Part 194 nor

with existing Appendix C. DOE instructed Sandia to perform calculations on the assumption that the relevant drilling rate is 25 drillholes/km^2/10,000yrs (at SCR-69). However, DOE, in its responses to comments on compliance-related documents, has vigorously advocated expert judgment to assess the likelihood of future intrusion (see DOE response to EPA 92PA comment T122; DOE response to EEG 92PA comment P1). The rate of 25 drillholes is almost certain not to be the precise rate required by Part 194. Therefore, there is little point in commenting on this aspect of the DCCA. Moreover, there is nothing for the public or the Agency to say about it, because DOE has not tried to justify it.

DOE says that it calculated releases to groundwater at 1000 years and "scaled" the result to provide an estimate of releases at 100, 1000, 3000, 5000, 7000, 9000, and 10000 years (at 6-46, 6-88). (Direct releases to the surface were explicitly calculated at years 100, 125, 175, 350, 1000, 3000, 7250, and 10000 (at 6-46, 6-89)). The "scaling" technique is not explained in the DCCA, inhibiting comment and causing concern. Also, DOE has said that it has the capability to use Monte Carlo procedures to sample the number, time, and location of drilling intrusions (DOE response to EEG 92PA comment DC-08). DOE has stated that it agrees that "the times of intrusion chosen for analysis should be suitably representative of the complete set of all possible times during the regulatory period." (DOE response to NMAG 92PA comment AG-2e). Nevertheless, sampling processes have not been used in preparing the DCCA. Presumably, some change will be made for the CCA.

The DCCA uses borehole fill properties consistent with silty sand (at 6-88). As EEG has pointed out, such is not necessarily consistent either with Appendix C or with practice in the Basin (EEG 92PA comment MI-11e).

The model of cuttings, cavings, and spallings releases is still in a state of flux. One version of the model is contained in the DCCA Appendix CUTTINGS. We note that the description of drilling practices in the Delaware Basin, although mostly borrowed from the SPM position paper, is set forth without citation (at CUTTINGS-2). Such data should not be accepted without references. The Appendix CUTTINGS does not state the parameters of the exploration borehole but refers to the Appendix PAR. As to the model CUTTINGS, PAR discusses only one variable parameter, drill bit diameter.

Elsewhere, in its comments on compliance-related documents, DOE has stated that it is still working on aspects of the model of spallings releases, such as a model of incomplete consolidation of waste (DOE response to EPA 92PA comments T133, T139, T171; DOE response to NMAG 92PA comment AG-1q). The model in the DCCA is

essentially the same as that in the SPM position paper on disposal room and cuttings models (March 28, 1995 draft). However, the DCCA discussion is abbreviated, raising other questions. For instance, Table 3 of the SPM paper, which shows the density, viscosity, and yield stress of drilling mud, is omitted from the DCCA. Likewise, Table 5 of the position paper, with borehole roughness and shear strength parameters, is omitted. The DCCA says that the parameters chosen for PA are in the Appendix PAR, but no parameters for mud characteristics appear. Further, the parameters for analysis of gas spall appear at CUTTINGS-13 but are not supported in Appendix PAR. Other parameters appear at CUTTINGS-14 but not in Appendix PAR. Appendix PAR says that data, range,and references for waste shear strength will be discussed in the final CCA (at PAR-227). Thus, the Agency's question whether DOE has data on the viscosity of salt water based mud remains unanswered (DOE response to EPA 92PA comment T030).

Since the March 28, 1995 SPM position paper draft DOE has told the Agency that further revisions will be made to the spallings representation in the final CCA. At the August 30-31, 1995 DOE-EPA technical exchange Sandia announced that it has a "new model for release by blowout" based on a critical entrainment velocity, which has been incorporated in the CUTTINGS code. Much reduced blowout releases were projected, and it is said to be no longer necessary to assume human intervention to activate blowout preventers. However, no technical support for the new model was presented. In addition, Sandia stated that it planned to develop experimental data on waste strength, which would still further reduce spallings releases; this newer model is to be in preliminary form by September 29, 1995 and incorporated in the CUTTINGS code by March 1996. Thus, the model set forth in the DCCA is not the model which will be in the final CCA, and it is not appropriate to comment upon it.

