May 9, 2003

Joseph D. Ziegler, Acting Director
Office of License Application and Strategy
U.S. Department of Energy
Office of Repository Development
P.O. Box 364629 M/S 523
North Las Vegas, NV 89036-8629

SUBJECT: REVIEW OF DOCUMENTS PERTAINING TO AGREEMENT TOTAL SYSTEM PERFORMANCE ASSESSMENT AND INTEGRATION (TSPAI).3.21 (STATUS: NEED ADDITIONAL INFORMATION)

Dear Mr. Ziegler:

In your letter dated January 21, 2003, the U.S. Department of Energy (DOE) enclosed a response to Agreements TSPAI.3.18, TSPAI.3.21, TSPAI.3.23, Thermal Effects on Flow (TEF).2.13, and General (GEN).1.01, Comments 18, 24, and 69. The enclosed report documented technical information and associated references, the physical relationship of the unsaturated flow system on barrier capabilities of the proposed repository, and sensitivity analyses for risk importance. The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed this information, with respect to Agreement TSPAI.3.21, and the results of the staff's review are enclosed. Separate NRC review letters will be prepared for Agreements TSPAI.3.18, TSPAI.3.23 (including comments from GEN.1.01), and TEF.2.13.

Agreement TSPAI.3.21 states that DOE will demonstrate that effects of near surface lateral flow on the variability of net infiltration are appropriately considered. A more exact consideration of near-surface and overland lateral flow processes could affect focusing of net infiltration. Increased or focused infiltration could be important to performance assessment evaluations because of the resulting potential for increased seepage into repository drifts. Therefore, NRC staff requested DOE to demonstrate that the effects of near surface lateral flow, which could lead to focused infiltration, are appropriately considered.

The technical content and references in the Rickertsen (2003) report provide some of the information requested in key technical issue Agreement TSPAI.3.21. However, based on the limited technical information that was provided, it is not clear to staff that the DOE total-system performance assessment analyses adequately account for effects of near-surface and overland lateral flow process in the net infiltration submodel. Additional technical information is needed to complete Agreement TSPAI.3.21 based upon technical merit.

The DOE report also provided results from dose-based, sensitivity studies in order to demonstrate that the current understanding of net infiltration processes is adequate given that it has little significance to the calculation of the mean annual dose in the first 10,000 years following waste emplacement. The risk sensitivity studies provided are not sufficiently documented to support the completion of Agreement TSPAI.3.21 on the basis of low risk significance. Additional risk information is needed if DOE chooses to complete Agreement TSPAI.3.21 based upon risk assessments and sensitivity analyses. Guidance on the use of risk

information to complete agreements was provided by NRC in its letter to DOE titled, "Use of Risk as a Basis for Closure of Key Technical Issue Agreements," dated January 27, 2003.

Additional information, as described in the attachment, is needed to complete the key technical issue Agreement TSPAI.3.21. DOE may choose to complete Agreement TSPAI.3.21 by either providing: 1) additional technical information as discussed in Section 4.1 of the attachment, or 2) additional risk information as discussed in Section 4.2 of the attachment. With regard to the latter option, the disposition of Agreement TSPAI.3.21 can be determined after DOE adequately addresses NRC's concerns with its approach to resolving agreements via risk assessments and sensitivity analyses as discussed in the January 27, 2003, risk letter.

The NRC's interest in the information requested in the agreements is to support a detailed review of the potential license application. The NRC will consider risk information provided by DOE in conjunction with other factors, when evaluating whether sufficient information exists for NRC to conduct a detailed review of a potential license application. Consequently, the NRC may need to continue to request the original information sought in an agreement if we are not satisfied that the risk-information provided is adequate.

The key technical issue Agreement TSPAI.3.21 has the status "need additional information." If there are any questions regarding this letter, please contact Bill Dam at 301-415-6710 or by e-mail at wld@nrc.gov.

Sincerely,

/RA/

Janet R. Schlueter, Chief
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: NRC Review of DOE Documents
Pertaining to Key Technical Issue
Agreement TSPAI.3.21.

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information to complete agreements was provided by NRC in its letter to DOE titled, "Use of Risk as a Basis for Closure of Key Technical Issue Agreements," dated January 27, 2003.

