AUG 8 1991

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SUBJECT: DRAFT REPORT ON GUIDELINES AND ACCEPTANCE CRITERIA FOR REVIEWING SPECIFIC ASPECTS OF GROUNDWATER PROTECTION PLANS
FIN L1411

Dear Mr. Thorne:

Enclosed are review comments on the draft report. Most of the comments relate to suggestions for expanding your discussion to provide more specific guidelines.

Even though there are a large number of comments, I do not anticipate it taking as much effort as what went into the development of the original document since most of the background work should be out of the way.

If you have any questions, please give me a call at FTS 492-0568. Also, please acknowledge receipt of these comments.

Sincerely,

ORIGINAL SIGNED BY

Mark Thaggard, Hydrogeologist
Low-Level Waste Management Branch
Division of Low-Level Waste Management
and Decommissioning, NMSS

Enclosure: As stated

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SUBJECT ABSTRACT: DRAFT REPORT ON GUIDELINES/ACCEPTANCE CRITERIA FOR REVIEW SPECIFIC ASPECTS OF GW PROTECT PLANS - FIN L1411

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Review Comments

Draft
GUIDELINES AND ACCEPTANCE CRITERIA FOR REVIEWING
GROUNDWATER PROTECTION PLANS FOR URANIUM MILL TAILINGS SITES

Pacific Northwest Laboratory
June 13, 1991

GENERAL COMMENTS:

1) The report needs to be in NUREG format.

2) No mention is made within the report of 10 CFR Part 40, Appendix A and the Title II program. The SOW calls for the development of guidelines and acceptance criteria applicable for both Title I and Title II sites.

3) Overall the report needs more detail in the general discussion sections; such as rationale for the need of the document and the intended use of the document.

4) The criteria presented in the document should be affirmative statements and not phrases and queries. If needed, simple queries can be listed within the body of the accompanying explanations to assist the reader in meeting the criteria objectives.

5) Sentence structure and grammar should be carefully proofed. There are a number of run-on sentences and inexact word use (several are pointed out in the specific comment section).

6) When possible, references should be given for specific standard methods or 'industry standard' practices when discussing laboratory tests, field tests, or well installations as relating to acceptance of DOE-provided demonstrations.

7) The criteria listed in the Appendix should be grouped according to the topics presented in the report, with a heading of each topic above each grouping.

SPECIFIC COMMENTS:

1) **1. INTRODUCTION**, Page 1, Paragraph 1, Second sentence: The word "control" should come before the word "cleanup".

2) **1. INTRODUCTION**: Additional information needs to be included describing the intended use of the document. The reader needs some direction on how 'firm' the criteria are and how much latitude in judgement should be exercised when

making a determination of criteria acceptance.

3) **2. DISPOSAL AND CONTROL OF RESIDUAL RADIOACTIVE MATERIAL**, Page 2, Paragraph 1:

   A. Some additional information should be included to introduce some of the general design objectives of DOE closures; such as long term closure, low maintenance, isolation from intrusion, and minimized impact to human health and the environment. It should also be pointed out that each DOE closure design is site-specific and based on meeting a site-specific performance assessment.

   B. The word 'facility' should be added after disposal.

4) **2.1 REGULATORY REQUIREMENTS FOR DISPOSAL**, Paragraph 1 and 2:

   A. The discussion on the history of the groundwater protection standards would probably be better suited as part of the introduction.

   B. No mention is made of 10 CFR Part 40, Appendix A for Title II sites.

5) **2.1 REGULATORY REQUIREMENTS FOR DISPOSAL**, Paragraph 2: The last sentence should be eliminated since the additional requirements are not specifically identified. Further, DOE is under no obligation to implement these additional requirements.

6) **2.1 REGULATORY REQUIREMENTS FOR DISPOSAL**, Paragraph 3:

   A. The main administrative differences between regular RCRA and how it is applied by 40 CFR 192 should be discussed.

   B. The rule citation in the first sentence should be changed to read as follows: 40 CFR Part 192.02 (a)-(c).

7) **2.1 REGULATORY REQUIREMENTS FOR DISPOSAL**, Paragraph 4: The citation NRC (1988) is not listed as a reference. It is possible that this reference should be NRC (1989).

8) **2.1 REGULATORY REQUIREMENTS FOR DISPOSAL**, Paragraph 5:

   A. Items in this paragraph need to be expanded and presented in a separate paragraph for each item. As presented, the items are almost redundant, since they were introduced in the fourth paragraph. Since the

RCRA provisions are introduced in the fourth paragraph, a discussion of each provision should follow in separate paragraphs.

B. Careful consideration needs to be given to the use of the concept of "compliance period". There is no specified compliance period (under the 40 CFR 264 definition) for the Title I program. While it is true that the facility must be designed to control for the release of contaminants for 200 - 1000 years, the concept of compliance period is not used in 40 CFR 192. The compliance period by definition is the period over which monitoring must be done, which would be the post-disposal period for Title I sites.

