TO: John Buckley, WMEG, U.S. Nuclear Regulatory Commission
FROM: J. Daemen JD
RE: BWIP Draft EA
DATE: 10-23-84

This review is based on a partial reading of the reference document, with minimal cross-checking of source references or other documents.

General Comments

1. Missing References

   Occasional checking of reference list suggests that numerous references are still missing in this draft.

2. Overall the BWIP EA presents a balanced and realistic assessment, even though some disagreements with the assessment are expressed in the detailed comments. The EA recognizes problem areas and uncertainties, and fully justifiably points out that only at depth testing can resolve many of the uncertainties.

3. Retrievability is virtually not addressed, except indirectly.

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Comment Number	Comment
2.1	Section 2.2.2.1 Page 2-43, Last paragraph What type of evidence or argument is there to support the claim that it is generally considered difficult to design an underground facility that will accommodate a fault rupture that occurs within 8 kilometers?
2.2	Figures 2-21,22 Pages 2-45,46 It is recommended that the meaning of the figures be clarified by adding a more explicit caption and explanation of the various shades.
2.3	Section 2.2.41, Identification of Preferred Candidate Repository Horizon Pages 2-59/67 It is virtually impossible to assess the adequacy of the decision making process without reviewing the detailed documents which describe it. Only final conclusions are given here, with minimal information as to how they were reached.
2.4	Section 2.2.4 e.g. Page 2-60, 4th paragraph; 2-65, 4th paragraph Missing Reference Ash, 1983, referenced repeatedly and obviously important, is not included in the references.
2.5	Section 2.2.4 Pages 2-59/67 It might be desirable for DOE to explain why a decision has been made to switch from the Umtanum to the Cohassett as the preferred flow.

2.6 Section 2.3.7.2 Summary of the Rock Characteristics
Page 2-74
Optimistic Assumption

The statement in the first paragraph of this section that there will be no significant risk to the safety of personnel must be based on a very optimistic interpretation of available information. Conversely, the available information would not warrant the conclusion that a disqualifying condition exists.

Comment Number	Comment
3.1	Section 3.2.3.8 Structural Analysis Page 3-38, First paragraph Missing Reference It is recommended that (Rohay and Davis, 1983) be included in the references.
3.2	Section 3.2.3.8 Structural Analysis Pages 3-36/38 Conflicting Evidence It is recommended that the contradictions about the horizontal compression direction be discussed and if possible resolved.
3.3	Section 3.3.2 Ground Water Page 3-57, last line Conflicting Data It is recommended that the hydraulic conductivity conversion be checked.
3.4	Section 3.3.2 Ground Water Page 3-68, second paragraph Missing Reference: Bentley, 1982.

Comment Number	Comment

4.1 Section 4.1.1.1 Lithologic Characterization
Pages 4-3/4
Questionable Characterization Plan

It is regrettable that the exploratory shafts are not explicitly included, e.g. by petrographic studies of the cuttings.

4.2 Section 4.1.2.1 Construction
Pages 4-8, last paragraph and 4-11, first paragraph
Incomplete Information

It is recommended that the precise location of the principal borehole (RRL-2, Figure 2-29, Page 2-58) with respect to the exploratory shaft be identified, and that a complete drilling record and all information from RRL-2 and the principal hole be made available to NRC.

4.3 Section 4.2.1.1 Geology
Page 4-25
Incomplete Analysis

It is recommended that an extrapolation of borehole spalling in RRL-2, if any, and in the principal borehole to possible shaft fracturing be provided.

4.4 Section 4.2.1.2.2 Ground Water
Page 4-26
Incomplete Analysis

It appears that construction effects, e.g. mud infiltration, aquifer mixing during construction, grouting, are not addressed.

4.5 Section 4.2.4 Alternative Site Characterization Activities that Would Avoid Adverse Impacts
Pages 4-36/38
Questionable Analyses

The first sentence of this section, with its implication that a HIW repository is essentially similar as any large underground construction project is highly questionable, if not misleading, as is confirmed most

obviously by the scope of the site characterization, as well as by its content (numerous tests proposed here would never even be considered, let alone performed, for any other large underground construction project).

The last paragraph of 4-37 and the first one on page 4-38 are highly questionable. Conventional shaft sinking would allow geological mapping along the entire shaft length, would greatly facilitate sampling rock and groundwater at many levels, would greatly facilitate drilling holes into the adjacent rock, would allow shaft and support monitoring, etc... It is recognized that blasting might induce additional disturbance of the rock adjacent to the shaft. However, if the stress levels are sufficient to cause rock damage, blasting effects might be secondary. It is unclear what is meant by the thermodynamic changes induced by the drilling process (blasthole drilling?), but clearly large hole drilling also will induce such changes (e.g. temperature, fluid pressure).

The summary in the last sentence clearly is not justified, as the type and amount of data that would be obtained by the two different shaft sinking methods would be significantly different.

