NUCLEAR WASTE CONSULTANTS INC.
8341 So. Sangre de Cristo Rd., Suite 6
Littleton, Colorado 80127
(303) 973-7495

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Communication No. 22

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: **NNWSI Issues Hierarchy**

Dear Mr. Pohle:

Please find attached the Nuclear Waste Consultants document review of An Issues Hierarchy Approach to Site Characterization and Regulatory Compliance. This document review was prepared by Mark Logsdon (Nuclear Waste Consultants); Mike Galloway and Fred Marinelli (Terra Therma); Lyle Davis and David McWhorter (Water, Waste and Land); and Dan Stephens (D.B. Stephens & Assoc.) under Subtask N.1 of Contract No. RS-NMS-85-009, per the instructions of the NRC Project Officer in his letter, dated December 2, 1985. The document review has received a technical and management review by Adrian Brown, Project Technical Director and NWC President. Please note that we have chosen to use a slightly modified version of the WMGT document review form for this purpose.

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

Respectfully submitted,
NUCLEAR WASTE CONSULTANTS, INC.

Mark J. Logsdon

Mark J. Logsdon, Project Manager

Att: Document Review - NNWSI Issues Hierarchy View-Graphs

cc: US NRC - Director, NMSS (ATTN PSB)
DWM (ATTN Division Director)
Barry Bromberg, Contract Administrator
WMGT (ATTN Branch Chief)

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

1.0 INTRODUCTION

TITLE: AN ISSUES HIERARCHY APPROACH TO SITE CHARACTERIZATION AND REGULATORY COMPLIANCE

AUTHOR: NNWSI PROJECT STAFF

DATE: MAY 17, 1985

REVIEWERS: Mark Logsdon (Nuclear Waste Consultants); Michael Galloway and Fred Marinelli (Terra Therma); Lyle Davis and David McWhorter (Water, Waste and Land); Dan Stephens (D.B. Stephens & Assoc.)

DATE: February 5, 1986

PURPOSE: General review of proposed Issues Hierarchy approach, particularly with respect to consistency with NRC staff's issues.

SCOPE: General review of concepts presented in document for technical completeness and for consistency with NRC licensing requirements. Evaluation of the extent to which the outlined approach is likely to produce information needed for the preparation of NRC license documents and evaluations supporting them.

KEYWORDS: Regulatory requirements, Mission Plan, Siting Guidelines, Part 60, issues, issue-oriented site technical positions; data needs, objectives, site characterization, hydrology, test program.

DATE APPROVED: Mark J. Logsdon - NWC Project Manager 2/5/86

2.0 SUMMARY OF DOCUMENT AND GENERAL COMMENTS

2.1 SUMMARY OF DOCUMENT

The subject document is a copy of a set of view-graphs and associated hand-out material presented by staff of NNWSI to the DOE/OCRWM Office of Geologic Repositories, presented on May 17, 1985. The presentation describes an approach to defining the project work that will be required to meet regulatory and legal requirements for the siting, construction, operation, closure and decommissioning of a deep geologic repository for high-level nuclear waste (HLW). The approach uses a hierarchical ensemble of "key issues", "issues", information needs, and data/parameters derived from a logical analysis of the DOE Mission Plan and the Siting Guidelines (10 CFR 960). It is implicit in the approach that the Mission Plan and the Siting Guidelines accurately and consistently reflect the Nuclear Waste Policy Act and 10 CFR 60.

Based on the material outlined in the view-graphs, a list of "issues" and "information needs" is appended.

2.2 GENERAL COMMENTS

Because the reviewers did not attend the NNWSI oral presentation of May 17, 1985, this review is based solely on the outline, written material supplied and on our review of the requirements of the relevant laws and regulations. Nuclear Waste Consultants and its subcontractors were asked to concentrate particularly on the technical completeness of the document and to provide

comment to the NRC staff on the appropriateness of NRC and DOE adopting this material as a common set of issues to be addressed throughout the licensing process.

Fundamental to our review position in preparing these comments is the assumption that the overriding matter of concern for the NRC staff will be the need to reach findings on the compliance of the DOE license application with the requirements of 10 CFR Part 60. In particular, NWC considers that the structure of Part 60 indicates that evaluations against the performance objectives are more important to a determination of regulatory compliance than are disjointed data compiled to address the favorable and potentially adverse conditions, and that performance of the repository system against the EPA Standard (40 CFR 191) is paramount. Based on these concerns, Nuclear Waste Consultants has two major concerns with this document and the approach that it describes.