9) **2.2 LEACHING AND LONG-TERM RELEASES OF HAZARDOUS AND RADIOACTIVE CONSTITUENTS FROM CONTAMINATED MATERIALS**, Paragraph 2:

A. The discussion is limited to only the engineered structures of the disposal unit with no mention or criteria for the natural setting and natural conditions, such as proper characterization of the site as it relates to the operation of the facility. Further, no guidance is given on reviewing the analyses of the natural setting as they relate to long-term releases of hazardous constituents.

B. Is the use of the average seepage conservative? Please keep in mind that DOE typically estimates the seepage rate to be equal to the design vertical K_{sat} of the barrier; this is considered a maximum seepage rate and is usually accepted by NRC staff as long as it can be demonstrated that the barrier can be built to achieve the design K_{sat}. It would appear that you are recommending something less stringent than what is currently used and accepted.

C. The last sentence in the paragraph, is someone ambiguous. Are you saying that the assumption currently made by DOE are conservative or the assumptions that DOE makes need to be conservative?

10) **2.2.1 LONG-TERM SEEPAGE RATE**, Page 4, Criterion 1: You need to expand upon your statement that "fingering" should be considered in the performance assessment of the cover. In particular, can this be realistically incorporated into the analysis? If so, how? Further, is there a way around this issue?

11) **2.2.1 LONG-TERM SEEPAGE RATE**, Page 4, Criterion 2:

A. The second to the last sentence of the first paragraph (under this section), where you talk about the need for more samples, is somewhat vague. In particular, the terms "large variation" and "uniform" could be better defined.

B. Since laboratory samples are commonly compacted, something should be said about the effects of laboratory compaction. For example, should lab compaction be considered as an adequate representation of field compaction? Further, what is considered more conservative, compaction wet or dry of optimum? Also, what about the effects of excessive gradients used in lab analyses?

C. References to accepted standard methods should be clarified to include specifically, which methods or what type of methods (ASTM, EPA, etc.) or equivalent are acceptable. If a standard method is not available, then some reference should be given to some of the methods that are currently being used. Further, specific recommendations should be made on which of these standard methods are considered most appropriate for the materials commonly associated with UMTRAP barriers.

D. Some discussion is needed on what should be considered conservative, a hydraulic conductivity based on the wetting or one based on the drying curve.

12) **2.2.1 LONG-TERM SEEPAGE RATE**, Page 5, Criterion 3:

A. In the first sentence, as-built properties need to be defined. Are you referring to measuring the hydraulic conductivity or properties such as moisture content and bulk density? If you are referring to moisture content and bulk density, be aware that recent reports, in the literature, indicates these parameters may not provide a good as-built determination of the permeability of a cover.

B. In the second to the last sentence, the term "large amount of uncertainty" is somewhat vague for a guidance document. In addition, it should be pointed out that even a fair amount of certainty in the laboratory analyses may not represent a large amount of certainty in the performance of the cover.

C. Keep in mind, in your reference to the moisture monitoring at the Shiprock site, that the NRC has not

fully accepted these results.

13) **2.2.1 LONG-TERM SEEPAGE RATE**, Page 5, Criterion 4: With regards to your comment that potential mechanisms for increasing permeability should be considered, it should be stated that these should be considered in the design of the cover; i.e., the potential for cracking and biointrusion should be incorporated into the cover design. It is not clear that this is what you are saying.

14) **2.2.2 EXPECTED CONCENTRATION OF CONSTITUENTS IN SEEPAGE**, Page 5: Specific references to which methods for batch or column leach tests should be made.

15) **2.2.2 EXPECTED CONCENTRATION OF CONSTITUENTS IN SEEPAGE**, Criterion 5:

A. Milling process should be eliminated from the list of factors which control the presence of constituents in the residual radioactive materials. Since you list constituents added during milling , a factor, this would account for the differences associated with the different milling processes. The mechanical process is not expected to effect the presence of constituents.

B. You should provide a reference for the statement that radionuclides commonly found in high concentrations in tailings from acid leach mills are ^{226}Ra,...

C. The discussion about organic (hazardous) constituents in the tailings ".... from coincidental operations at the site" could include RCRA mixed wastes, which are not part of the Title I closures. Some clarification is needed concerning source generation of hazardous wastes; such as: If generated as part of the milling process... OK, if generated outside of the milling process ..... additional determination may be required.

D. In your statement that organic compounds are commonly used in the extraction process, it would be helpful if you provided some examples of the commonly used organic compounds (if known). Further, your reference source should be identified.

E. Selenium and arsenic are referred to as nonmetals. Elsewhere in the document they are referred to as metals. The document should be checked for consistency regarding this reference.

