

Comments Derived from Review of Center for Nuclear Waste
Regulatory Analyses Milestone 06002.01.362.530

The Center for Nuclear Waste Regulatory Analyses (CNWRA) should consider the comments below, and address them to the extent practicable, as it continues work in the Redistribution of Radionuclides in Soil (DOSE2) program element, and to the extent applicable, and in the development of the Total System Performance Assessment (TPA) code in the Methodology and Overall System Performance (MOSP) program element. The comments have been grouped into three separate areas: technical basis; integration between process-level work and TPA code implementation; and communication.

A. TECHNICAL BASIS

1. The applicability of western wildfire-related increases in sediment yield and associated modeling and literature studies to the work documented in the milestone report has not been clearly identified. If these studies are applicable then that information should be incorporated, to the extent practicable, into future CNWRA work on redistribution. The applicability of the western wildfire-related increase in sediment yields to the work in this program element should also be more clearly communicated in the future.
2. Most of the studies for flood frequency of Fortymile Wash are several years old. This year Nevada experienced a very wet spring and rainfalls that have been referred to, in the print media, as once-a-century rainfalls. If there is any recent hydrographic or meteorologic data to bolster the previous flood frequency studies or that could corroborate the estimates for Fortymile Wash flood frequencies used in this report, they should be obtained.
3. Concerning flood frequency, the Squires and Young (1984) citation alludes to the extrapolation of gaging station records to perform the predictions. There are techniques of transposing storms over different drainage basins and taking into account geographical differences that could also be used to refine estimates of flood frequency beyond extrapolation of gaging station records alone. These techniques may need to be investigated if flood frequency is shown to be an important factor to risk.
4. Concerning the maximum particle diameter for particle transport, Figure 3-1 appears to show that the domain of the redistribution model encompasses all of the repository and volcanic vent. Therefore, everything coming out of the vent, including large clinkers and bombs, could potentially contribute to the tephra load in the drainage basin of Fortymile Wash. There is a size cutoff for the plume calculation in the ASHPLUME code (and presumably in the TEPHRA code as well). In the current TPA code, the parameter is called "MaximumParticleDiameterForParticleTransport[cm]" and is set to 10 cm. Therefore, particles as large as 10 cm appear to be included in the tephra load for the model. The current technical basis for this approach could be enhanced or communicated more clearly.
5. Concerning the diffusion analogy, the deliverable makes the assertion that the diffusion coefficient is calculated by dividing the volumetric transport rate by the

perimeter of the erosional front. Other than it is dimensionally correct, in the future, it should be made clearer why this is the diffusion coefficient.

6. In the future the technical basis for the non-analogous nature of silicic Mount Saint Helens tephra to basaltic tephra should be expanded upon. For instance, the deliverable states that the basaltic tephra is generally coarser grained than silicic tephra. If the basaltic tephra weathers to a finer grained material, would it behave more like Mount Saint Helen's tephra? If it does not weather to finer material, then is the basaltic tephra readily resuspendible? Answers to these types of questions, would increase the clarity of the non-analogous nature of silicic tephra to basaltic tephra.
7. In discussing sediment accumulation rates in the Fortymile Wash depositional fan the thickness of the recently active fan appears to be assumed to be 1 to 2 m [3.3 to 6.6 ft]. If the stratigraphic information from Nye County wells, such as the "19 well complex" and perhaps 2 DB wells, or other wells in the depositional fan, is available and sufficient to describe the recently active fan thickness, then that technical basis should be incorporated into the CNWRA's work.

B. INTEGRATION BETWEEN PROCESS-LEVEL WORK AND TPA CODE IMPLEMENTATION

1. It is not entirely clear from this deliverable whether the process-level work (collection of data and process-level modeling) is completely integrated with the abstracted approach implemented in the TPA code. The CNWRA should strive to work more closely in the DOSE2 and MOSP program elements so that both the data collection and process-level modeling (both eolian and fluvial redistribution) will be more integrated with the approach that is being implemented in the TPA code.
2. One area where it was not clear how integration between the current work and the TPA code is occurring is the area of flood frequency. In the deliverable there is a lot of discussion about the generation of a flood-frequency curve. This is certainly a difficult problem, and the relationship between flooding and sediment transport in channels is a strong one. The authors correctly point out that the lack of a long period of data collection at the site makes the prediction of flood frequency difficult. It would be possible to refine the flood-frequency estimates (see comment #2 in technical basis discussion above), but it is not clear where the information on flood frequency has been used in the redistribution model within the TPA code. The connection between flood-frequency estimates and the redistribution model should be made more clearly.
3. The deliverable implies that the TEPHRA code has been validated but the reference to that validation was not cited. Further, in this deliverable it is not clear whether it was validated against Cerro Negro data and how good was the fit. Also the deliverable does not make clear whether a mass-consistent wind field for the duration of the Cerro Negro eruption was available. This type of information should be considered and communicated in future descriptions of the process-level work.

