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NUCLEAR WASTE CONSULTANTS INC.

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Distribution:
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June 16, 1986

009/Task 5.02
RS-NMS-85-009
Communication No. 66

U.S. Nuclear Regulatory Commission
Division of Waste Management
Geotechnical Branch
MS 623-SS
Washington, DC 20555

Attention: **Mr. Jeff Pohle, Project Officer**
Technical Assistance in Hydrogeology - Project B (RS-NMS-85-009)

Re: **Review of EPA Standards for Individual and Groundwater Protection**

Dear Mr. Pohle:

Please find attached letters from Water, Waste and Land, Inc. (WWL), Terra Therma, Inc. (TTI), and Daniel B. Stephens and Associates (DBS) to Nuclear Waste Consultants, Inc. (NWC) evaluating the EPA Standards for individual (40 CFR 191.15) and groundwater (40 CFR 191.16) protection at each of the three sites currently being considered as repositories for high-level waste. NWC directed the site teams to perform this evaluation in order to identify "significant" and "special" sources of groundwater at each of the three sites. The two categories of groundwater are defined in Section 191.15 and 191.16:

1. Significant Source of Ground Water

(1) An aquifer that:

- a. is saturated with water having less than 10,000 milligrams per liter of total dissolved solids;
- b. is within 2500 feet of the land surface;
- c. has a transmissivity of at least 200 gallons per day per foot, provided that any formation or part of a formation included within the source of groundwater has a hydraulic conductivity greater than 2 gallons per day per square foot;
- d. is capable of continuously yielding at least 10,000 gallons per day to a pumped or flowing well for a period of at least a year.

or, (2) An aquifer that provides the primary source of water for a community water system as of the effective date of this Subpart.

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2. Special Source of Ground Water

Those Class 1 ground waters identified in accordance with the Agency's Ground Water Protection Strategy published in August, 1984 that: (1) Are within the controlled area encompassing a disposal system or are less than five kilometers beyond the controlled area; (2) Are supplying drinking water for thousands of persons as of the date the Department chooses a location within the area for detailed characterization as a potential site for a disposal system (e.g., in accordance with Section 112(b)(1)(B) of the NWPA); and (3) Are irreplaceable in that no reasonable alternative source of drinking water is available to that population.

Because of the potential significance of these specific categories of groundwater to defining performance measures for HLW repositories, the matter was discussed at some length during the project management meeting in Silver Spring on April 14-15, 1986, at which time I notified you that I had already tasked the subcontractors with providing the necessary analysis.

The results of the site teams' evaluations of the relevant groundwater categories are summarized below:

<u>SITE</u>	<u>SIGNIFICANT SOURCE</u>	<u>SPECIAL SOURCE</u>
NNWSI	Topapah Springs	None
BWIP	Several	None
DEAF SMITH	Dockum/Ogallala	None

In each case, the site teams have concluded that because there are no sources of groundwater within 5 km of the controlled area that are supplying thousands of persons with drinking water, there are no "special" sources of groundwater. (At this time, the State of Texas is studying the need and appropriateness of applying for a Sole-Source Aquifer designation for the Ogallala Aquifer in the area of Deaf Smith County (S. Zimmerman, State of Texas, personal communication to Mark Logsdon (NWC), June 13, 1986). If this designation were granted then the Ogallala would be subject to groundwater protection; however, at this time Texas's plans have not proceeded far enough to require a consideration of this case.) Based on these analyses, NWC considers that, for the three sites currently being considered, it will be necessary to assess compliance of the three potential sites with respect to the Individual Protection Requirements of 40 CFR 191.15, but that it will not be necessary to evaluate compliance with the Groundwater Protection Requirement of 40 CFR 191.16.

Because the Individual Protection Requirement is stated in terms of a dose limitation, the analysis of anticipated performance of a repository with respect to this standard requires an approach to assessing the "undisturbed" performance of the repository during the first 1,000 years, a flow and transport analysis, and a dosimetry analysis at some appropriate point of compliance. The last of these three analyses can probably be performed using standard methods and the assumption that an individual ingests 2 liters/day drinking water from a well that is located exactly at the point of compliance. The flow and transport analysis would have to consider a wide range of physical conditions, representative of the thermal field throughout the first 1,000 years, and source terms, representative of the changing radionuclide inventories. Clearly, this would be a formidable analytical problem unless one can make a demonstration that the release rate for "undisturbed" performance in the first 1,000 years meets some sort of de minimus test that makes the resulting analysis trivial (because the dose limits could never reasonably be reached).

The de minimus approach has appeal (at least to anyone who would have to perform - and defend - the computations that would appear to be needed otherwise), but the current version of 10 CFR Part 60 and 40 CFR Part 191 do not provide much guidance on how it could be applied. In particular, these rules do not, to our knowledge, specify de minimus levels of HLW. Section 60.113(a)(1)(i), addressing the Engineered Barrier System (EBS), specifies that "Containment of HLW will be substantially complete during the period when radiation and thermal conditions in the engineered barrier system are dominated by fission product decay;...." Section 60.113(a)(1)(ii)(B), addressing the controlled release rate after the containment period, specifies that "The release rate of any radionuclide from the engineered barrier system following the containment period shall not exceed one part in 100,000 per year of the inventory of that radionuclide calculated to be present at 1,000 years following permanent closure...." Based on these two sections, it would appear that the Commission considered that releases from the EBS during at least the first 300 years (and perhaps as much as 1,000 years) would be substantially below 10^{-5} per year, though it seems likely that one would have to consider the "instantaneous" inventory for each radionuclide as the reference inventory, in order to allow for consideration of doses that could arise from the fission products, should they be released.

If this all seems highly confusing, it seems so to us as well. We consider that when Part 60 was being written, the Commission and its staff did not anticipate the individual protection requirement, and therefore were not concerned to define what is meant by "substantially complete" containment. Yet, in the current regulatory setting, to leave that undefined would seem likely to lead to a computational (and perhaps regulatory) morass when it comes time to reach findings on compliance with 40 CFR 191.15. If this matter

has already been addressed by others, such as Sandia National Laboratories, we would appreciate any documentation that you can provide.

If this matter has not yet been addressed, NWC considers that the Staff could establish a method for defining a de minimus level, based on back-calculating the release limits (in terms of specific activity) that would be needed to reach the dose limits that are presented in 191.15, using some suitable model for the flow and transport system and for health effects at a given site. Since this would be a matter of site-specific licensing compliance, rather than the setting of "generally applicable standards", it appears to us that this could appropriately be done by the NRC, in consultation with (but not necessarily depending on the concurrence of) the EPA. We consider that this is an appropriate topic for a Task 5 Technical Report, and hereby request that the NRC Project Officer direct NWC to develop a letter report addressing a technique for establishing de minimus release levels for application to assessments of 40 CFR 191.15. We look forward to an early, written response on this proposal.

If you have any questions about this matter, please contact me immediately.

Respectfully submitted,
NUCLEAR WASTE CONSULTANTS, INC.



Mark J. Logsdon, Project Manager

Att: Letters from WWL, TTI, DBS

cc: L. Davis, WWL
M. Galloway, TTI
R. Knowlton, DBS