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Docket No. 50-397

Mr. R.L. Ferguson
Managing Director
Washington Public Supply System
3000 George Washington Way
Richland, Washington 99352

Dear Mr. Ferguson:

Subject: WNP-2 Request for Additional Information

As a result of our review of your application for operating license, we find that we need additional information. The information needed is contained in a nine page USGS Draft Status Review, a copy of which is enclosed with this letter. These nine pages were provided to you by the U.S. Geological Survey earlier this month.

To maintain our licensing review schedule for the WNP-2, please provide responses to the enclosed request as soon as possible. If you desire any clarification, please contact Ina Alterman at (301) 492-7850 or Raj Auluck at (301) 492-9778.

Sincerely,

/s/

A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

Enclosure:
As stated

cc w/enclosure:
See next page

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Draft Status Review

Hanford, Washington

M. H. Hait and D. D. Dickey

April 2, 1982

Washington Public Power Supply System

Nuclear Project No. 2

Benton, County, Washington

NRC Docket No. 50-397

Comments on Geology

Tectonic Models

In spite of the large quantity of geologic work in the Hanford area including the FSAR (Amendment 18), the analyses and models that the applicant has supplied regarding the structure and tectonic setting of the site area are incomplete. Full written explanations of the applicant's recent thinking, expressed only cursorily at the November 17, 1981, NRC/USGS/WNP-2 meeting, and clear integration of this thinking into more quantitative, accurate models of the geology of the site area and its environs are needed. The models should be compatible with all details of the known geology and should include enough detail to permit full evaluation of the applicant's analyses of seismic probability and segmentation and capability of faults.

A list of "conclusions" regarding structure and regional tectonics presented at the November meeting by G. A. Davis, a consultant to the applicant, is here reproduced, for use as a reference in our specific requests and as a possible partial outline for response by the applicant.

"CONCLUSIONS -- REGIONAL TECTONICS
AND STRUCTURAL GEOLOGY

"1. TECTONICS OF COLUMBIA PLATEAU, FOR AT LEAST PAST 15 M.Y., ARE PRIMARILY A RESPONSE TO NORTH-SOUTH SHORTENING (AND A PROBABLE NORTH-SOUTH ORIENTATION OF SIGMA 1) (DAVIS).

ESTIMATES OF TOTAL NORTH-SOUTH SHORTENING RANGE FROM 2 TO APPROXIMATELY 7% (BENTLEY, 1980; LAUBSCHER, 1981).

"2. MIOCENE AND YOUNGER COMPRESSION IN THE COLUMBIA PLATEAU AND BLUE MOUNTAINS PROVINCES HAS OCCURRED SYNCHRONOUSLY WITH EAST-WEST, THEN NORTHWEST-SOUTHEAST EXTENSION IN THE GREAT BASIN PROVINCE TO THE SOUTH. COMPRESSIONAL DEFORMATION IN THE FORMER AREAS PROBABLY REPRESENTS AN INCOMPLETELY LINKED RESPONSE TO EXTENSION IN THE LATTER AREA (LAUBSCHER, 1977, 1981; DAVIS, 1977, 1981; SMITH, 1978).

"3. THE PRINCIPAL PLATEAU STRUCTURES ARE (1) FOLDS WITH EASTERLY TRENDS AND (2) FAULTS OF TWO BROAD TYPES: (A) THOSE WITH STRIKES PARALLEL OR SUB-PARALLEL TO FOLD TRENDS, BOTH OF REVERSE AND NORMAL TYPE; AND (B) THOSE WITH STRIKES AT HIGH ANGLES TO FOLD TRENDS, MOST IMPORTANTLY WITH NORTHWEST STRIKES AND A COMPONENT OF DEXTRAL SLIP.

"4. PLATEAU FOLD STRUCTURES ARE NOT RELATED TO DISPLACEMENTS ALONG STEEP (60°+) REVERSE FAULTS THAT ROOT INTO THE BASEMENT AS PROPOSED BY BENTLEY (1977).

