United States Department of the Interior

BUREAU OF MINES
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WASHINGTON, D.C. 20241

June 26, 1986

Memorandum

To: Charlotte Abrams, Project Officer, Geotechnical Branch, Division of Waste Management, U.S. Nuclear Regulatory Commission

From: Ransom F. Read, NRC Program Manager

Subject: Final EA Reviews and Comments--Work Directive 003 of Task Order #002 of Interagency Agreement NRC-02-85-004

FIN #D1018

Enclosed are review forms and responses to NRC's natural resource related comments on five final Environmental Assessments (Hanford site, Yucca Mountain site, Deaf Smith site, Davis Canyon site, and Richton Dome site) as required under Task Order #002 of Interagency Agreement NRC-02-85-004.

Ransom F. Read

Enclosure

DEAF SMITH
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/10/86 Contractor (BOM)

(A) Draft EA comment number.
WM Branch.
Comment topic.

(B) Was the comment addressed in the Final EA? Yes.
Where? Sec. 3.2.8.2, P 4, p. 3-118.

(C) How was our Draft EA comment addressed?

1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify) No conclusions needed to be drawn.

(D) Was our comment addressed as we suggested? Yes.
If not, specify.

(E) Status.
1) Has the basis for our concern changed?
2) Resolution deferred by DOE to SCP?
3) Has a new NRC concern developed?
4) Other (Specify) Comment adequately addressed.

Comment 3-28

Section 3.2.8.2 Other Resources Page 3-95 Paragraph 1

This section states "Abundant potassium salts have not been observed in the DOE wells." The final EA should address where, both geographically and stratigraphically, potassium salts have been noted.

DEAF SMITH
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/10/86 Contractor (BOM)

(A) Draft EA comment number. 3-27.
WM Branch.
Comment topic. Hydrocarbon Resources, Sec. 3.2.8.1.

(B) Was the comment addressed in the Final EA? No.
Where?

(C) How was our Draft EA comment addressed?
1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

(D) Was our comment addressed as we suggested? No.
If not, specify. The final EA does not address the apparent discrepancy between the conclusions of Dutton, et al (1982) (as pointed out by the NRC reviewer) and those of DOE. Dutton states (p. 73) that "additional discoveries in the basin are likely."; DOE, citing this reference, concludes that potential for hydrocarbon resources is low.

A paragraph has been added to Sec. 3.2.8.1. in which a study by Means and Hubbard (1985), using 6 source-rock indicators from Dutton (1982) and three ground water indicators, appears to support DOE's conclusion of low hydrocarbon potential. Perhaps this is considered by DOE as "addressing" the NRC comment.

(E) Status.
1) Has the basis for our concern changed? No.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify) No.

New information in Sec. 3.2.8.1. notwithstanding the NRC comments have yet to be addressed in a satisfactory manner.

Consistency
Information, evaluations, and rankings, Chapters 3, 6, and 7, respectively, are consistent.

Comment 3-27

Section 3.2.8.1, Hydrocarbon Resources Page 3-86 to 3-92

This section extensively cites Dutton, et al. (1982) and concludes that the Palo Duro Basin is undercharged with respect to hydrocarbon potential, and that the possibility of undiscovered hydrocarbons is low. Dutton, et al. (1982), however, states (page 1) that "the Palo Duro Basin seemingly has all the elements necessary for hyrocarbon generation and accumulation: reservoirs, traps, source rocks, and sufficient thermal maturity. ...The Palo Duro Basin contains source rocks of sufficient quality to generate hydrocarbons. Pennsylvanian and Wolfcampian shales contain up to 2.4 percent total organic carbon and are fair to very good source rocks", concluding on page 73 that "additional discoveries in the Palo Duro Basin are likely." On Figures 52 and 53, in Dalton, et al. (1982), Pennsylvanian and Lower Permian potential reservoir fairways are superimposed over organic-rich source rocks. These maps, which ignore granite wash potential, show that the site area has potential for hydrocarbon production. Although these studies are theoretical, it appears that the potential for oil or gas discoveries has been underestimated in the Draft EA.

RICHTON
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/18/86 Contractor (BOM)

(A) Draft EA comment number. No Specific Comments pertaining to minerals
WM Branch. resources were presented by the NRC or in
Comment topic. Volume III.

(B) Was the comment addressed in the Final EA?
Where?

(C) How was our Draft EA comment addressed?
1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

(D) Was our comment addressed as we suggested?
If not, specify.