C. COMMUNICATION

1. An important area for clarification in future descriptions of this work concerns whether the work assumes or demonstrates (e.g. "shown") an issue. For example several places in the deliverable (e.g., page ii, second paragraph; and page 1-2, paragraph four), the deliverable seems to imply that it has been "shown" that the amount of remobilized tephra could significantly affect airborne concentrations. However, it is not clear where this was shown. Although it may well be true, it seems to be an assumption of this analysis rather than an output. This assertion should be clarified (e.g., it is important because it may affect airborne concentrations).
2. Another area where future descriptions could be clarified is the relationship between remobilized tephra and airborne concentrations. It is unclear what it means to say that the accumulation rate of remobilized tephra may exceed the decay rate in airborne particle concentration. It seems to be a convolution of two different processes. In general, a more explicit discussion of the link between sediment supply and airborne particle concentration, even if only from a theoretical point of view, should be provided in the future.
3. Future discussions of the process level work should simply refer to Kokajko (2005) for the U.S. Nuclear Regulatory Commission's (NRC) staff analysis of the U.S. Department of Energy approach. Because this deliverable is focused on the CNWRA's independent work it is not clear that categorical statements, such as those made on page 1-3, paragraph one, are appropriate.
4. Some of the terminology used in the deliverable is confusing. For instance, the dilution factor sounds like something that is just the opposite of what it is. For example with a dilution of 20% you would think the amount of ash had been cut by 20%. However, in reality it is 20% remaining of the tephra. If the dilution factor terminology is common usage, then in the future, it should be indicated as such and explained so that the meaning of the term is clear.
5. It is difficult to understand what are the risk-drivers. The CNWRA may want to consider in the future highlighting in more detail, what factors drive the model. This would help to place the technical basis for each portion of the model in context as well as provide a better understanding of the results. For instance, this would help to determine if some of the input data needs to be built on a more solid technical basis, or to be handled probabilistically instead of by averaging.
6. Future descriptions of the sediment budget approach should be clarified. For instance, in the deliverable Section 1.7.1; second paragraph, both the second and third sentence are ambiguous (missing words or incomplete sentences).
7. Future communications on Paricutin sediment yield information should be clearer. For instance, on page 4-1, second paragraph, the discussion cited from Segerstrom (1961) comments that sediment yield for Paricutin ". . . should return to normal, preeruption levels in 1972," but that description does not indicate whether that this was a prediction that turned either out to be correct or not, or

that there was no information available to confirm the prediction.

8. Future discussions on the use of the diffusion analogy to sediment transport need to be clearer. First, the description of the finite difference analysis as “. . . an unstable solution. . .” is not entirely technically accurate, as the solution is stable as long as the time increment is kept below a certain criterion. Second, the numerical solution, as in equation 4-4, needs to have two boundary conditions, but these conditions were not clearly stated. Perhaps the upstream and downstream ends of the domain would be held fixed at the elevation of the natural stream bed. In this way, the elevation in the model (z) would not decrease below the natural level of the unaffected stream. The boundary conditions used should be stated more clearly in the future.
9. In the future, descriptions for the case where statistical means for key parameters are applied should be clearer. For instance, the deliverable notes that the percentage of the catchment basin covered by tephra is less than 100 (e.g., in the case of the mean parameters it is 18%). It is not clear how this coverage in your computations is treated. It could be that for the case cited above, the computational approach looks at an increase in the elevation z for the middle 18% of the finite-difference cells. It is also not clear whether an average tephra deposition over the affected cells or another approach is used. In the future a clearer explanation of how the calculations are conducted would be beneficial.
10. In the future, when describing the erosional nature of dryland rivers it should be made clear that when dryland rivers are in flood they are also more efficient erosional agents than perennial systems. In the deliverable it states “when dryland rivers are in flood they are also efficient erosional agents than perennial systems,” which suggests a missing word. Also the sentence, in the same paragraph, beginning with “For example, a soil mantel, . . .” appears to be an incomplete sentence, and future descriptions of this thought should be clarified.
11. The reference Connor et al. 2001 was cited on page 1-15 of the report but was not in the list of references. The relevance of that citation should be made clear in future communications on this subject.
12. When communicating about this work, it is important to clearly identify, and remain consistent with, the regulatory language which constrains the subject. For instance, the CNWRA should clearly identify the regulatory language in 10 CFR 63 that is pertinent (e.g., concerning the reasonably maximally exposed individual) and not rely on other independent interpretations (e.g. Bechtel SAIC Company, LLC., 2003a) to describe and constrain the approach taken.
13. Future communications on this work should be careful in describing any basis that NRC may or may not take in any NRC licensing decisions (e.g., language such as “ensures that NRC licensing decisions can be based on . . .” should probably not be used).

14. Future presentations which utilize Figure 1-3 should clearly define the variables used in the figure.
15. Although on page 5-3 of the deliverable it cites Figure 5-3 as illustrating the mass of tephra reaching the Fortymile Wash depositional, it is clear that Figure 5-2 contains that information.