Additional information, as described in the attachment, is needed to complete the key technical issue Agreement TSPAI.3.21. DOE may choose to complete Agreement TSPAI.3.21 by either providing: 1) additional technical information as discussed in Section 4.1 of the attachment, or 2) additional risk information as discussed in Section 4.2 of the attachment. With regard to the latter option, the disposition of Agreement TSPAI.3.21 can be determined after DOE adequately addresses NRC's concerns with its approach to resolving agreements via risk assessments and sensitivity analyses as discussed in the January 27, 2003, risk letter.

The NRC's interest in the information requested in the agreements is to support a detailed review of the potential license application. The NRC will consider risk information provided by DOE in conjunction with other factors, when evaluating whether sufficient information exists for NRC to conduct a detailed review of a potential license application. Consequently, the NRC may need to continue to request the original information sought in an agreement if we are not satisfied that the risk-information provided is adequate.

The key technical issue Agreement TSPAI.3.21 has the status "need additional information." If there are any questions regarding this letter, please contact Bill Dam at 301-415-6710 or by e-mail at wld@nrc.gov.

Sincerely,

/RA/

Janet R. Schlueter, Chief
High-Level Waste Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: NRC Review of DOE Documents
Pertaining to Key Technical Issue
Agreement TSPAI.3.21.

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NRC Review of DOE Documents Pertaining to
Key Technical Issue Agreement TSPAI.3.21

The U.S. Nuclear Regulatory Commission (NRC) goal of issue resolution during the pre-licensing period is to assure that the U.S. Department of Energy (DOE) has assembled enough information on a given issue for NRC to accept a license application for review. Resolution by the NRC staff during pre-licensing does not prevent anyone from raising any issue for NRC consideration during review of a license application. Equally important to note is that resolution by the NRC staff during pre-licensing does not prejudge what the NRC staff evaluation of that issue will be after a licensing review. Issues are resolved by the NRC staff during pre-licensing when the staff has no further questions or comments about how DOE is addressing an issue. Pertinent new information could raise new questions or comments on a previously resolved issue.

This enclosure addresses Key Technical Issue (KTI) Agreement Total System Performance Assessment and Integration (TSPAI).3.21, which was reached between NRC and DOE during a technical exchange and management meeting.[1] This agreement pertains to the DOE approach for modeling the process of infiltration into the unsaturated zone at Yucca Mountain, and whether the effects of near-surface lateral flow on the spatial variability of net infiltration are appropriately considered in total-system performance assessments. This agreement was addressed by the DOE in a letter[2] and in the enclosed report (Rickertsen, 2003), which are the subject of this review.

1 Wording of the Agreement

TSPAI 3.21: "Demonstrate that effect of near surface lateral flow on the spatial variability of net infiltration are appropriately considered. DOE will demonstrate that effects of near surface lateral flow on the variability of net infiltration are appropriately considered in an update to the Simulation of Net Infiltration for Modern and Potential Future Climates AMR (ANL-NBS-HS-000032) and UZ Flow Models and Submodels AMR (MDL-NBS-HS-000006). These AMRs are expected to be available to NRC in FY 2003."

2 Background

The shallow infiltration subissue of the Unsaturated and Saturated Flow Under Isothermal Conditions (USFIC) KTI was previously considered resolved at the NRC staff level following the publication by DOE of the total system performance assessment performed for the viability assessment (DOE, 1998; CRWMS M&O, 1998). The resolution of this subissue was based, in part, on staff's conclusion that the net infiltration rates for present and future climates considered in the DOE abstraction reasonably bounded the uncertainty in net infiltration at Yucca Mountain. DOE subsequently refined their net infiltration model, and estimates of net infiltration above the potential repository were revised to lower values. The revised net infiltration estimates prompted

[1]Reamer, C.W. "U.S. Nuclear Regulatory Commission/U.S. Department of Energy Technical Exchange and Management Meeting on Total System Performance Assessment and Integration (August 6–10, 2001)." Letter (August 23) to S. Brocoum, DOE.

[2]Ziegler, J.D. "Transmittal of Report Addressing Key Technical Issue (KTI) Agreement Items Total-System Performance Assessment and Integration (TSPAI) 3.18, 3.21, 3.23, and Thermal Effects on Flow (TEF) 2.13." Letter (January 21, 2003) to J. Schlueter.

staff to reexamine the shallow infiltration subissue. Staff subsequently identified the treatment of near-surface lateral flow in the DOE net infiltration model as a potentially important uncertainty that should be evaluated to assess whether the simplified approach for dealing with the complex process of overland and near-surface lateral flow could lead to underestimation of net infiltration.