(E) Status.
1) Has the basis for our concern changed?
2) Resolution deferred by DOE to SCP?
3) Has a new NRC concern developed?
4) Other (Specify)

See attached.

BOM Reviewer's Comment

The final EA adequately discussed potential resources including hydrocarbons, sodium chloride, sulfur, lignite, and sand and gravel. There resulting conclusions are justified.

Consistency

Information, evaluation, and ranking as set forth in Sec. 2.3.8., 6.3.1.8., and 7.2.1.8.1, respectively are consistent.

DAVIS CANYON
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/10/86 Contractor (BOM)

(A) Draft EA comment number. 3-22.
WM Branch.
Comment topic. Host Rock Chemical Properties, Sec. 3.2.7.1., P 3.
Potash, Sec. 3.2.8.8.2., P 6.

(B) Was the comment addressed in the Final EA? Yes.
Where? Sec. 3.2.7.1., p. 3-98 to 3-103.

(C) How was our Draft EA comment addressed?

*1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

* See attachment.

(D) Was our comment addressed as we suggested? Partially.
If not, specify.

See attachment.

(E) Status.
1) Has the basis for our concern changed? Yes.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

Consistency
Information, evaluation, and ranking as presented in Chapters 3, 6, and 7, respectively, is consistent. The appearance of conflicting data still exists between Chapters 5 and 6 (see Comment #6-48).

3.2.7.1. Host Rock Chemical Properties. This section was entirely rewritten and incorporates much new information. The existence of potash in Salt Cycle 6 was recognized and some of its possible geochemical effects within the proposed repository host rock discussed. A new figure, 3-23 (p. 3-51), indicates carnallite concentration beneath the site ranges between 1.5 and 3.5 weight percent. The conflict in thicknesses of Salt Cycle 6 and the carnallite marker in the area of borehole GD-1 (as reported in Sec. 3.2.7.1. and fig. 3-16) has been resolved.

3.2.8.8.3. Potash. The position of the zero potash deposition line in draft figure 3-25 was retained in the final EA (fig. 3-38, pp. 3-106). The line is intended to show the approximate limits of Salt Cycle 18 (the potentially economic bed), not Salt Cycle 6 (which hosts the carnallite marker). The section recognizes the presence of potash at the Davis Canyon site; however, the quantity and quality of potash contained in Salt Cycle 6, (due to abrupt thinning of the bed south and west of the GD-1 borehole), has low economic potential.

Special Attention

Comment 3-22

Section 3.2.7.1, Host Rock Chemical Properties, page 3-70, paragraph 3, and Section 3.2.8.8.2., Potash, page 3-109, paragraph 6

With present data base, there is little justification to assume potash mineralization does not occur at the site. The boundaries for both the potentially economic potash deposits and the zero potash deposits shown in Figure 3-25 are poorly constrained by the available data and the zero potash line includes portions of the Davis Canyon site. Conflicting evidence is presented in the table on 3-110, Figure 3-16 and Section 3.2.3.3 as to reported potash in the core of GD-1. The potash content is of concern for geochemistry, rock properties, dissolution and economic mineral deposits and, therefore, is a considerable concern for waste isolation.

DAVIS CANYON
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/9/86 Contractor (BOM)

(A) Draft EA comment number. 6-48.
WM Branch.
Comment topic. Statement of Qualifying Condition (Human Interference and Natural Resources). Sec. 6.3.1.8.1., P 5, p. 6-113.

(B) Was the comment addressed in the Final EA? Partially.
Where? Sec. 6.3.1.8.1., P 4, p. 6-167 to 6-168. - Yes.
Sec. 5.2.1.2., P 2, p. 5-61. - No.

(C) How was our Draft EA comment addressed?
*1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

1) Modified conclusions?
*2) Same conclusions?
3) Other? (Specify)

* See attachment.

(D) Was our comment addressed as we suggested? Partially.*
If not, specify.

* See attachment.

(E) Status.
1) Has the basis for our concern changed? No.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

Use of the term "proven resources" (vice "known" or "reported" in Sec. 5.2.1.2. is misleading in that it implies that tonnage and grade or other geological or engineering data have been generated for potash (and other) resources underlying the GROA. The term has been retained in the final EA (sec. 5.2.1.2. P 2, p. 5-61).