2.2.1 Issues Versus Data Needs Assessments

The reviewers consider that the technical matters addressed in these "issues" and "information needs" are so broad and general that they cover the scope of essentially all matters relating to hydrology and related earth sciences and engineering. While this approach may be appropriate in a management document (which this is) to assure that all facets of hydrogeology are considered, it does little to assure that the details of specific hydrogeologic concerns that

must be resolved to support licensing documents are known and will be collected and appropriately analyzed.

The outline begins promisingly: page 7 of the view-graph handout says that,

> "...A detailed discussion will be written explaining
>
> -- Why the need exists
>
> -- Technical basis for addressing the need
>
> - data/parameters to be collected
>
> - logic for how the information need will be satisfied ("necessary and sufficient" test for data/parameters)
>
> - How the tests, analyses or studies will be conducted (references to test plans)"

However, beyond this statement of intent, the document and the approach that it represents do little to identify, or even to present a logic which would allow one to establish, the "necessary and sufficient" data needed to evaluate the performance of a deep geologic repository against the performance objectives of 10 CFR Part 60 (including 40 CFR 191). All "issues" and "information needs" have, or at least appear to have, equal weight. The result is that one is left with a "laundry list" of technical topics that could just as easily have been drawn from the index of Freeze and Cherry as derived from a rigorous analysis of how to determine repository performance.

Without a discussion of how one goes the next step to determining what and how much data need to be collected to address specific matters of NRC regulatory concern, the document cannot be said to be successful, either for DOE or for the NRC staff. For an example of how an "issues"-related document can lead to an unsatisfactory (in our opinion) technical planning document, please refer to the NWC/TTI document review of the BWIP Exploratory Shaft Test Plan (SD-BWI-TP-007; review dated January 31, 1986; NWC Communication No. 21 - on file with the Division of Waste Management).

With respect to the NNWSI document, consider the following cases as examples. "Present locations and rates of surface erosion" (1.5.1) is presented as an information need at the same level as "Flow paths, fluxes, and velocities of water and gases in the unsaturated zone" (1.1.6). There is no documentation in the presentation of how one would know that either of these is an "information need", of what the relative importance to repository performance of either, of whether there is any data needed for the resolution of the first beyond what is currently available, of what the data needs for resolution of the second would be, etc. In short, the issues approach to designing a site characterization and licensing program which is described in the document - does not allow one to determine the kind of program that will likely lead to a successful license application. At its best, this approach provides a set of categories against which one can track that technical activities are being conducted; it provides no indication of importance of technical concerns nor of progress toward resolution of data needs. Thus, it is unlikely either to serve as a reliable guide to developing an effective and efficient

characterization program or as a management tool for evaluating the ongoing progress of the site characterization activities.

The simple fact of the matter is that a statement like "Hydrologic characteristics of the site" (1.1.3) is not very useful, either to DOE or to NRC, as a statement of "information needs": Which hydrologic characteristics are important to repository performance? At what level of detail? At what level of confidence? We already know that we need to know something about the hydrogeology of the site; no one needs a decision-theory tool to identify this level of concern at this stage of the national program. What is needed is a rigorous thought process that will move the program forward in a timely, goal-directed fashion. Fundamentally, both DOE and NRC need an analysis of data needs related to the performance objectives of Part 60 as the starting point for the NRC's independent analysis.

Need must be defined in terms of the following aspects:

a. Current absence of the information;

b. Ability to collect the information needed;

c. Ability of the information which is to be collected to allow needed improvement of predictive accuracy to be achieved.

If any of these elements are missing, then there is no point in developing a work plan to pursue the information. (Note that there may be data that is needed to reach a regulatory decision but which cannot be collected, perhaps

for technological reasons). The NWC statement of data needs does not mean that DOE is free to ignore matters that may concern performance of the repository system because it is hard or even impossible to collect data. On the contrary, if a finding of reasonable assurance that the public health and safety will be protected cannot be reached without that specific information, even by use of highly conservative assumptions or engineering methods, then a project decision point has been reached. There simply is no use in expending project resources on useless efforts to collect information. The corollary of that position is that every statement of information need must be accompanied by a plan for how that information will be assembled.)