The DOE net infiltration model is used to estimate the lateral distribution of net infiltration at Yucca Mountain for both present and potential future climates. These calculated net infiltration rates are input as the spatially variable upper boundary condition for the site-scale unsaturated zone flow model (CRWMS M&O, 2000a), which, in turn, is used for input to the drift seepage and radionuclide transport abstractions for total-system performance assessment calculations.

The DOE net infiltration model includes the effect of overland surface flow using an approach referred to as "instantaneous flow routing," which assumes excess precipitation (i.e., any water that does not infiltrate or evaporate during a model time step) is instantaneously diverted to the nearest downslope model cell to be included as mass input during the next time step. While this method does produce expected increases in local net infiltration in washes where lateral surface flow converges (U.S. Geological Survey, 2001), it is a gross simplification of a complex process and it does not explicitly consider subsurface lateral flow that may occur at the soil bedrock interface. Additionally, the net infiltration submodel is calibrated to match stream runoff in small watersheds representing only a portion of the model area. The runoff measurements at the outlets of watersheds provide little supporting basis for the distribution of run on and runoff within the watershed.

It is not immediately clear whether a more rigorous treatment of near-surface and overland lateral flow processes would result in greater focusing of net infiltration at locations such as wash bottoms. The amount and rate of near-surface and overland flow is affected by a number of variables, including the intensity and duration of precipitation, soil thickness, soil and bedrock hydrologic properties, slope and roughness of the ground surface, amount and type of vegetation, evapotranspiration potential, and antecedent soil moisture conditions.

Increased or focused infiltration could be important to performance assessment evaluations because of the resulting potential for localized increased seepage into repository drifts that could mobilize radioactive waste in the event of a waste package failure. Hence, NRC staff requested DOE to demonstrate that the effects of near surface lateral flow, which could lead to focused infiltration, are appropriately considered. Although DOE originally had agreed to provide such a demonstration, the agency has subsequently decided on an alternative approach of demonstrating that multiple lines of evidence support their current net infiltration estimates and that, in any event, total-system performance assessment calculations are not significantly affected by net infiltration and drift seepage rates. This alternative approach to addressing Agreement TSPAI.3.21 is documented in the report by Rickertsen (2003), which is reviewed in the following section.

3 NRC Review

The Rickertsen (2003) report provides three areas of discussion to support the completion of key technical issue Agreement TSPAI.3.21. First, technical information and associated references are provided as lines of evidence supporting the DOE conclusion that the variability in the representation of net infiltration used for total-system performance assessments is reasonable.

Second, the physical relationship between the net infiltration rate and the barrier capabilities of the proposed repository is discussed. Third, analyses of sensitivity of total-system performance to bounding cases of net infiltration are provided.

3.1 Review of Technical Information and Associated References

Present-day net infiltration estimates from the DOE infiltration submodel vary spatially and range approximately from 0 to 250 mm/yr (0 to 9.8 in/yr) for the current climate state, depending upon local elevation, precipitation/evaporation rates, soil depth, and bedrock permeability (Flint et al., 2002). Rickertsen (2003) explains that the instantaneous flow routing method used to account for lateral surface flow (i.e., run-on and run-off) produces increased values for local net infiltration in washes where lateral flow converges. Rickertsen (2003) also argues that, while more detailed treatment of lateral surface flow is possible, any difference in the predicted infiltration rates that such treatment would produce would be of secondary importance because the nonwelded Paintbrush tuff layer in the unsaturated zone above the repository moderates focused and episodic flow.

Multiple lines of evidence from a variety of field measurements summarized by Rickertsen (2003), in response to Agreement TSPAI.3.18, are also said to be applicable to Agreement TSPAI.3.21. These lines of evidence, which were first presented by Flint, et al. (2002), include neutron logging of moisture profiles, chloride mass balance calculations, analysis of borehole temperature profiles, analysis of calcite deposition in the unsaturated zone, chemical, isotopic and modeling analyses of perched water bodies, recharge estimated from the Maxey-Eakin method, and inferences from a regional heat-flow anomaly beneath Yucca Mountain.