Section 6.3.8.1. has been augmented to show that while potash resources exist in the GROA, the beds (Salt Cycle 6, 13, and 18) are too thin to be "of economic interest now or in the foreseeable future." Notwithstanding the clarification of information relating to low economic potash potential in the GROA, the statement in Sec. 5.2.1.2 continues to give the appearance of a conflict of information or evaluation.

Special Attention

Comment 6-48

Section 6.3.1.8.1, Statement of Qualifying Condition (Human Interference and Natural Resources), page 6-113, paragraph 5

In Section 5.2.1.2, potash is described as a "proven resource" while in this section, it states that it is not likely to underlie the site. These are contradictory statements which affect both environmental concerns and concerns with health and safety which need to be reconciled.

DAVIS CANYON
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/11/86 Contractor (BOM)

(A) Draft EA comment number. 6-49.
WM Branch.
Comment topic. Analysis of Potentially Adverse Condition (Human Interference and Natural Resources (Sec. 6.3.1.8.3., p. 6-115 and 6-116).

(B) Was the comment addressed in the Final EA? No.
Where?

(C) How was our Draft EA comment addressed?
1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

(D) Was our comment addressed as we suggested?
If not, specify.

(E) Status.
1) Has the basis for our concern changed? No.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

Hydrocarbons still need to be discussed. Existing borehole data in the candidate area and 7 kilometers distant from the site indicate the presence of hydrocarbons.

Special Attention

Comment 6-49

Section 6.3.1.8.3, Analysis of Potentially Adverse Condition (Human Interference and Natural Resources), page 6-115 and 6-116

Based on the oil and gas shows encountered in Borehole GD-1 within the Leadville Limestone and Paradox Formation, as well as from other wells in the site vicinity, hydrocarbons should also be discussed in this section.

NNWSI
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/12/86 Contractor (BOM)

(A) Draft EA comment number. 6-94.
WM Branch.
Comment topic. Data Relevant to the Evaluation, Sec. 6.3.1.8.2., P 1, p. 6-236.

(B) Was the comment addressed in the Final EA? No.
Where?

(C) How was our Draft EA comment addressed?
1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

Not addressed.

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

(D) Was our comment addressed as we suggested? No.
If not, specify. The paragraph was rewritten, expanded somewhat, and included additional references. Suggestions and comments by NRC were not addressed.

(E) Status.
1) Has the basis for our concern changed? No.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

See attachment.

BOM Reviewer's General Comments

To a future explorationist an area such as Yucca Mountain, surrounded on three sides by mining districts that in the past have been explored or exploited (Bare Mt., 16 km northwest; Lee, 15 km southwest; Armagosa, 10 km southwest; Wahmonie, 20 km east; and the Mine Mountain, 25 km northeast, p. 6-286, Final EA), may be perceived as a prime exploration target. Perceived potential, as well as "real" resources, should be assessed to determine the probability of post-closure exploratory drilling on or near the proposed HLW site.

Although DOE considers geothermal resources in the vicinity of Yucca Mountain to lack sufficient temperature for commercial power applications, the cited temperatures represent a potential for space heating, food processing, and industrial applications and should not be dismissed (Final EA p. 3-23). Further, high temperature zeolites (Final EA p. 6-192) have been identified in tuff units and potential hydrothermal opal and travertine deposits have been noted in fault zones on either side of Yucca Mountain (NRC staff report; Rice, 12/28/84).

Yucca Mountain is in the southern end of the southern Nevada Volcanic Field bounded on the north and west by at least seven calderas, one of which (Silent Canyon caldera) hosts rocks petrographically similar to those of the McDermitt caldera near the Nevada-Oregon border (Bell and Larson in Draft Environmental Assessment p. 3-23, Yucca Mountain Site, Nevada Research and Development Area, Nevada, December 1984). Rocks related to the McDermitt caldera host the largest producing mercury mine as well as the potentially largest single lithium resource in the Nation. If the similarity of lithologies between the McDermitt and Silent Canyon calderas does exist, then the potential for similar resources also exists. All references to these similarities have been deleted in the final EA; this is disturbing. The issue of caldera mineralization, however, is addressed in the final EA on p. C.5-50, but does not recognize the potential for mercury or lithium resources in rocks of the Silent Canyon Caldera. Citing an evaluation of caldera mineralization by McKee (1979) the DOE concludes that large base and precious metal deposits in Nevada are not generally associated with calderas or the products of caldera evolution. This notwithstanding, the vicinity of Silent Canyon Caldera should be studied in greater detail. The potential for mercury and lithium north of Yucca Mountain, and those perceived or real potentials addressed above, may constitute a powerful incentive for post-closure exploratory drilling.

