July 30, 2002

The Honorable Jessie Hill Roberson
Assistant Secretary for Environmental Management
U. S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-0113

Dear Ms. Roberson:

As required by law, the Defense Nuclear Facilities Safety Board (Board) is engaged in a safety review of the adequacy of the design of the Pretreatment, Low-Activity Waste, and High-Level Waste (HLW) Facilities of the Hanford Waste Treatment Plant (WTP). One focus of the Board's review is the structural response of the facilities when subjected to natural phenomenon hazards, particularly earthquake-induced ground motion.

After reviewing several aspects of the HLW Facility's foundation and structure design, three issues related to seismic design remain: the probability of tectonic activity of the anticlines and associated faults for the Yakima Folds, the spectral amplification associated with the attenuation relationship, and the amplified floor and equipment response of the superstructure. These three issues are unresolved and their effect can result in an increase in the seismic loads that are appropriate for the design of the facility foundations.

It is important that these issues be resolved as they can affect future defense nuclear facility design at the Hanford site. However, to support near-term placement of concrete, the Board evaluated estimates of maximum increases in seismic loads that might arise from these uncertainties. On the basis of this assessment, the Board believes the current foundation design for the HLW Facility includes sufficient margin to safely accommodate increases in predicted seismic loading that could result from these issues, provided these margins are not otherwise consumed. This assessment and estimates are summarized in the enclosure to this letter.

The Board has taken this approach toward addressing these issues to accommodate the aggressive schedule being used by the Department of Energy's (DOE) Office of River Protection for accelerating design and construction of the WTP facilities to meet environmental cleanup commitments. That aggressive schedule allows construction to commence before the design has been completed, posing the risk that adjustments made in finalizing the design could have a negative impact on portions of the facility where construction is under way or complete. The result could be the need for expensive modifications or acceptance of increased public health and safety risks. While this strategy has been employed successfully in the construction industry, it works best when well-defined and mature technologies are being used, and the facility to be constructed is not the first of a kind.

It has been the Board's experience that unforeseen changes that occur later in the design process commonly erode early estimates of margin. This observation is particularly applicable to projects for facilities of a unique design, as is the case with WTP. The seismic design issues identified by the Board illustrate the risk DOE is accepting in its decision to employ an aggressive design and construction schedule for WTP. DOE and contractor management must remain sufficiently focused on the need to provide and preserve adequate margins (i.e., for seismic loads as well as for other aspects of the design) early in the development process to ensure that the design and construction of the WTP will result in a safe, robust, and successful facility.

As design and construction proceed, it is important that construction not get too far ahead of the design work, such that engineering safety features are not incorporated at an appropriate time. DOE must be alert to such a possibility, and, if necessary, delay construction to accommodate engineered safety designs.

Sincerely,

John T. Conway
Chairman

c: Mr. Mark B. Whitaker, Jr.

Enclosure

**Enclosure**

**Seismic Design Margin Evaluation for High-Level Waste Facility**

Disposition of the Board's concerns regarding the seismic design criteria for the High-Level Waste Facility can result in a significant increase in applied seismic loads and reduce the margin for the current foundation design. The following table summarizes the Board's evaluation of seismic load uncertainty, estimates of anticipated maximum load increase, and estimates of compensatory margin that presently exists in the foundation design.

| Uncertainty | Estimated Maximum Increase in Design Loads | Current Compensation |
|---|---|---|
| Earthquake source probability increase in seismic load. | 35% | Demand/capacity ratio of 0.85 limit permits an increase of ~53% in seismic load. |
| Adjustment to account for change in attenuation. | 15% | The soil structure interaction dynamic analysis increased seismic loads by 15%. |
| Amplified floor and equipment response of the superstructure. | 40% | The use of 1.5x peak acceleration increased seismic loads by about 70% in the below grade structure. |