"5. PLATEAU FOLDS ARE PROBABLY NOT RELATED TO SOUTH-DIPPING THRUST FAULTS THAT TRANSECT THE ENTIRE CRUST AND ROOT INTO A REGIONAL DECOLLEMENT THAT DETACHES CRUST FROM MANTLE AND ROOTS BENEATH THE BLUE MOUNTAINS PROVINCE (AS PROPOSED BY LAUBSCHER, 1977, 1981).

"6. PLATEAU FOLDS APPEAR TO REPRESENT A STRUCTURAL SPECTRUM BETWEEN (1) PRIMARY FOLDS WITH SECONDARY REVERSE (OR THRUST) FAULTING, AND (2) SECONDARY FOLDS RELATED TO INTRA-CRUSTAL THRUST-TYPE DETACHMENTS OR LESS THROUGHGOING ZONES OF INTERCONNECTED FAULTS AND KINK-BANDS (PRICE, 1980; DAVIS, 1981; WCC, 1981; BRUHN, 1981; COWAN, 1981).

"7. AVAILABLE DATA AND CURRENT FOLD/FAULT THEORY FAVOR MODELS OF PRIMARY FOLDING WITH SECONDARY REVERSE AND THRUST FAULTING FOR THE UMTANUM-GABLE MOUNTAIN STRUCTURAL ALIGNMENT (PRICE, 1980; GOLDER, 1981; DAVIS, 1981; COWAN, 1981; WCC, 1981)

"8. PLATEAU FOLD TRENDS ARE ANOMALOUSLY NORTHWESTWARD IN A SOMEWHAT DIFFUSE ZONE THAT EXTENDS NORTHWESTWARD FROM WALLULA GAP AT LEAST AS FAR AS THE EASTERN END OF RATTLESNAKE HILLS. THIS ZONE WAS RECOGNIZED BY RAISZ (1945) AS PART OF HIS CLE ELUM-WALLULA LINEAMENT (CLEW). RAW IS THE ACRONYM GIVEN THIS ZONE BY WCC(1981) FOR ITS LENGTH BETWEEN THE RATTLESNAKE HILLS AND THE VICINITY OF MILTON-FREEWATER.

"9. THE GEOMETRY AND KINEMATICS OF STRUCTURES WITHIN RAW SUGGEST THAT IT IS A COMPLEX ZONE OF FOLDING AND FAULTING, THE LATTER CHARACTERIZED BY DIVERSE AND SUPERPOSED COMPONENTS OF BOTH REVERSE AND DEXTRAL STRIKE-SLIP.

"10. NO COMPELLING DATA ALLOWS AN UNEQUIVOCAL CHOICE BETWEEN TWO PREVAILING TECTONIC MODELS: (1) CLEW (RAW) IS THE STRUCTURAL EXPRESSION OF A BASEMENT ZONE OF DEXTRAL WRENCH-FAULTING THAT BECOMES EITHER DEEPER (LAUBSCHER, 1977, 1981) OR BROADER AND MORE DIFFUSE (DAVIS, 1981) TO THE NORTHWEST; (2) RAW IS THE CONSEQUENCE OF NORTH-SOUTH COMPRESSION OF PLATEAU STRATA AGAINST A TRIANGULAR, RIGID BASEMENT "BUTTRESS" WITH A NORTHWEST-TRENDING SOUTHERN BOUNDARY WITH A COMPONENT OF ASSOCIATED STRIKE-SLIP DEFORMATION (PRICE, 1981). NO BASEMENT ZONE OF STRIKE-SLIP FAULTING IS REQUIRED BY THE SECOND MODEL. THE WIDESPREAD OCCURRENCE OF SUBHORIZONTAL STRIAE ALONG MAJOR FAULTS WITHIN RAW (STEEPLY DIPPING STRIAE ARE ALSO COMMON) ARE SUPPORTIVE OF EITHER MODEL.

