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~~JB-8/27/86 M2-SINGH~~

- 1 -

Dr. Madan Singh
 Engineers International
 98 E. Naperville Road
 Westmont, IL 60559-1595

RE: Request review of NNWSI Draft of Chapter 2 of the SCP.

Dear Dr. Singh:

I am requesting Engineers International to conduct a review of Chapter 2 (Draft) of the NNWSI Site Characterization Plan. The review will be conducted in accordance with the requirements set forth in Subtask 1 of Task Order 007 of NRC Contract No. 02-84-002. Due to the length of the document to be reviewed, sections 2.1 through 2.5 should be treated as one document for review and sections 2.6 through the references should be treated as a second document for review.

Since Task Order 007 is already in place and sufficient funds should be available for these reviews, this letter allows EI to proceed with the above stated reviews pending verbal authorization from the NRC Contract Officer.

I understand that the above stated document has been sent to EI under separate cover. In reviewing this document EI should compare the contents with DOE's Annotated Outline for Site Characterization Plans dated January 18, 1985. EI should also scan the reference list and identify new documents which were not referenced in the Draft EA or Final EA.

If you have an questions regarding the contents of this letter do not hesitate to call me at (301) 427-4544.

WM-RES
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Sincerely,

ORIGINAL SIGNED BY

John T. Buckley
 Engineering Branch
 Division of Waste Management, NMSS

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 (Return to WM, 623-SS)

Enclosure:
 Annotated outline for
 Chapter 2 of the SCP

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 PDR WMRES EECENGI
 D-1004 PDR

DFC : WMEG <u>JB</u>	: WMEG <u>DG</u>	: WMEG -	:	:	:	:
NAME : JBuckley	: DGupta	: MNataraja	:	:	:	:
DATE : 08/27/86	: 08/27/86	: 08/27/86	:	:	:	:

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Chapter 2 - GEOENGINEERING

In this chapter, the mechanical, thermal, and thermomechanical properties of the rock units and the expected mechanical boundary conditions that are the basis for the design of the geologic repository will be presented. Each discussion will include a brief summary of generic information from similar rock units and projects and site-specific information,* if available. The information will be in sufficient detail to (1) permit an understanding of the geomechanical basis of the proposed design of a repository appropriate to the site (Chapter 6) and (2) support the discussion of design issues in Part B. The discussions will include values or ranges of values for the design parameters used in the design and will provide the rationale for selecting these preliminary values.

2.0 INTRODUCTION

This section will introduce the site Geoengineering to indicate the role in the site characterization program of the material covered in the chapter. This section will include in a brief introductory fashion:

- Summary remarks about how the presently available information has been obtained and plans for obtaining additional information
- Summary remarks about how the information will be used
- Discussions about conceptual models that are based upon or are supported by the information contained in the chapter
- Discussions about the quality of present data and the sophistication of models which will use the data.

2.1 MECHANICAL PROPERTIES OF ROCK UNITS - INTACT ROCK

The scope of the section, background, equipment and procedures, limitations and uncertainties in data, and definitions (where needed) will be stated.

2.1.1 Mechanical Properties of Other Rocks

Mechanical properties of rocks from locations other than the site will be presented, as appropriate.

*Site-specific information means information gained from tests done in, or samples taken from, limited borings, surface outcrops, near-surface test facilities, pre-existing tunnels or mines, etc., near the site proposed for characterization. It does not imply that a shaft has been sunk.

2.1.2 Mechanical Properties of Rocks at the Site

This section will present the mechanical properties as determined by laboratory tests and samples of the potential host rock and of other rock units important for the design of a repository appropriate to the site. Data on elastic and inelastic behavior, compressive and tensile strength, and the effects of heating and fluid pressure are presented. Geologic borehole logs, geologic cross sections, or photographs accumulated during preliminary site exploration activities will be provided, as appropriate, to show where the tests were conducted or samples taken. Anisotropic properties will be addressed or isotropic approximations justified.

2.2 MECHANICAL PROPERTIES OF ROCK UNITS - DISCONTINUITIES

The scope of the section, background, equipment and procedures, limitations and uncertainties in data, and definitions (where needed) will be stated.

2.2.1 Mechanical Properties of Discontinuities in Other Rocks

Mechanical properties of discontinuities in rocks from locations other than the site will be presented, as appropriate.

2.2.2 Mechanical Properties of Discontinuities in Rocks at the Site

The mechanical properties and physical characteristics of discontinuities (fractures, joints, bedding planes, inclusions, voids) present in the rock units will be described. Site-specific data as well as available generic data from similar rock units and environments will be provided. The discussion will include the coefficient of friction, the compressibility of fractures and filling materials, and the effect of heating and changes of pore pressure on the mechanical properties of the joints, fractures, bedding planes, and other discontinuities.

2.3 MECHANICAL PROPERTIES OF ROCK UNITS - LARGE SCALE

The scope of the section, background, equipment and procedures, limitations and uncertainties in data, and definitions (where needed).

2.3.1 Mechanical Properties of Other Rocks

Strength, deformability, and creep data (where appropriate) for rocks from locations other than the site will be presented, as appropriate.