Some of the lines of evidence presented in the Rickertsen (2003) report, such as analysis of calcite deposition, inferences from geothermal heat-flow anomalies, and Maxey-Eakin approaches, cannot be considered reliable estimators of net infiltration for the time and spatial scales relevant to the potential performance of a repository at Yucca Mountain. The other lines of evidence have associated analytical uncertainties. For example, neutron-logging of 98 shallow boreholes in the Yucca Mountain region (Flint and Flint, 2000) provides good geographic coverage of the Yucca Mountain area, but a potential data bias is that boreholes are typically limited by accessibility to locations near the crest of Yucca Mountain, where soil cover is thin, or in lower areas, accessible through washes, where soil cover is deep. Steeply sloping areas and areas with thick talus deposits are not well represented by the supporting data set, but may be important as areas that generate or receive significant amounts of lateral surface and near-surface flow. Also, because neutron logging in fractured bedrock generally reflects changes in rock matrix saturation, these data probably lead to underestimation of infiltration when significant portions of flow occur in the rock fractures. A more detailed review of the lines of evidence for support of the net infiltration model is being documented in the staff's review of Agreement TSPAI.3.18.

3.2 Review of the Physical Relationship of the Unsaturated Flow System on Barrier Capabilities of the Proposed Repository

Rickertsen (2003) provides a discussion in response to Agreement TSPAI.3.21 regarding the physical relationship between the net infiltration rate and barrier capabilities. In the event of a waste package failure, local areas of elevated precipitation and net infiltration may lead to local

areas of increased seepage, which may cause more water to contact waste, and may also increase the transport velocity in the drift invert and in the unsaturated zone below the repository. Both of these latter effects (i.e., more water contacting waste and faster transport velocity) would be expected to have some effect on total-system repository performance. While the discussion by Rickertsen (2003) provides some useful insights, it does not provide a basis for closure of Agreement TSPAI.3.21. Rickertsen (2003) provides dose-based sensitivity analyses to provide insight on the significance to risk of increased net infiltration rates, seepage rates, and contaminant transport rates.

The role of net infiltration on the barrier capabilities of the proposed repository system is discussed in the Rickertsen (2003) report. Basically, increased or focused net infiltration at the surface of Yucca Mountain could result in higher volumes and areas of seepage into repository drifts. As conceptualized in the DOE performance assessment model, increased seepage would likely result in a larger fraction of drip shields in an aqueous environment, rather than just a humid environment, for more of the time. Rickertsen (2003) asserts that increased seepage would make the environment for drip shield corrosion more benign because of dilution and the presence of corrosion inhibiting ions, such as nitrate, in seepage water. In the event of drip shield failure, increased seepage would also cause a larger fraction of waste packages to be in an aqueous environment. Rickertsen points out, however, that DOE studies show that corrosion rates for Alloy 22 are similar for aqueous and humid air environments, implying that higher seepage would not substantially affect waste package lifetimes. The evaluation of the complex processes that might affect the chemistry of seepage water and the resulting effects on corrosion rates for drip shields and waste packages are part of the key technical issue Agreements ENFE.2.06 and ENFE.2.09. Additional confidence will be provided for conclusions stating that increased seepage would have either minimal or beneficial effects on corrosion rates upon the successful completion of such agreements which increase the understanding of the potential range of local chemical conditions that may occur on drip shield and waste package surfaces.

3.3 Review of Sensitivity Analyses for Risk Importance

The total-system sensitivity analyses described by Rickertsen (2003) include three types of analyses: (1) a comparison of mean dose estimates between a case where the base-case net infiltration is used and a bounding case where net infiltration is approximately equal to the present-day mean annual precipitation; (2) a comparison of mean dose estimates between an expected seepage case with an average seepage rate of less than 0.1 m^3/yr (26 gal/yr) over approximately half the packages, and a bounding case where seepage is set to 1.0 m^3/yr (260 gal/yr) over all waste packages; (3) a comparison of dose estimates between the expected case and cases where flow and transport parameters are computationally neutralized (i.e., radionuclides are assumed to be released directly into wells in Amargosa Valley). These three types of sensitivity analyses are made by Rickertsen (2003) for each of two scenarios: a nominal scenario for otherwise expected conditions, and an igneous activity groundwater release scenario in which magma is assumed to damage waste packages and drip shields in a portion of the repository.