The proposed site is also bounded on the west by the large Solitario Canyon Fault characterized by a wide zone of highly brecciated rock material that extends more than 1 kilometer below the surface. Brecciated zones are often excellent hosts for mineralization. The Solitario Canyon Fault zone should be thoroughly explored by surface sampling and drilling to confirm or deny the existence of any mineralized body. A potential for undiscovered hypothetical resources exists in this zone.

The northern portion of Yucca Mountain hosts many rhyolite intrusions and flows. Exploratory drilling in the vicinity of the intrusives is required in order to fully assess the resource potential.

DOE conclusions relating to mineral potential at the Yucca Mountain site were based on the studies of Bell and Larson (1982) and analyses of drill hole data presented in Maldonado and Koether (1983) and Spengler, et al (1981) (Final EA- 3-23). The titles of the Maldonado and Koether (Final EA 3-122) and Spengler (Final EA-3-128) documents suggest the studies were conducted to determine the structure, stratigraphy, and petrographic features of local Tertiary volcanics and not necessarily for the purpose of resource assessment.

Because of its withdrawal from the public domain for a period of 40 or more years, little if any prospecting or mineral exploration utilizing state-of-the-art exploration techniques and methods, has been conducted in the vicinity of Yucca Mountain. Extensive studies, employing modern geological, geochemical, and geophysical exploration methods and supported by a comprehensive diamond drilling program would be necessary to sustain the conclusions relating to low mineral potential as stated in the draft EA.

Until and unless the area is examined and evaluated extensively, it is not possible to formulate definitive conclusions concerning its resource potential. However, the geologic character of the area (Tertiary volcanics, hot springs, etc.) and the lithologic and petrographic similarities of area rocks to those hosting known mineral deposits indicates a potential for undiscovered hypothetical resources.

Consistency

Information, evaluation, and ranking as set forth in Sec. 3.2.4., 6.3.1.8, and 7.2.1.8, respectively, are consistent.

In Draft EA

6-94

Section 6.3.1.3.2, Data Relevant to the Evaluation, Page 6-236, Paragraph 2 1

Natural resource exploration has been banned within the Nevada Test Site for the last 30 years. Because of this, the analysis of past and present mines and surface workings in the region may not be a good indicator of economic potential. This is particularly true since "Geophysical, geological, and geochemical data, as well as historical background, make Wahmonie (on the NTS) a prime exploration target for precious metals." (Quade and Tingley, 1983). The NRC suggests that the discussion in this section place the data used in the survey by Bell and Larson (1982) in the proper context and explain how it impacts the conclusions for each applicable guideline in this section.

BWIP
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/11/86 Contractor (BOM)

(A) Draft EA comment number. #5.
WM Branch. GT.
Comment topic.

(B) Was the comment addressed in the Final EA? No. See attached.
Where?

(C) How was our Draft EA comment addressed? Not addressed.
1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

(D) Was our comment addressed as we suggested? No.
If not, specify.

See attached.

(E) Status.
1) Has the basis for our concern changed? No.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

Comment #5

The final EA has not addressed this comment adequately. The only new information of significance is on p. 6-175, para. 3, the DOE does suggest that natural gas seals must exist below the basalts, however, there is still no discussion of natural gas traps other than anticlines; such as faults and feeder dikes. Additionally, since the EA suggests these seals "must" exist, the potential for exploratory drilling in search of these traps may occur in the future. This would also be supported by the presence of methane in ground water samples from flows within the Cold Creek syncline.

The final EA has still failed to address the postulated location of the Yakima Ridge anticline within 1/2 mile of the repository.

The NRC's concern expressed by this comment has not changed. DOE's findings for guideline condition 960.-4-2-8-1(a) and 960.-4-2-8-1(c)(1) requires changes or additional support by further analyses of the above as well as the additional comments appended (see "reviewer's comments").

COMMENT #5 Major Emphasis

Natural Resources

Guidelines on Natural Resources 10 CFR 960-2-8-1

For qualifying condition 960.4-2-8-1(a), the DOE has not adequately documented available information on hydrocarbon resource potential such as: traps below or within synclines, and close proximity of anticlines to the reference repository location. The draft EA implies that any potential for natural resources in the immediate vicinity of the reference repository location is low, because the repository location is in the Cold Creek syncline and is away from anticlines that form the traps for natural gas (draft EA, page 6-142).

