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MEMORANDUM FOR: Philip S. Justus, Section Leader
Siting Section
High-Level Waste Technical
Development Branch
Division of Waste Management

FROM: David J. Brooks
High-Level Waste Technical
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Division of Waste Management

SUBJECT: WRITTEN CLARIFICATION OF OPEN GEOCHEMISTRY CONCERNS IN BWIP DSCA

Attachment-1 is a set of NRC responses to points on geochemistry that BWIP indicated needed clarification in their "Dispositions and Responses to NRC Comments" on the BWIP DSCR (dated May 25, 1983) and which remained as open items after the June 14 workshop on BWIP responses to the DSCA.

[redacted]

David Brooks
High-Level Waste Technical
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ATTACHMENT-1

ITEM REFERENCE: (BWIP) DISPOSITION OF NRC ISSUES HAVING SIGNIFICANT IMPACT ON THE PROJECT/PAGE 7/ITEM 1.

STATEMENT OF NRC COMMENT: "Plans to characterize the stratigraphy and mineralogy below Grande Ronde Basalt were omitted from the SCR."

BWIP DISPOSITION: Disagrees and needs further clarification.

NRC RESPONSE: "... Grande Ronde..." should read "repository horizon" or "Umtanum member of the Grande Ronde." Further, to characterize potential changes in geochemical conditions around the waste package (through time), ambient nearfield conditions must be characterized (in all directions). Finally, NUREG/CR-2352 (page 39 and 50) suggests that "radionuclides may be released from a facility in the Umtanum member of the Grande Ronde Formation will remain in this formation or possibily migrate downward." Thus, characterization of radionuclide migration should consider the geochemistry below the repository horizon.

ITEM REFERENCE: (BWIP) DISPOSITION AND RESPONSES TO NRC COMMENTS/PAGE 21/ITEM 3.

STATEMENT OF THE NRC COMMENT: "The basalt - groundwater and geochemical environment is stated to be benign. Because of the limited data available, the problems with determining uncontaminated down-hole measurements, and outstanding questions on the interpretations of data, this statement appears to be premature.

BWIP DISPOSITION: Disagree.

NRC REPONSE: The NRC considers that the data and test results available have not bounded the full range of important variables affecting canister corrosion, such as redox conditions, radiolysis and temperature. Until this work has beem completed, assertions on the "benign" nature of the environment surrounding the waste package is at best premature and its implications cannot be underestimated. For example, the establishment of such conditions (the environment is benign at the source term) would

suggest that the environment elsewhere is of minor significance to repository performance (i.e., if nothing happens at the source term then release to the accessible environment is not of concern).

ITEM REFERENCE: (BWIP) DISPOSITIONS AND RESPONSES TO SPECIFIC NRC COMMENTS/PAGE 44/ITEM 2.

STATEMENT OF NRC COMMENT: "Experimental evidence indicates ... the clay minerals (see Section 6.3)./5 (unsupported conclusion), 7 (lack of supporting data), 16 (incorrect or no reference) -- These pressures are not effective for controlling mineral stability."

BWIP DISPOSITION: Disagree.

NRC RESPONSE/CLARIFICATION: Comment "5,7 and 16" should be replaced by "6 (alternatives not considered)." We agree with the BWIP comment that their statement in the SCR was unclear. Further, the concern of the NRC staff is that these pressures are not effective for controlling mineral stability at high temperatures (repository conditions). Obviously, the minerals present are in apparent or metastable equilibrium with ambient conditions.

ITEM REFERENCE: (BWIP) DISPOSITION AND RESPONSES TO SPECIFIC NRC COMMENTS/PAGE 45/ITEM 1.

STATEMENT OF NRC COMMENT: Figure 6-8/4 (unsupported assertion) and 6 (Alternatives not considered).

BWIP DISPOSITION: Disagree.

NRC RESPONSE/CLARIFICATION Comment "6" (Alternatives not considered) is withdrawn and should be replaced by comment "16" (no reference). The basis for this comment is that every figure/table is a data dump (or another way of stating a conclusion) and therefore should be referenced to a specific RHO document that can be reviewed concerning the details of the basic strategy, laboratory techniques and analysis of data and uncertainty.

ITEM REFERENCE: DISPOSITION AND RESPONSES TO SPECIFIC NRC COMMENTS/PAGE 53/ITEM 4.

STATEMENT OF NRC COMMENT: "...; Giggenbach, 1981)./15 (incomplete data base/16 (incorrect or no reference) -- 'Reference doesn't really apply to subject discussed.'"

BWIP DISPOSITION: Disagree.

NRC REPONSE/CLARIFICATION: We agree that the Giggenbach reference supports the SCR statement "... minerals including radionuclide-bearing solids, will generally undergo continuous change to compositionally related minerals with lower free energy based on thermodynamic principles ...". However, the Giggenback paper is dealing with the alteration of primary minerals to secondary minerals (solid to solid changes). It is not clear how this is related to the solid to solution (species) changes i.e., solubility, that were being discussed. Further, the discussion (paragraph) in the SCR is directed towards the solubility of only spent fuel radionuclide oxides. By the time the discussion is completed, the operative words are solubilities of actinide-bearing waste forms. It is not clear whether this approach, i.e., looking at the solubility of oxides, is being considered by the BWIP as a means of dealing with other waste forms. This approach may not apply to other waste forms, such as borosilicate glass, since the oxide (and hydroxide) solids will probable not be the limiting phase (See DSCA appendix U, pages U-4 thru U-7).

ITEM REFERENCE: (BWIP) DISPOSITION AND RESPONSES TO SPECIFIC NRC COMMENTS/PAGE 56/ITEM 5.

STATEMENT OF NRC COMMENT: Table 6-16./6 (Alternatives not considered), 7 (lack of supporting data), 9 (uncertainty about testing techniques), 10 (uncertainty about analysis), and 14 (conflicts with previous statement).

BWIP DISPOSITION: Requires further clarification.

NRC RESPONSE/CLARIFICATION: Comment "6" (Alternatives not considered) is withdrawn and should be replaced by comment "16" (no reference). The basis for this comment is that every figure/table is a data dump (or another way of stating a conclusion) and therefore should be referenced to a specific RHO document that can be reviewed concerning the details of

their basic strategy, laboratory techniques and analysis of data and uncertainty. Comment 14 (Conflicts with previous statement is withdrawn.)

ITEM REFERENCE: DISPOSITION AND RESPONSES TO SPECIFIC NRC COMMENTS/PAGE 57/ITEM 1.

STATEMENT OF COMMENT: "Table 6-17.."- 6 (Alternatives not considered)

BWIP DISPOSITION: Requires further clarification.

NRC RESPONSE/CLARIFICATION: Comment "6" (Alternatives not considered) is withdrawn and should be replaced by comment "16" (no reference). The basis for this comment is that every figure/table is a data dump (or another way of stating a conclusion) and therefore should be referenced to a specific RHO document that can be reviewed concerning the details of their basic strategy, laboratory techniques and analysis of data and uncertainty.

ITEM REFERENCE: DISPOSITION AND RESPONSES TO SPECIFIC NRC COMMENTS/PAGE 59/ITEM 6.

STATEMENT OF NRC COMMENT: "Archaeological Objects and Metal Materials/inadequately covered in the SCR."

BWIP DISPOSITION: Agree.

NRC COMMENT/CLARIFICATION: The NRC staff is concerned primarily with how the conditions under which metal artifacts are preserved, relate to those expected in a repository in basalt. Further, this basic concern exists for any analogue argument used by BWIP.