JAN 0 7 1986

MEMORANDUM FOR: A. Thomas Clark
Advanced Fuel and Spent Fuel Licensing Branch
Division of Fuel Cycle & Material Safety, NMSS

FROM: Leon L. Beratan, Chief
Earth Sciences Branch
Division of Radiation Programs & Earth Sciences, RES

SUBJECT: MONITORED RETRIEVABLE STORAGE (MRS) FACILITY, CLINCH RIVER, TENNESSEE

We have reviewed the Monitored Retrievable Storage Conceptual Design Report to determine if there is a potential for solution cavities in bedrock beneath the site. Enclosed is a summary of our review.

The proposed foundation levels presented in the report are above or within the badly weathered zone in rock, and there is a possibility that cavities are present in carbonate rocks beneath the site. The planned Receiving and Handling Building straddles the unconformable contact between the Knox Dolomite and the Chickamauga Siltstone. This contact is known to be highly irregular and to contain numerous paleokarst features (cavities or other solution features preserved from an earlier geologic time) within the Knox Dolomite. Detailed site investigations will be needed to identify and define the extent of cavities and to determine their significance to the site.

Questions concerning this review should be addressed to R. McMullen (Ext 74318) of the Earth Sciences Branch.

Leon L. Beratan

Leon L. Beratan, Chief
Earth Sciences Branch
Division of Radiation Programs &
Earth Sciences, RES

Enclosure:
Review of the Monitored Retrievable Storage Conceptual Design Report

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POTENTIAL FOR KARST FEATURES IN BEDROCK BENEATH THE PROPOSED MONITORED RETRIEVABLE STORAGE (MRS) FACILITY AT THE FORMER CLINCH RIVER BREEDER REACTOR SITE

Bedrock beneath the proposed MRS Facility near Oak Ridge, Tennessee consists of alternating sedimentary rock strata of sandstones, siltstones, and carbonates (dolomite and limestone). The strata dip to the southeast at about 30° and greater, and outcrop at the surface in wide bands that are oriented (strike) in a northeast-southwest direction. All of the rocks are severely weathered and contain solution features in the upper few feet to several tens of feet down to a maximum depth of 73 feet in limestone and dolomite. The weathering and solutioning has taken place along joints and bedding planes. At depth the joints become less frequent and tighter, and solutioning is uncommon.

The different rock formations have variable susceptibilities to weathering and solution activity depending on their content of carbonate material. For example, the more pure dolomites and limestones are more susceptible to solutioning than the siltstones and sandstones.

At ground surface, from northwest to southeast, the bands of rock are comprised of strata from the Knox Group and the Chickamauga Group. At the site the Chickamauga Group has been subdivided into a lower siltstone unit (Unit A) and an upper limestone unit (Unit B). In vertical section, from bottom to top, the sequence is also the Knox Group overlain by the Unit A and then the Unit B Chickamauga Group.

During the early investigations for the Clinch River Breeder Reactor (CRBR), TVA and then Law Engineering conducted geologic site selection studies and determined that the Unit A Chickamauga horizon was the most suitable for siting the CRBR from a foundation stability point of view than either the Knox Group or the Unit B limestones because it possesses superior engineering properties, has been less effected by weathering and solution activity, and subsurface

conditions are more predictable. More detailed, site specific investigations conducted later confirmed that conclusion.

Excavation for the CRBR was made well below the maximum depth of weathering into continuous high quality rock. The MRS facility lies over portions of the former CRBR area, but it also extends well into the area underlain by the Knox dolomite, an area that is relatively unknown. The proposed elevations for the cask pads in the storage area and the foundation level for the Receiving and Handling Building will be above or within the zone of extensive weathering and solutioning, therefore, the potential for cavities in the rock beneath the facility is high. A relatively detailed exploratory program will be required to locate and define the extent of cavities and determine their significance to the site.

The Receiving and Handling Building is situated above the unconformable contact between the Knox and Chickamauga Groups. The surface of the Knox Group, which is now tilted to the southeast at an angle greater than 30°, had been exposed at ground surface for a long period of time during the Ordovician Period. A well developed karst topography formed at that time. Surface solution features and cavities were later filled with material of the Chickamauga Group, forming what are known today as paleokarst features. In addition to the standard site investigations that are going to be undertaken to identify solution cavities in the upper rock weathered zone, studies should also be conducted along this interface to confirm the assumption that the paleokarst features beneath the site are completely filled with rock.

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