Exploration in the Saddle Mountains has indicated that natural gas is present below the basalts (draft EA, page 6-187). The deep (greater than 12,000 ft) Shell Oil Company well, at Saddle Mountains 26km (16 miles) north of the reference repository location (draft EA, page 6-139), is the closest commercial exploratory drilling. The exploration target is below the basalt.

The American Association of Petroleum Geologists newsletter, "Explorer", (Shirley, Nov. 1984) indicates exploration activity on the Columbia Plateau is increasing due to rapid advancements in magnetotelluric methods capable of detecting deep structure beneath the basalts. Magnetotelluric results show that the anticlines and synclines in the basalts do not reflect the structures beneath the basalts (RHO-BW-ST-19P). Hence, gas reservoirs below the basalts may be found under synclines in the basalts, as well as under anticlines. The presence of hydrocarbon traps below the Cold Creek syncline may be indicated by the presence of methane (natural gas) in groundwater samples from the Cohassett flow, in the Cold Creek syncline (draft EA, page 6-187).

The EA states, on page 6-139, that the Yakima Ridge (3 kilometers (2 miles) west of the reference repository location) is the nearest anticlinal ridge to the reference repository location. However, Yakima Ridge anticline is postulated by the DOE to exist buried (draft EA, page 3-51) within a half mile southeast of the reference repository location.

The DOE's assessment, as presented in the draft EA, does not consider possible kinds of natural gas traps other than anticlines, such as: faults (detailed comment 6-41 and 3-11) and feeder dikes which may be buried beneath the repository area (Ice Harbor dike, Pasco, U.S.G.S., 1979).

Based on the indications cited above, we consider that the DOE has incompletely documented the finding and support of the qualifying condition (Section 960.4-2-8-1(a)). Another finding that is impacted by consideration of this information is potentially adverse condition 960.4-2-8-1(c)(1).

The NRC suggests that in the final EA, the DOE document consideration of the above information on hydrocarbon potential in the geologic setting of the Hanford site, and reconsider the findings for guideline conditions 960.-4-2-8-1(a) and 960.4-2-8-1(c)(1) and consider changing or better supporting them.

BWIP
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/11/86 Contractor (BOM)

(A) Draft EA comment number. 3-1.
WM Branch.
Comment topic. Geologic Conditions, Sec. 3.2, p. 3-1 to 3-56.

(B) Was the comment addressed in the Final EA? No.
Where?

(C) How was our Draft EA comment addressed?
1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

Not addressed.

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

(D) Was our comment addressed as we suggested?
If not, specify.

Not addressed.

(E) Status.
1) Has the basis for our concern changed? No.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

The final EA contains no data pertaining to mineral resources in Chapters 3, 4, and 5. This information should be included.

3-1

Section 3.2, Geologic conditions, pages 3-1 through 3-56

There is no discussion of mineral resources in this section. Also, there is no discussion of mineral resources in Chapters 4 and 5. All information on mineral resources in this draft EA is presented in detail in Section 6.3.1.8, "Human interference (natural resources)" which covers siting guideline 960.4-2-8-1. Mineral resources may have implications for the socioeconomic analysis as well as the performance of the repository system after closure. It is suggested that the appropriate information on mineral resources be placed in Chapters 3, 4 and 5 to make each of these Chapters more complete.

No No

Some addit - no discussion.

BWIP
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/10/86 Contractor (BOM)

(A) Draft EA comment number. 6-52.
WM Branch.
Comment topic. Qualifying Condition, Sec. 6.3.1.8., P 3, p. 6-137.

(B) Was the comment addressed in the Final EA? No.
Where?

(C) How was our Draft EA comment addressed?

1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

Not addressed.

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

(D) Was our comment addressed as we suggested?
If not, specify.

Not addressed.

(E) Status.
1) Has the basis for our concern changed? No.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

See attachment.

6-52

Section 6.3.1.8, Qualifying condition, page 6-137, paragraph 3

The DOE does not consider structural hydrocarbon traps formed by steeply dipping faults, such as that which may exist along the southeastern corner of the repository (see detailed comment 6-41), as well as possible others within the repository itself. Potential traps other than anticlines could include feeder dikes. Although such dikes are reportedly found only south and east of the site where exposures allow their detection, numerous others, like the Ice Harbor dike near Pasco (USGS, 1979), may lie buried beneath the repository area.