Comment Number	Comment
5.1	Section 5.1.2.2.7 Waste Placement Panels Page 5-22, fourth paragraph Unsubstantiated Statement It is recommended that DOE provide references on the bentonite-crushed basalt mixture performance (i.e. water absorption, permeability).
5.2	Section 5.1.3 Ongoing Engineering Studies Page 5-24 Information Need It is recommended that the logic behind the recommendation to drill and blast long drifts be provided.
5.3	Section 5.2.1.2.2 Ground Water Page 5-28 Optimistic Incomplete Analysis Given the numerous aquifers, potentially large inflows under high pressure, this appears to be a very superficial statement.

Comment Number	Comment
6.1	Section 6.3.1.2.9 Potentially adverse condition Page 6-72, third paragraph Incomplete analysis The note indicating that this test will be expanded is noted. It is recommended that particular attention be given to the possibility of crack tip corrosion in highly stressed basalt-subjected to elevated temperatures and groundwater flow.
6.2	Section 6.3.1.3.3 Favorable condition Pages 6-80, 81, 82 Missing references The Lawrence Berkeley Laboratory (1983) and Kelsall et al. (1982) references are not listed.
6.3	Section 6.3.1.3.3 Favorable condition Page 6-80 Incomplete analysis Given the initial importance of the flow thickness, it would be highly desirable for DOE to identify techniques that will be used to identify local thinnings, i.e., to assure that minimum required thickness is available.
6.4	Section 6.3.1.3.3 Favorable condition Pages 6-80/82 Incomplete analysis Assuming that Kelsall et al. (1982) is ONWI-411, the title of ONWI-411 is "A Preliminary Evaluation . . .," and the authors of ONWI-411 caution repeatedly about the preliminary nature of their report. Apparently LBL (1983) is preliminary also. Although the strength data used by Kelsall et al. (1982) might have been conservative, the stress data almost certainly was not. The statement in the second paragraph on p. 6-82 that no increase in permeability will occur in the radial direction contradicts Kelsall et al. (1982), p. 41, if a plastic zone develops. Finally, there is very little if any experimental or in situ evidence to confirm these highly conjectural analyses.

The question of the damaged zone around excavations in basalt is important because of the potential thinness of the zone between dense interior basalt flows and the adjacent aquifers. It also could have significant implications for retrievability.

6.5 Section 6.3.1.3.5 Potentially adverse condition
Page 6-92, third paragraph
Questionable analysis

The bulking analysis is highly questionable. Whether or not each bulks during a fall depends far more on the type of fall than on the height of the fall. If one massive fall occurs, bulking will be minimal. Bulking is likely to be large if a gradual progressive fall occurs, e.g. during failure propagation above the initial fall. Stability analysis on the basis of bulking is insufficient. According to the analysis presented here, a cavern with high vertical dimension and a roof of only 1.3 m thick would stand up under very high lateral stresses. (It also appears to be assumed that the rooms will be centered almost exactly within the flow throughout the repository). This seems extremely unlikely.

It is recommended that a detailed analysis be presented indicating the likelihood that roof failure will not propagate up into the flow top, or identifying the conditions under which this might occur. In the latter case remedial action might be identified (including retrieval, flood recovery, stabilization measures, etc.)

6.6 Section 6.3.1.3.5 Potentially adverse condition
Page 6-92, last paragraph, last sentence
Inadequate analysis

The analysis in Subsection 6.3.1.3.3 is inadequate for reasons discussed under comment numbers 6.2 and 6.4. The analysis by LBL (1983) is not available to me, but ONWI-4511 (Kelsall et al., 1982) is based on an excavation in an infinite medium, clearly not applicable when the boundary of the solid rock (flow top) is close to the excavation.

6.7 Section 6.3.1.3.6 Potentially adverse condition
Page 6-94, top paragraph
Questionable site characterization technique

Exploratory holes probing forward during construction will allow determination of the flow thickness only if they are angled up and down. Such a scheme might result in a large number of connections between the repository and aquifers under high pressure.

It is recommended that DOE re-assess the desirability of exploratory holes probing forward during construction.

6.8 Section 6.3.1.3.8 Conclusion and qualifying condition
Page 6-99, next to last paragraph

The conclusion assumes that sufficient areas with thicker dense interiors exist, and that they can be identified.

6.9 6.3.3.2.4 Favorable condition
Pages 6-135/137
Questionable finding

In light of the extensive discussion in this section suggesting that medium to heavy support is likely to be required it is difficult to understand how any uncertainty can be left that the favorable condition will not be met.

6.10 Section 6.4.1.4.3 Abnormal/accident conditions
Pages 6-165/166
Incomplete analysis

It is recommended that repository flooding be considered as one of the accident conditions.

6.11 Section 6.4.1.4.4 Estimated dose consequences for hoist drop incident
Pages 6-166/168
Questionable analysis

The consequences are analyzed as if the release occurs at the bottom of the shaft. It is reccommended that the analysis consider the risk that major damage occurs during the fall due to hitting of the shaft equipment and walls. If glass failure were to occur during the fall, it would appear that considerably more glass could be pulverized.

TO: J. Buckley, WMEG, NRC
FROM: J. Daemen JD
RE: BWIP EA
DATE: 10-24-84

It would be very helpful if you could provide a copy of:

- Lawrence Berkeley Laboratory (1983), cited on p. 6-80
- Ash, 1983, cited on pages 2-60, 2-65.