The DCCA fails to explain how the various models of direct releases are analyzed in PA. How, for example, are activity levels assigned, if at all, to the waste released in spallings events? How is the entrainment rate assigned? How does PA make the basic selection among blowout, stuck pipe, and gas spall (presumably based on gas pressure and permeability, but it is not stated)? How are parameters such as cleanout duration, solids entrainment percent, and drill bit penetration rate established? What are the correlations among parameters in these models?

DOE states that for direct releases it sampled the variability of waste activity levels, using the distribution of activity levels shown in the 1991 Integrated Data Base (at 6-89). However, DOE states that the final application will use a different approach, based on the then-current BIR (at 6-89). How a distribution of

activity levels will be derived from the BIR is not explained. Again, the CCA will have a different approach from the DCCA, and comment on the DCCA would have no purpose.

6.4.10 The Castile Formation and Brine Reservoir

The DCCA contains little information about the area deemed underlain by Castile brine reservoirs. It is said that "[t]he repository was assumed to be underlain by three pressurized brine reservoirs, with two reservoirs under the waste disposal panels and one reservoir under the experimental and waste-handling area." (at 6-46). Previously, DOE has stated that "uncertainty will never be removed relative to the areal extent of brine reservoirs. It is for this reason that the DOE treats for uncertainty by modeling the E1 type scenarios in PA." (DOE response to NMAG CSR comment AG-20). Thus, in the 1992 PA the fraction of the area of the Castile brine reservoirs overlapping the disposal area was a variable parameter (see volume 3 of 1992 PA, at 5-1 et seq.). It is not clear whether a similar approach was used in the DCCA. Again, in the SPM position paper on non-Salado flow and transport DOE stated that it would assume that a total of <u>four</u> brine reservoirs underlie the waste panels (Iteration 2, at 3-31, 3-33)(March 27, 1995). Why the number is now three (or two) is not explained.

Similarly, in the 1992 PA various parameters of the Castile brine reservoir were treated as variable (see 92PA, vol. 3, at 4-10, 5-1). Now, apparently, the parameters are deemed fixed (DCCA at 6-91). Since these parameters are fixed, they do not appear in Appendix PAR (see 6-97), and there is no attempt to defend them in the DCCA. Consequently, no comment is appropriate.

6.4.11 Climate Change

The DCCA states that the effects of climate change on groundwater flow are the subject of a current study, which may affect how climate change is treated in the final CCA (at 6-91). We have encouraged DOE to focus on potential effects on the Culebra of precipitation increases, and it is appropriate that such studies should be made. Since the studies are not complete, it is too soon to comment on DOE's treatment of future climate change.

6.4.13 Numerical Codes

The DCCA presents an abbreviated description of the performance assessment process (at 6-92 et seq.). In commenting on the 1992 PA the Agency and others noted the need for greater clarity as to how DOE proceeds from parameters to final CCDF's. See EPA 92PA comments T010-011, T024-027, T157, T170). The requested

clarification has not been provided. The final CCA should be completely transparent as to questions such as:

1. Present the family of CCDF curves that is represented by the single curve deemed determinative.

2. How does one proceed from drilling rate to specific postulated intrusions?

3. How are outcomes of drilling events at specific times (e.g., 1000 years) "scaled" to reflect outcomes at different times?

4. How are correlations among variables represented?

5. What support is there for the proposition that 4/3 the number of variable parameters is sufficient for Latin hypercube sampling procedures?

6. What is the method for selecting parameters for sampling?

7. What is the method for selecting the type of distribution applicable to a variable parameter?

8. What level of confidence is associated with the probability judgments implied in parameter distributions?

9. What is the method for accounting for conceptual model uncertainty?

10. What parameters are fixed (e.g., location of intrusion borehole)?

11. When a value is deemed "conservative," what does that mean? Does it mean that releases will be enhanced in all circumstances, compared with releases projected using the actual value?

12. What effect is attributed to markers or other institutional controls in reducing the rate of intrusion or other prospective human activities?

We hope that the Agency will have an opportunity to consider these comments in preparing its own October 1995 and January 1996 comments to DOE on the DCCA. In addition, if the Agency should disagree with any of the foregoing comments, we hope the that the Agency will publicly state its view on such points.

Thank you for considering these comments.

Respectfully,

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