In addition, (RHO-BWI-ST-19P) reports that magnetotelluric results indicate that the basalt doesn't reflect the basement structure and there is great relief on the pre-basalt surface. Consequently, the lack of surficial anticlines does not necessarily imply the absence of deeper structural targets within the Cold Creek syncline. Although such structures are hidden from conventional geophysical methods, the November, 1984 issue of the American Association of Petroleum Geologists Explorer credits the current exploration "boom" on the Columbia Plateau to rapid technical advancements in magnetotelluric methods, capable of detecting structure beneath the basalts. This is significant because loss of waste isolation could occur from exploratory drilling in or near the reference repository location.

It is suggested that this section of the final EA recognize that currently undetected sub-basalt anticlines may be found and that assessments be made for hydrocarbon traps other than anticlines.

No Change

BWIP
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/11/86 Contractor (BOM)

(A) Draft EA comment number. 6-53.
WM Branch.
Comment topic. Favorable Condition, Sec. 6.3.1.8.3., P 2, P. 6-139.

(B) Was the comment addressed in the Final EA? No reference to methane in the Grand Ronde has been included.
Where? In Sec. 6.3.1.8.12, P 4, p. 6-184, last sentence, a mention of "at best speculative" hydrocarbons present below the basalts, is made.

(C) How was our Draft EA comment addressed? Not addressed.
1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

(D) Was our comment addressed as we suggested?
If not, specify.

(E) Status.
1) Has the basis for our concern changed? No.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

See attachment.

6-53

Section 6.3.1.8.3, Favorable condition, page 6-139, paragraph 2

No mention is made anywhere in Section 6.3.1.8.3 of the fact that ground-water samples from the Grande Ronde Basalt formation, Cohassett flow ("preferred candidate horizon") are about 50 percent saturated with methane gas (page 6-187 of the draft EA). Only the Wanapum and Saddle Mountains basalt formations are discussed. The Saddle Mountains and Wanapum Basalt are said to have methane from carbonaceous interbeds. The Grand Ronde Basalt formation is not interbedded with terrestrial carbonaceous matter and methane is not indigenous to basalt rock (draft EA page 6-187). The gas in the Grande Ronde formation may originate in sediments below the basalt. This is supported by the presence of methane in sediments below the basalt found during exploration in the vicinity of the Saddle Mountains (draft EA page 6-187). Deep sources of methane make exploratory drilling through the Grande Ronde, the unit in which waste emplacement is proposed, a possibility.

Section 6.3.1.8.3 of the EA might be revised to consider that methane gas has been found in the Grande Ronde formation and that it may originate from below-basalt sediments; and that there is a reasonable possibility for exploratory drilling through the repository host rock.

Not Added. Minor change in wording

BWIP
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/11/86 Contractor (BOM)

(A) Draft EA comment number. 6-54.
WM Branch.
Comment topic. Favorable Condition, Sec. 6.3.1.8.3., P 4, p. 6-139.

(B) Was the comment addressed in the Final EA? No.
Where?

(C) How was our Draft EA comment addressed?
1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

Not addressed.

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

(D) Was our comment addressed as we suggested?
If not, specify.

(E) Status.
1) Has the basis for our concern changed? No.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

See attachment.

6-54

Section 6.3.1.8.3, Favorable condition, page 6-139, paragraph 4

This section of the draft EA does not adequately consider available information indicating methane gas exists in the reference repository location. This section indicates that any hydrocarbons generated under the Pasco Basin should have migrated away from the synclinal area to the anticlinal ridges. However, this is not consistent with the existence of methane gas in groundwater in the Pasco Basin, Cold Creek syncline, reference repository location (Hydrochemical Data Base, Jan., 1984). There are no sedimentary interbeds in the Grande Ronde basalt which is the formation the reference repository is in. Methane is not indigenous to basalt (page 6-187). The gas may have migrated from sediments below the basalt. This section indicates that the sedimentary sequence beneath the basalt is the hydrocarbon exploration target. Potential deep exploratory targets for gas below the Cold Creek Syncline impact human intrusion assessments for the Hanford site.

It is suggested that this section of the EA should be revised to recognize and provide an interpretation for the existence of methane gas in the Cohassett flow ("preferred candidate horizon").

BWIP
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/10/86 Contractor (BOM)

(A) Draft EA comment number. 6-55.
WM Branch.
Comment topic. Favorable Condition, Sec. 6.3.1.8.3., P 4, p. 6-139.

