

LETTER REPORT

TITLE: Scoping Review of the Draft EAs for the Salt Sites

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PROJECT TITLE: Technical Assistance in Geochemistry

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COMMENT NO. 1

Draft EA Section:

All sections related to geochemistry.

Scoping Review Comment:

The EAs contain a significant number of unsupported assertions. Limited factual data are available to support most discussions related to geochemistry. In addition, conservative assumptions and bounding values are not supported by theoretical arguments or a range of data. The tone of the discussions is one of "gut feeling" - an approach which might not be appropriate for the important decision of site selection.

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ORNL SCOPING REVIEW COMMENTS

DRAFT ENVIRONMENTAL ASSESSMENTS FOR CANDIDATE SALT SITES
(comments are general and refer to EAs for all salt sites)

COMMENT NO. 2

Draft EA Section:

All sections related to geochemistry.

Scoping Review Comment:

The seven EAs, though each representative of a different site, contain remarkably similar information on the geochemical characteristics of these seven different salt sites. This is not surprising in light of the limited amount of data available. However, in some cases the information presented is clearly a word-for-word reproduction from one EA to another - suggesting that, in some cases, the same information is intended to qualify several different sites. Given that the EAs are supposed to serve as a basis for choice among the sites, it seems incredible that DOE could make a legitimate choice when much of the information and supporting analysis is identical. If sufficient information is not available to discuss each site independently, then it would seem that the information would not be sufficient to provide a basis for site selection.

ORNL SCOPING REVIEW COMMENTS

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COMMENT NO. 3

Draft EA Section:

6.3.1.2.2 Evaluation Process

Scoping Review Comment:

The EAs state that the basis for the analyses include: (1) limited or no site-specific data, (2) reasonably conservative bounding values, and (3) generic data from other more accessible salt sites which is assumed to be appropriate to the sites under consideration. Limited ranges of values for water content and brine chemistry are assumed and these values are not shown to encompass the entire possible range of values. Also, data from widely spaced drill holes are extrapolated to the candidate sites. Such extrapolations can involve large uncertainties which cannot be quantified until site-specific investigations are initiated. This basis for evaluation is weak for a document which is intended to compare candidate sites. If site-specific data are not available, how can a meaningful differentiation among sites be accomplished? In addition, the basis for assumptions and parameter values being reasonably conservative is not established. In order to have reasonable assurance that extrapolations and predictions of repository performance are not non-conservative, the so-called bounding assumptions and parameter values must be based on a sound fundamental understanding. Otherwise, there can be no assurance that extrapolations will behave as anticipated.

ORNL SCOPING REVIEW COMMENTS

DRAFT ENVIRONMENTAL ASSESSMENTS FOR CANDIDATE SALT SITES
(comments are general and refer to EAs for all salt sites)

COMMENT NO. 4

Draft EA Section:

6.3.1.2.3 Analysis of Favorable Conditions

"(2) Geochemical conditions that promote the precipitation, diffusion into the rock matrix, or sorption of radionuclides; inhibit the formation of particulates, colloids, inorganic complexes, or organic complexes that increase the mobility of radionuclides; or inhibit the transport of radionuclides by particulates, colloids, or complexes."

Scoping Review Comment:

The favorable behavior of iron-silica phases (formed during the testing of waste package components) removing actinides from solution is invoked in this section of the EAs. The preliminary nature of these tests and the fact that not all important processes (e.g., radiation, presence of corroded metal rather than fresh metal, etc.) have been investigated suggests that taking credit for the precipitation of radionuclides is premature. Until all potentially important mitigating effects are accounted for, results from such tests are merely suggestive, not conclusive.

ORNL SCOPING REVIEW COMMENTS

DRAFT ENVIRONMENTAL ASSESSMENTS FOR CANDIDATE SALT SITES
(comments are general and refer to EAs for all salt sites)

COMMENT NO. 5

Draft EA Section:

6.3.1.2.3 Analysis of Favorable Conditions

"(2) Geochemical conditions that promote the precipitation, diffusion into the rock matrix, or sorption of radionuclides; inhibit the formation of particulates, colloids, inorganic complexes, or organic complexes that increase the mobility of radionuclides; or inhibit the transport of radionuclides by particulates, colloids, or complexes."

AND

"(4) A combination of expected geochemical conditions and a volumetric flow rate of water in the host rock that would allow less than 0.001 percent per year of the total radionuclide inventory in the repository at 1,000 years to be dissolved."

AND

6.3.1.2.4 Analysis of Potentially Adverse Conditions

"(3) Pre-waste-emplacement ground-water conditions in the host rock that are chemically oxidizing."

Scoping Review Comment:

For some of the salt sites, information is stated to be incomplete and not sufficient to characterize the redox potential of the rock/water system. For some sites, however, reducing conditions are invoked as a favorable condition. The evidence stated to support this assumption includes: (1) assemblages of minerals suggestive of reducing conditions, (2) the presence of methane in groundwaters, and (3) a few Eh measurements indicative of reducing conditions. These arguments for reducing conditions are totally unacceptable at this time. The evidence is not well documented and the fallacy of the concept of Eh in low-temperature groundwaters is well established. In addition, the EAs suggest that if conditions are reducing, radionuclides will have low solubilities and, thus, will precipitate. This assumption is not always warranted. Kinetic inhibitions to the establishment of equilibrium conditions can be significant. This disequilibrium could allow redox sensitive radionuclides to remain in their more soluble oxidized state and not precipitate as expected. Considerably more information is needed before reducing conditions and its favorable effect on radionuclide concentrations can be assumed for these sites.

ORNL SCOPING REVIEW COMMENTS

DRAFT ENVIRONMENTAL ASSESSMENTS FOR CANDIDATE SALT SITES
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COMMENT NO. 6

Draft EA Section:

6.3.1.2.3 Analysis of Favorable Conditions

"(3) Mineral assemblages that, when subjected to expected repository conditions, would remain unaltered or would alter to mineral assemblages with equal or increased capability to retard radionuclide transport."

Scoping Review Comment:

Mineral assemblages are stated to not alter as a result of the repository, therefore the favorable conditions is invoked. Technically, this is incorrect. Although the effects of temperature are addressed (the melting points of salt and anhydrite are referenced), the dissolution of the salt as a result of migrating fluid inclusions in a thermal field is not. Brine migration is obviously not a desirable process within the repository, because water is allowed to contact the waste packages and because the mineral assemblages will be altered (i.e., dissolved) - whether the process of dissolution and reprecipitation of salt can be said to have no impact, favorable impact, or adverse impact is not apparent at this time. However, it would seem that the favorable condition cannot be unequivocally invoked based on current information.