For the nominal scenario, results indicate that dose estimates are marginally higher for the bounding net infiltration case compared to the base case; the mean annual dose estimate is increased by approximately 10 percent only during the first 5,000 years. The lack of sensitivity

of the nominal case to the net infiltration rate can be attributed, in part, to the benefits of the drip shield, which is modeled to be effective at preventing advective releases of radionuclides by reducing the water that drips onto the waste package and water that enters the invert. The sensitivity studies suggest that highly soluble radionuclides (e.g., C-14 and Tc-99) dominate the initial dose estimates. Increased infiltration would result in increased wetting of the drift invert, which accommodates slightly higher diffusive release rates. Increased infiltration also increases flow velocity below the repository, reducing radionuclide travel time to the water table. No quantitative comparisons of radionuclide diffusion through the inverts or unsaturated zone transport velocities are provided in the Rickertsen (2003) report. The justification for the magnitude of the changes applied to parameters, and documentation with respect to the changes made to the models and the explanation of the results, will help establish confidence in the conclusions of the sensitivity analyses.

Sensitivity of mean dose estimates to net infiltration rates are also presented for the igneous activity groundwater scenario. In this scenario, mean annual dose estimates represent the dose resulting from groundwater pathways following an igneous intrusion. Drip shields and waste packages are assumed to be breached following the igneous activity. The dose estimates for the bounding infiltration case are about two to three times as great as the dose estimates using the base-case infiltration rates in the igneous activity scenario. The sensitivity study presented in the DOE report explains that the increased dose estimates for the igneous groundwater scenario and the increased sensitivity to the bounding infiltration rate (compared to the nominal case) are the result of the breached drip shields and waste packages, which permit advective flow to contact the waste. Information regarding the timing of igneous events for each realization is not provided in the DOE report. Bechtel SAIC Company (2002) indicates that the timing of the igneous event is stochastically sampled over a 100,000 year simulation.

The infiltration sensitivity study includes the far field effect of increased infiltration, but does not include near-field effects such as increased seepage into emplacement drifts. The seepage sensitivity study addresses the effects of increased seepage that may be associated with higher infiltration. For both of the separate bounding infiltration and seepage sensitivity analyses, the results of the nominal scenario analyses suggest mean annual dose estimates are dominated by highly soluble radionuclides and, because the inventory of these radionuclides can be exhausted by relatively small amounts of water, the results are not very sensitive to increased infiltration or seepage individually. However, DOE did not propagate the uncertainty associated with increased infiltration into the seepage model abstraction. While it is clear that the increased infiltration rates were applied to the unsaturated zone transport model, it is not clear how inputs to the seepage abstraction were modified for the sensitivity analyses.

For the igneous activity groundwater release scenarios of bounding infiltration and seepage, dose estimates are also influenced by some less soluble radionuclides, and therefore the amount of water contacting the waste is shown to have a more significant effect on dose than it does in the nominal case. The increase in mean annual dose estimates for the bounding cases was generally less than an order of magnitude above the expected case dose estimates, however, and generally less than about 0.001 mSv (0.1 mrem) during the 10,000 yr compliance period, which is substantially below the 0.15 mSv (15 mrem) regulatory limit.

For the sensitivity analyses of complete neutralization of flow and transport, mean doses for the both the nominal scenario and igneous scenario were modeled to arrive much earlier, as would

be expected. Although the mean dose rates modeled for these scenarios were two to three orders of magnitude greater than the base case dose estimates, the peak doses remained significantly below the 15 mrem regulatory limit during the 10,000 yr compliance period.

The Rickertsen (2003) report concludes that "uncertainties in the representation of the unsaturated zone flow system described in these KTI agreements do not play a significant role in determining whether the individual protection requirement would be met. Similar conclusions would be drawn with respect to the determination regarding the groundwater protection requirements."

4 NRC Comments and Conclusions

Rickertsen (2003) provided originally requested information to address the topic of the TSPAI.3.21 agreement, and the results of total system performance assessment simulations that illustrate the lack of sensitivity of dose to estimates of the net infiltration rate.

4.1 Comments and Conclusions on the Technical Information

The technical content and references in the Rickertsen (2003) report provide some of the information requested in key technical issue Agreement TSPAI.3.21. However, based on the limited technical information that was provided, it is still not clear to staff that the DOE total-system performance assessment analyses adequately account for effects of near-surface and overland lateral flow process in the net infiltration submodel. Additional technical information is needed to complete Agreement TSPAI.3.21 based upon technical merit. To complete Agreement TSPAI.3.21, DOE could provide the information originally requested in the text of the agreement. For example, net infiltration estimates from portions of the DOE submodel could be compared to estimates obtained using a smaller (e.g. watershed-scale) model that treats overland and near-surface lateral flow using more physically based numerical approaches. A second approach utilizing a technical basis would be to use the multiple lines of field evidence to quantitatively evaluate the range of uncertainty for present-day net infiltration above the proposed repository area, and demonstrate that this uncertainty is reasonably bounded by the net infiltration estimates used in total-system performance assessments. DOE has chosen an alternative approach, however, of using total-system sensitivity analyses to demonstrate that further refinement of net infiltration estimates would not be productive given the low relative significance of net infiltration to dose-based, total-system risk analyses. Staff comments on the DOE sensitivity analyses of risk importance are provided in the following section.