The basic merit of the data needs assessment approach at this stage of the DOE and NRC programs is that it allows an evaluation of the completeness of data based on the impact that additional data would have on the precision of the knowledge of the performance of the system. The data needs assessments should be performed iteratively with data collection throughout the lifetime of the project, using increasingly sophisticated models only as the need for them arises.

2.2.2 Regulatory Basis of the NNWSI Issues

Even if the staff wishes to continue with the issues approach, Nuclear Waste Consultants considers this set of issues is an inappropriate set for the NRC staff to adopt. As stated on page 2 of the handout, "the issues hierarchy is explicitly tied to the Mission Plan and the Siting Guidelines." The approach

is aimed at fulfilling DOE's responsibilities, which include a number of matters that are outside the regulatory concern of the NRC staff.

Our concern is twofold. First, we consider that it will be sufficiently challenging for the NRC staff to develop and maintain a regulatory program that addresses the technical and procedural requirements of its own Rule without attempting to undertake reviews of extraneous aspects of another agency's obligations. The NRC has, appropriately, provided comment to the DOE on both the Mission Plan and the Siting Guidelines, but these are program documents for an agency with a different mission than that of the NRC. We consider that it is very important for the NRC to apply its resources - very limited in comparison with those of the DOE - toward preparing for its required regulatory reviews.

Second, we are concerned that if NRC were to adopt these issues in conjunction with DOE, then there would be a dimunition of the degree of independence of the NRC staff position in subsequent licensing assessments. This is particularly true if one accepts the implicit logic of the hierarchical approach that the characterization program flows from this list of "issues" and "information needs". If the assumption were true and its logic were followed, then NRC would be agreeing to the DOE site characterization program without even having seen it. We consider that the public would be best served if the NRC were to develop its own analysis of both what needs to be done and how well DOE is doing it, as discussed above in our comments on data needs assessments.

2.3 SPECIFIC COMMENTS

The reviewers find that the DOE "issues" and "information needs" and the NRC "issues" for hydrogeology (STP's 1.0) are very consistent. The only area in which the NRC states an "issue" that is not explicitly and implicitly covered by a DOE "issue" or "information need" appears to be the matter of developing three-dimensional distributions of hydrogeologically important parameters (though this my be addressed implicitly through other Information Needs).

The only one of the "issues" or "information needs" that we find to be flawed in statement is 1.2.6. Radionuclides are not retarded by dispersion, diffusion, or advection; these are transport mechanisms. We consider that this "information need" be restated to more properly address the physics of the phenomena.

In our review we have only found one potential ommission from the list of "information needs", and that may be more important in salt than in the other media. The various subissues or information needs under Issue 1.15 (Groundwater Travel Time) refer only to information needed to "calculate" travel time and "calculation models" to predict travel time. Travel time calculations in low-permeability materials with an high degree of heterogeneity and represented by only sparse data will be subject to great uncertainty. Direct dating of travel times along identified flow paths using natural radionuclides and other environmental tracers may avoid these difficulties. Furthermore, groundwater dating has the advantage of directly demonstrating long-term isolation of the aqueous phase from the biosphere,

rather than inferring it, as computational models do. At a minimum, we consider computational models should be tested against available hydrochemical data, including environmental tracers, as they would against any other appropriate set of hydrogeological data. Thus, we consider that direct measurements of travel times under pre-emplacement conditions using environmental tracer techniques deserves explicit mention along with "calculated models" referred to in 1.15.3.

3.0 RECOMMENDATIONS

Nuclear Waste Consultants recommends that the NRC staff not adopt the NNWSI issues hierarchy as the basis for a common set of "issues" for both NRC and DOE. Instead, we recommend that the NRC staff develop data needs assessments for each area of technical concern, all motivated by the need to evaluate performance of the repository system against the performance objectives of 10 CFR 60. Such an approach will assure the staff's independence in technical evaluations during the licensing process and, if properly formulated, will serve as a defensible basis for identifying the necessary and sufficient information to support a license application.

In other words, it is NWC's recommendation that the NRC develop a Generic Technical Position on data and investigation needs for licensing of an HLW repository. Such a document would describe the philosophy upon which the NRC's licensing data needs are based, and the approach that NRC uses in going from data needs to future investigation needs. We perceive that this would be a major program guidance document.