"11. THE OLYMPIC-WALLOWA LINEAMENT IS NOT A FUNDAMENTAL CRUSTAL BOUNDARY OF CONTINENT-OCEANIC TYPE IN THE AREA OF THE PASCO BASIN (DAVIS, 1981). GEOLOGICAL INTERPRETATIONS (LAUBSCHER, 1981; DAVIS, 1981) AND CRUSTAL GEOPHYSICAL STUDIES (SSS, 1980; WESTON GEOPHYSICAL; 1981) CONCLUDE THAT NEITHER CLEW NOR RAW COINCIDE WITH A MAJOR CHANGE IN CRUSTAL COMPOSITION. THE ANALYSIS OF NORTH-SOUTH TRENDING GRAVITY ANOMALIES THAT CROSS CLEW INDICATES THAT ANY STRIKE-SLIP DISPLACEMENTS THAT MAY HAVE OCCURRED PARALLEL TO CLEW CANNOT HAVE EXCEEDED TWO OR THREE KILOMETERS (WESTON GEOPHYSICAL, 1981); THE ANALYSIS DOES NOT DEMONSTRATE THAT STRIKE-SLIP DISPLACEMENT HAS OCCURRED. MIDDLE MIOCENE BASALT FLOWS AND DIKES (CA. 15 MYBP) AND HIGH-ANGLE FAULTS (INCLUDING THE HITE FAULT) ARE NOT DISPLACED ALONG THE TRACE OF THE OLYMPIC-WALLOWA LINEAMENT AS DRAWN BY RAISZ UP THE SOUTH FORK OF THE WALLA WALLA RIVER (KENDALL AND OTHERS, 1981)."

Items 4-10 definitely require expansion. For example, items 4 and 5 are rejections of earlier models, and details supporting such conclusions should be provided. These new conclusions allow removal of limbs from the fault tree in Apendix 2.5 K. The structural and tectonic model(s) presented should include enough detail to permit full, accurate evaluation of the applicant's analysis of seismic probability, segmentation of faults, and capability of faults. Some of the support material expected is:

361.20 (USGS 1) To-scale cross section(s) of the geology through the site to a depth sufficient to include the elements critical to evaluation of the model.

361.21 (USGS 2) To-scale illustration of the geometry and origin of the folds and faults common to the tectonic end-members of the "structural spectrum" referred to in Items 6 and 7 of "Conclusions": (a) primary folding, secondary faulting, and (b) primary faulting, secondary folding.

361.22 (USGS 3) Maps and cross sections of actual examples within the "structural spectrum;" and explanation of how these examples bear on structural interpretations extended into the WBP-2 site area.

361.23 (USGS 4) Well-illustrated explanations of the structural relationship between the RAW trend and the large folds (Gable Mountain, Saddle Mountains, and Frenchmen Hills) that extend far to the north and east of RAW. This explanation should include but not be limited to, adequate analysis of Price's (1981) model, Item 10 (2) of "Conclusions," which suggests many miles of northward translation of an originally east-west-trending fold. How does this translation take place? What is the evidence for translation and what bearing does the translation represented by this and other folds have on structural interpretations below the WNP-2 site?

361.24 (USGS 5) Illustrate explanation of the applicant's concept of "* * * intracrustal thrust-type detachments and less-throughgoing zones of interconnected faults and kink-bands." How do these relate to the "structural spectrum"? Where are they or where would they be expected? Show in schematic cross section(s) the conceptual and spatial relationships between the hypothetical faults and the crustal levels of Appendix 2.5 K (WPPSS, 1981), and the examples within the "structural spectrum" (3, above. Show the vertical zone through which the present-day north-south compression is acting. Show depths of significant earthquakes projected into cross section.

361.25 (USGS 6) Provide comparison, with suitable cross sections, of the structural geology of the Umtanum-Gable Mountain-southeast anticline with Toppenish Ridge. Explain more fully what leads you to postulate a fault origin for Toppenish (WCC. 1981a) and a fold origin for Umtanum-Gable Ridge (Item 7, "Conclusions").

Active Volcanism.

The applicant should assess the possibility of having a fissure lava flow at the site.

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