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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAR 31 1983

Mr. Robert Morgan
Project Director
Nuclear Waste Policy Act
Project Office
U. S. Department of Energy
Washington, D.C. 20545

Dear Mr. Morgan:

SUBJECT: NRC ANALYSIS OF HANFORD SITE CHARACTERIZATION REPORT

Background:

On November 12, 1982, the U.S. Department of Energy (DOE) submitted to the Nuclear Regulatory Commission (NRC) the DOE's Site Characterization Report (SCR) for the Basalt Waste Isolation Project (BWIP). The BWIP SCR was submitted under the provisions of NRC's procedural rule, 10 CFR Part 60, Section 60.11.

While NRC staff was analyzing the BWIP SCR, the Nuclear Waste Policy Act (NWPA) of 1982, Public Law 97-425, was enacted into law. Under Section 113(b)(1) of that act, DOE is required to submit to NRC, the host state, and any affected Indian tribe on whose reservation a candidate site is located, for review and comment: (1) a general plan for site characterization activities to be conducted at such candidate site; (2) waste form or package description; and (3) a conceptual repository design that takes into account likely site-specific requirements. The site characterization plan (SCP) required by Public Law 97-425 is similar, but not identical, to the SCR described in NRC's procedural rule, 10 CFR Part 60, Section 60.11.

We understand that DOE intends to submit to NRC later this year an SCP and related documents specified in the Act for BWIP. We also understand that these documents will supersede the November 1982 BWIP SCR and will provide information not included in the November 1982 BWIP SCR.

Upon receipt later this year, NRC will review the BWIP SCP. The NRC is also looking at the impact of the NWPA on NRC's procedural rule. However, pending any changes to NRC's procedural rule, we intend to provide NRC staff's draft analysis of the BWIP SCP for public review and comment prior to publication of a final analysis by the NRC staff in accordance with NRC's procedural rule. Since the NRC staff has completed

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its review of the November 1982 BWIP SCR, we are publishing our Draft Site Characterization Analysis (DSCA) of that document now, in order to provide DOE and all other interested parties with our views on the site characterization program identified in the BWIP SCR. Because the DSCA identifies in some detail the information NRC staff believes is necessary to support a licensing application to the NRC, it should be of value in the development of the BWIP SCP and other SCP's which DOE may develop.

Accordingly, attached is a copy of NRC's DSCA, NUREG-0960, "Site Characterization Analysis of the Site Characterization Report for the Basalt Waste Isolation Project," dated March 1983.

The BWIP SCR, and NRC staff analysis of it (DSCA), constitute an important early step in the process of prelicensing consultation between NRC and DOE aimed at identifying the information needs of licensing that must be satisfied by site characterization investigations. These investigations will involve, in many cases, long lead-times in planning and execution, because of the nature of the technical issues which involve questions about complex natural systems and development of engineered barriers. The objective of prelicensing consultation is to assure that potential licensing issues are identified at an early time so they are dealt with fully in site characterization. Accomplishing this through documents such as the BWIP SCR and NRC's DSCA provides opportunity for the public, States, tribes, and Federal government agencies to be informed and aware of the prelicensing consultation process.

General Conclusions:

The NRC staff believes that based on investigations conducted to date the SCR identifies the general questions that would need to be answered if DOE were to request NRC to license a repository in basalt at Hanford. There is, however, a difference of view on the completeness of the investigations to date in addressing some of these questions.

We believe the SCR places too much confidence in the suitability of the site for a repository on the basis of information collected to date. Preliminary DOE statements regarding groundwater travel time, geologic stability and site geochemistry, in the view of the NRC staff, do not consider the present uncertainties about the geologic parameters affecting these site parameters. In the DSCA, uncertainties in the present information which need to be addressed during site characterization are discussed.

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With respect to future investigations at the BWIP, the NRC staff considers that the plans need further amplification, and in some cases, modification to develop the information needed for licensing. In particular, the SCR needs emphasis and further development of the uncertainties about the effects that highly variable and complex basalt rock features have on groundwater flow and rock mass strength. The ability to identify, and to characterize the significance of faults, fractures, joints and other heterogeneities which are observed in the Columbia River basalts will be major questions to be resolved in site characterization. There is substantial uncertainty on these issues at the current time.

Summary of Analysis:

The NRC staff examined the SCR description of the proposed BWIP site characterization program from the standpoints of: (1) completeness in identifying the questions that would need to be answered in licensing a potential high-level waste repository at Hanford; (2) suitability of the proposed program for addressing these questions; and (3) effectiveness of plans to mitigate possible adverse effects (resulting from site characterization activities) on the capability of the site to isolate waste. NRC staff conclusions are summarized below.

(1) With respect to completeness of the SCR in identifying the general questions that would need to be answered in licensing, the NRC staff believes that a good job has been done. At this point of time there appears to be a common viewpoint toward the questions to be addressed during site characterization.