4.2 Comments and Conclusions on the Sensitivity Analyses for Risk Importance

The sensitivity analyses outlined by Rickertsen (2003) provide useful insight into the risk importance of the net infiltration rate in a total system performance assessment context and, combined with existing site data, may ultimately provide a sufficient basis for resolution of the USFIC KTI subissue shallow infiltration. However, the risk sensitivity study provided is not sufficiently documented to support the completion of Agreement TSPAI.3.21 on the basis of low

risk significance. In a recent letter,[3] NRC staff have previously communicated to DOE that additional information is needed when using risk as a basis to complete key technical issue agreements. First, an evaluation of combined uncertainty for all of the key technical issue agreements that are to be addressed using the low risk significance argument is required. Second, DOE should provide an adequate description of the sensitivity analyses completed. Third, some measure of how the variability of results changes between the different modeled cases is needed, because only the mean results of the stochastic performance assessment simulations have been presented to date. For example, presentation of the 5th and 95th percentiles of annual dose estimates, in addition to the mean dose estimates, would be a satisfactory way of conveying the variability and uncertainty of performance assessment estimates. These information needs apply to the DOE sensitivity analyses provided in the response to Agreement TSPAI.3.21. The three areas of information that are insufficient in the documented sensitivity analyses are described in more detail below.

1. The combined effect of uncertainties (for all agreements addressed with a risk argument) needs to be evaluated before the individual uncertainties can be dropped from further consideration. Otherwise, one could have the situation where moderate increases in risk are considered insignificant but, if numerous uncertainties are addressed in this manner, the combined effect could be significant.

   If agreements in other areas (e.g., waste package corrosion, spent nuclear fuel dissolution) that influence total-system performance assessment model results were not to be resolved via the use of risk-information in lieu of the originally agreed upon information, then there would be no need to evaluate the combined effects of uncertainties. However, it is the NRC's understanding that this is not the case. For example, the letter report for Agreement TSPAI.3.03 analyzed the sensitivity of the drip shield by means of neutralization, while the analyses for Agreement TSPAI.3.22 showed the sensitivity results of neutralizing natural barrier flow parameters and natural barrier flow and transport parameters. An adequate combined effects uncertainty analyses is needed as discussed in the January 27, 2003, letter from Schlueter (NRC) to Ziegler (DOE).

2. To further support the analysis results, DOE should provide an adequate description of the analysis (e.g., changes to the models, discussion of results) completed to evaluate the sensitivity cases. It is the NRC's understanding that the record package developed for the analysis contains an adequate description of the changes to the base case TSPA model.

   The DOE should update their total-system sensitivity analyses with regards to the groundwater protection standards (nominal scenario only) to support their claim that Agreement TSPAI.3.21 will not play a significant role in determining whether the groundwater protection standards will be met. The last such analyses were done before December 2000 (CRWMS M&O, 2000b).

[3]Schlueter, J.R. "Use of Risk as a Basis for Closure of Key Technical Issue Agreements." Letter (January 27, 2003) to J.D. Ziegler, DOE.

3. To convey uncertainty in the analyses, DOE should provide information on the variability of simulation results for the sensitivity cases and base cases, by plotting, for example, the 5th and 95th percentiles of dose estimates along with the mean dose estimates.

   Uncertainty and variability in the output of the analysis was not presented, but it is NRC's understanding that this information is readily available.

In conclusion, additional risk information is needed to complete Agreement TSPAI.3.21 based upon risk assessments and sensitivity analyses. When the DOE's risk sensitivity study is sufficiently documented to support the completion of Agreement TSPAI.3.21, staff will be able to determine whether this agreement can be completed on the basis of low risk significance.

5 Status of Agreement

The status of the KTI Agreement TSPAI.3.21 is "need additional information." Additional technical information is needed if DOE chooses to complete Agreement TSPAI.3.21 based upon technical merit (see Section 4.1). Additional risk information is needed if DOE chooses to complete Agreement TSPAI.3.21 based upon risk assessments and sensitivity analyses (see Section 4.2).

6 References

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