F. "pH" is improperly capitalized in the first sentence of the last paragraph in this section.

16) **2.2.2 EXPECTED CONCENTRATION OF CONSTITUENTS IN SEEPAGE**, Page 6, Criterion 6:

A. The first sentence after "Pore water sampling-" is a run-on sentence and should be reworked. Also, the idea expressed in this sentence may not hold true for organic constituents.

B. You should expand upon your statement that geochemical conditions in laboratory leach tests should simulate expected conditions within the disposal unit. Examples of specific geochemical parameters would be helpful.

C. The discussion should be expanded to discuss which method is preferable - batch or column tests, and why.

17) **2.3.1 PHYSICAL ATTENUATION PROCESSES:**

A. You need to check the half-life indicated for ^{210}Pb (i.e., 138 days), it should be 21 years. ^{210}Po has a half-life of 138 days.

B. The first sentence of the second paragraph in this section should be broken into two sentences. As it now reads, it is not clear that only hydrodynamic dispersion (and not diffusion also) results from the velocity distribution.

C. The terms dispersion, dispersivity, and mixing are used interchangeably in this discussion. Although similar, these terms mean slightly different things. All of these generally figure into dilution of plume concentration, which is not really an attenuation process. Perhaps, some distinction should be made between physical attenuation and reduction of constituent concentration.

18) **2.3.1 PHYSICAL ATTENUATION PROCESSES**, Criterion 8:

A. A space is needed after the first paragraph, i.e., after "....compliance should be considered."

B. Some discussion should be made as to when diffusion dominated flow should be assumed.

19) **2.3.1 PHYSICAL ATTENUATION PROCESS**, Criterion 9: Do you have any specific guidelines on when dispersion should be considered important?

20) **2.4.2 BACKGROUND MONITORING**, Page 13, Criterion 14: This discussion should be expanded to reference some examples of acceptable statistical methods. Also, the eventuality of

non-normal and non-lognormal data should be discussed. In addition, any recommended procedures for handling outliers should be discussed.

21) **2.4.2 COMPLIANCE MONITORING**, Page 13:

A. This should be 2.4.3 Compliance Monitoring.

B. The word "facility" should be placed after disposal in this section.

C. Under this section something should be said about proper sampling.

22) **2.4.2 COMPLIANCE MONITORING**, Page 14, Criterion 17: This discussion should be expanded to include the following:

* Monitoring wells being located as close as possible to the pile,

* Wells are fully screened in the monitored horizon, and

* Monitoring well spacing is adequate to intercept potential plumes.

23) **2.4.2 COMPLIANCE MONITORING**, Page 14, Criterion 18: This discussion should be expanded to include proper borehole seals and proper surface completions. It would also be helpful to reference some well completion standards (e.g. NWWA, ASTM).

24) **2.5.1 LINERS**, Page 15, Criterion 19: Discussions of residual moisture in the tailings should be expanded to include any water added to the system for dust control during closure.

25) **2.5.1 LINERS**, Page 15, Criterion 21: This discussion should be expanded to include other factors that affect liner durability, such as: chemical degradation by leachate, and physical degradation by settlement or seismic events.

26) **2.5.2 OTHER PHYSICAL BARRIERS**, Page 16: The last sentence should be changed from ".....these types of barriers are not usually not useful for...." to ".....these types of barriers are not usually useful for.....".

27) **2.5.3 GEOCHEMICAL BARRIERS**, Page 16: This discussion should be expanded to mention the potential interaction of a geochemical barrier on other design elements of a closure. For instance, if a hydrated lime barrier is used in conjunction with a compacted clay liner, is there any interaction between these two design components that would

reduce the effectiveness of the overall performance?

28) **3.1 REGULATORY STANDARD FOR CLEANUP**, Page 17:

A. Supplemental standards should not only be addressed for cleanup, but also for disposal.

B. The list of circumstances (in the second paragraph) under which supplemental standards could be applied is incomplete.

29) **GROUNDWATER CLEANUP PROGRAMS**, Page 18:

A. The discussion need to include the statement that cleanup cannot be deferred unless DOE demonstrate that public health and safety will not be endangered.

B. A new criterion should be included to address verification and confirmation of successful treatment and cleanup of contaminated groundwater.

30) **GROUNDWATER CLEANUP PROGRAMS**, Page 18, Criterion 24: The last sentence needs to be clarified. Are you saying that it need to be specified where these materials are going to be disposed?

31) **GROUNDWATER CLEANUP PROGRAMS**, Page 20, Criterion 29: The discussion should be expanded to include information on determining whether or not sufficient mixing is possible or can be accomplished successfully.

32) **GROUNDWATER CLEANUP PROGRAMS**, Page 21, Criterion 33: The discussion needs to be expanded to indicate the need for a good understanding of the aquifer geometry and the groundwater flow rate when flushing is relied upon.