2.3.2 Mechanical Properties of the Rocks at the Site

The results of any large-scale laboratory or field test, such as plate-bearing test, block test, chamber test, flat jack test, Goodman jack test, or convergence test will be presented. Large-scale here means tests of sufficient size to take into account the discontinuities, such as fractures, joints, and inhomogeneities of the media. Non-standard tests will be discussed in detail including procedures, equipment, instrumentation, data reduction, and uncertainties.

2.3.3 Relationship Between Intact Rock, Discontinuities, and Large-Scale Rock Properties

The relationship between the results of the laboratory tests and the results of the large-scale tests will be discussed. Site-specific data will be provided as well as available generic data for similar rock units and environments. Any rock mass classification schemes used to predict rock mass properties based on intact rock and discontinuity properties will be described, as will any analytical models (deterministic or probabilistic) used to evaluate rock mass properties.

2.4 THERMAL AND THERMOMECHANICAL PROPERTIES - INTACT ROCK

The scope of the section, background, equipment and procedures, limitations and uncertainties in data, and definitions (where needed) will be presented.

2.4.1 Thermal and Thermomechanical Properties of Other Rocks

The results of tests on intact rock from locations other than the site will be presented, as appropriate. Properties include thermal conductivity, heat capacity, and coefficient of thermal expansion.

2.4.2 Thermal and Thermomechanical Properties of Rock at the Site

The results of laboratory studies of the thermal properties of the rock units at the site, including thermal conductivity, heat capacity, and the coefficient of thermal expansion, will be presented.

2.5 THERMAL AND THERMOMECHANICAL PROPERTIES - LARGE SCALE

The scope of the section, background, equipment and procedures, limitations and uncertainties in data, and definitions (where needed) will be presented.

2.5.1 Thermal and Thermomechanical Properties of Other Rocks

The results of large scale testing of rock at locations other than the site will be presented, as appropriate. Properties include thermal conductivity, heat capacity, and coefficient of thermal expansion.

2.5.2 Thermal and Thermomechanical Properties of Rock at the Site

Results of any field studies and in-situ studies of the thermal and thermomechanical properties of the rock units will be presented. Nonstandard tests that have been conducted to obtain such results will be discussed in detail, including procedures, equipment, instrumentation, data reduction, and uncertainties.

2.5.3 Relationship Between Intact Rock and Large Scale Properties

The relationship between the results of laboratory tests and the results of large-scale tests will be discussed. The effect of joints and inhomogeneous material will be discussed.

2.6 STRESS FIELD

The scope of the section, background, equipment and procedures, limitations and uncertainties in data, and definitions (where needed) will be presented.

2.6.1 Stress Field in Region of the Site

Information will be presented from direct measurement and other observations concerning the regional stress field.

2.6.2 Stress Field at the Site

The stress field data specific to the site and the assumptions used to infer stress from field observations will be provided. The expected direction and magnitude of the principal stresses as a function of depth will be discussed. The data presented here will be referenced in Section 1.3 and will provide the basis for discussions relating stress field to tectonics contained therein.

2.7 SPECIAL GEOENGINEERING PROPERTIES

This section will describe any special thermal, mechanical, thermomechanical coupled properties, or other properties of the rock units that were considered in developing the design of a repository appropriate to the site (e.g., brine migration, thermal decrepitation, thermal dewatering). Available site-specific data as well as generic data from similar rock units will be provided.

2.8 EXCAVATION CHARACTERISTICS OF ROCK MASS

The scope of the section and background information will be provided.

2.8.1 Excavation Characteristics of Similar Rocks

Excavations under rock conditions similar to the rock conditions at the site will be discussed, including various techniques such as controlled blasting and mechanical excavation. The discussion will address the monitoring and analysis of the excavations.

2.8.2 Excavation Characteristics of Rock at the Site

Excavations in rock at or near the site will be discussed, including excavation methods and procedures, monitoring techniques, and analysis.

2.8.3 Changes in Geoengineering Properties Due to Excavation

The potential changes in geoengineering properties that might be produced by the various excavation techniques will be evaluated. Appropriate methods for avoiding or mitigating such damages will be discussed. The impact of these considerations on repository design will be summarized.

2.9 SUMMARY

This section will link the data and analyses presented in Part A - Chapter 2 to Part B of the Site Characterization Plan.

2.9.1 Summary of Significant Results

This subsection will present a synopsis of the significant results recorded in Chapter 2 in terms of:

- Performance objectives
- Conceptual models and boundary conditions
- Need for further data from site characterization
- Quality of the data, including uncertainties.

Cross-references to other parts of the SCP will be provided.

2.9.2 Relation to Design

This section will summarize the significant interrelationships between the information presented in this chapter and the design characteristics discussed in Chapters 6 and 7.

2.9.3 Identification of Information Needs

Information needs relevant to geoen지니어ing will be identified in this section. The relationship to Part B will be discussed, and a preliminary priority of information needed to complete site characterization will be presented.

2.9.4 Relation to Regulatory Guide 4.17

This section will present a site-specific synopsis of the information requested in Reg. Guide 4.17 which has not been shown to be a requirement for this SCP.

REFERENCES

A list of all pertinent references will be provided.