(2) With respect to suitability of the proposed site characterization program, our comments are summarized in the following paragraphs:

Hydrogeology. The description of the proposed testing program needs expansion to show how the program will provide sufficient information to resolve questions about groundwater flow direction and rates. The assumptions for planned scale and location of future hydrologic tests need further examination and explanation, particularly about current groundwater flow conditions. We believe that several large scale pump tests, in addition to those planned, may be required to resolve uncertainties about the effects that geologic features of the basalts have on groundwater flow directions and rates.

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Also, additional monitoring of hydraulic heads and regional groundwater modeling will likely be needed.

Geologic Stability. Plans in the SCR need to be expanded to characterize the potential effects of seismicity and geologic anomalies observed from investigations to date may have on repository operation and long-term isolation of waste.

Geochemistry. Geochemical reactions which offer the potential for contributing to waste isolation will be complex, particularly as they are affected by heat and radiation generated by the waste. The SCR needs to provide specific information about tests to be run or the strategies to be employed in gathering geochemical information to support licensing assessments. Also, the staff has identified several processes which we believe need amplification in the SCR plans. For example, the potential for certain nuclides to become highly soluble by reaction with carbonates in groundwater should be included.

Repository Design. The staff has several comments about the current conceptual designs and future design development and testing programs. For example, the staff believes the basis for the horizontal waste emplacement method described in the SCR needs to be further expanded and examined. Alternative designs should be assessed in terms of retrievability, backfill installation and waste isolation concerns. Also, the staff believes that the schedule for the programs for development and testing of repository seals and engineered backfill should be advanced. Although general descriptions are given, more detailed information on the tests to be conducted in the underground facility need to be presented or referenced in the SCR so that adequacy of the testing program can be reviewed. We believe the specific plans for this testing should consider the scale of excavations and testing to evaluate (1) the potential effects of rock mass features exhibited in basalts and (2) the effects that heat will have on groundwater and rock conditions around waste packages.

Waste Package. The SCR needs to identify requirements for the waste package in terms of performance reliability. Establishing at least tentative reliability performance requirements for the waste package and other engineered barriers in a manner which reflects uncertainties in the natural systems, is essential to the definition of the scope of the waste package program. Also, further

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consideration is needed of available information on pitting corrosion of materials like those proposed for the waste container in the reference conceptual design of the waste package. While the general design concept and materials appear to be reasonable for the Hanford site, the adequacy of the basis for the thickness of the waste container to provide reasonable assurance of containment needs further explanation.

Quality Assurance. While the SCR provides a general description of the quality assurance programs, more detailed information is needed about the plans and procedures which will control data gathering efforts, and hence, data quality. We consider that a rigorously executed QA program is essential for all technical areas to fully establish the quality of data.

Performance Assessment. While the staff generally agrees with the role for performance assessment that is described in the SCR, plans need to be expanded. Such plans should locate and justify such items as boundaries of the disturbed zone and the accessible environment, and should present more detail concerning code validation and documentation and treatment of uncertainties. Most important, we believe more emphasis is necessary on the use of sensitivity analyses to guide site characterization, including the iterative process between numerical modeling and data collection, and that DOE should ensure that the timing of these activities will be appropriate.

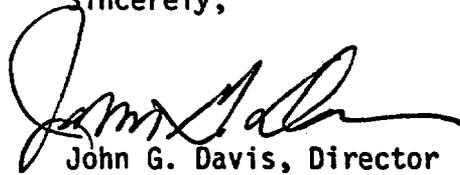
(3) With respect to mitigation of possible adverse effects of site characterization, the staff analysis points out that the SCR plans for development of shaft and borehole seals need further development and explanation. In particular, details on the sealing program for the exploratory shaft are needed. The staff identified in a letter of January 13, 1983 questions related to exploratory shaft construction because construction was expected to start early in 1983. The staff considers that questions related to the initial construction activities (i.e., at least to the point where the basalt rocks are penetrated) are resolved by DOE's February 23, 1983 response letter. Outstanding questions remaining concerning construction past this point will be addressed by DOE in April, as noted in the February 23, 1983 letter.

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Follow-up Action:

The staff is available to meet with DOE representatives to discuss the comments of the DSCA to assure that our comments are clearly understood and the means for addressing them are agreed upon as early as possible. Given the dynamic, evolving nature of the site characterization programs and the complexity of such undertakings, we believe that early staff meetings to review DOE's plans and schedules for addressing them are necessary. We do not anticipate that resolution in all cases will be accomplished before submittal of the BWIP SCP. However, we believe plans for resolution of each issue should be promptly initiated. As we have discussed, we believe your current efforts to provide NRC staff with prompt and ready access to information and data as they become available will need continuing emphasis. This prompt access is essential for NRC to perform its work in a timely fashion.

Sincerely,



John G. Davis, Director
Office of Nuclear Material Safety
and Safeguards

Enclosure:
NUREG 0960

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Sincerely,

Original Signed By

John G. Davis, Director
Office of Nuclear Material Safety
and Safeguards

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