(B) Was the comment addressed in the Final EA? No.
Where?

Not addressed.

(C) How was our Draft EA comment addressed?
1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

Not addressed.

(D) Was our comment addressed as we suggested?
If not, specify.

(E) Status.
1) Has the basis for our concern changed? No.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

See attachment.

6-55

Section 6.3.1.8.3, Favorable condition, page 6-139, paragraph 4

This section of the draft EA indicates that the anticlinal ridges are hydrocarbon exploration targets and the nearest anticline to the RRL is Yakima Ridge listed as being 2 miles west. Actually, Yakima Ridge has a buried subsurface extension which is one half mile southeast of the reference repository location, (RHO-BWI-ST-14). According to the draft EA, overall groundwater flow is believed to be to the southeast (draft EA, page 3-80). A potential hydrocarbon target structure this close to the reference repository location, along the overall groundwater flow path, is significant to human intrusion assessments. It is suggested that this section of the EA be revised to recognize the proximity of the buried Yakima Ridge anticlinal structure.

pp.

BWIP
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/10/86 Contractor (BOM)

(A) Draft EA comment number. 6-56.
WM Branch.
Comment topic. Potentially Adverse Condition, Sec. 6.3.1.8.5., p. 6-141 and 6-142.

(B) Was the comment addressed in the Final EA? Yes.
Where? Sec. 6.3.1.8.5., p. 6-177.

(C) How was our Draft EA comment addressed?

1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

(D) Was our comment addressed as we suggested? Yes.
If not, specify.

(E) Status.
1) Has the basis for our concern changed? Yes.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

See attachment.

6-56

Section 6.3.1.8.5, Potentially adverse condition, page 6-141 and 6-142

Available information is not adequately considered here. A potentially adverse condition exists at a site if naturally occurring materials are present whether or not actually identified in such form that economic extraction is potentially feasible during the forseeable future. The draft EA finds that this potentially adverse condition does not exist for Hanford. Unmentioned in this section is methane that occurs in the reference repository location at repository depths, from an unidentified source.

The lack of analysis regarding methane in the reference repository location seriously impedes assessment of this condition. It is suggested that this section of the EA be revised to include information indicating the presence of methane in the reference repository location. After this information is included, the finding should be reconsidered.

BWIP
DRAFT EA/FINAL EA COMMENT FORM

NRC Compiler _____ Date 6/11/86 Contractor (BOM)

(A) Draft EA comment number. 6-58.
WM Branch.
Comment topic. Disqualifying Condition, Sec. 6.3.1.8.11., P 5, p. 6-145.

(B) Was the comment addressed in the Final EA?
Where?

(C) How was our Draft EA comment addressed?
1) New information?
2) New analysis?
3) Rewrite, with rationale, of previous information?
4) Other (Specify)

1) Modified conclusions?
2) Same conclusions?
3) Other? (Specify)

(D) Was our comment addressed as we suggested?
If not, specify.

(E) Status.
1) Has the basis for our concern changed? No.
2) Resolution deferred by DOE to SCP? No.
3) Has a new NRC concern developed? No.
4) Other (Specify)

See attachment.

BOM Reviewer's Comment

The final EA contains no data pertaining to mineral resources in Chapters 3, 4, or 5. This information should be included.

Further investigations should focus on sub-basalt lithology, stratigraphy, and geologic structure.

The EA contains no discussion of methane gas that has been found in the Grande Ronde Formation. The possibility for exploratory drilling through the repository host rock in search of methane at or near the proposed HLW site exists. The same situation exists for the Cohassett flow which is the "preferred candidate horizon."

The location of the buried Yakima Ridge anticlinal structure deserves attention.

Consistency

Consistency cannot be discussed until minerals information (which is inadequately evaluated in Chapter 6) is included in at least Chapter 3 (if not 4 and 5 as well).

6-58

Section 6.3.1.8.11, Disqualifying condition, page 6-145, paragraph 5

This part of the draft EA makes a statement of questionable accuracy. It states that natural gas is not present within the vicinity of the RRL. Methane (CH_4) is a natural gas that occurs in the RRL at repository depths (Hydrochemistry Data Base, Jan. 1984). The possibility for exploration because methane gas exists within the vicinity of the reference repository location should be documented in this section because it may affect the assessment. It is suggested that the statement referenced above be reconsidered.