Lawrence Livermore National Laboratory

NUCLEAR SYSTEMS SAFETY PROGRAM

L-196

October 13, 1987

Mr. M. E. Blackford, MS-623ss
Project Officer
Geology/Geophysics Section
Technical Review Branch
Division of High-Level Management
Office of NMSS
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Transmittal of Reference Trip Report
FIN A0297

Reference: BWIP Trip Report, 29-30 September 1987, by R. W. Galster (Five pages).

Dear Mr. Blackford:

Submitted herewith, please find three (3) copies of the reference trip report prepared by Richard W. Galster. Galster reports that the trench review with the U.S. Bureau of Reclamation team was a worthwhile event. He also reports that discussions at the O'Sullivan Dam were led by Mark Schaffer, at the Smyrna Bench by Mike West, both consultants to the Bureau. The trench review was preceded on 29 September 1987 by a field review of the geology of the Smyrna Bench led by Robert D. Bentley, our team member.

Please note the summary in that Galster reports that none of the trenches excavated were diagnostic in terms of uncovering fault zones. The exposures along Lind Coulee Arm are clearly diagnostic, but the date of the latest movement must await positive dating of the older Pleistocene loess.

If you have any questions, please let us know.

Sincerely yours,

Dae H. (Danny) Chung
Project Leader

DHC/ic
Attachment as stated.

cc: H. E. Lefevre, NRC
K. McConnell, NRC

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BWIP Trip Report, 29-30 September 1987

1. At the telephone request of H. L. McKague on 20 August 1987 and H. E. LeFevre of N.R.C. on 14 September 1987, I participated in a field review of exposures and trenches developed by the U. S. Bureau of Reclamation near O'Sullivan Dam and on Smyrna Bench on 30 September. This was preceded on 29 September by a field review of the geology of the Symrna Bench led by R. D. Bentley. My observations and impressions of this field review follow.

2. Smyrna Bench geology. This very valuable field review led by R. D. Bentley included H. E. LeFevre and Keith McConnell of NRC and myself as participants. West Smyrna Bench lies on the north face of the Saddle Mountains structure between 7 and 12 miles east of the Columbia River at Sentinel Gap and within the Smyrna Bench Segment of the Saddle Mountains structure as defined by Reidel (1984). East Smyrna Bench lies between 13 and 16 miles east of Sentinel Gap within the Saddle Gap segment. The traverse on this field review was the entire length of West Smyrna Bench. The area has been mapped by Grolier and Bingham (1971), Swanson and others (1979) and more recently by Reidel (1984 and in press). For approximately 10 days prior to our review, Bentley and students from Central Washington University had been conducting field mapping in the area.

The face of Smyrna Bench is characterized by essentially flat-lying Elephant Mountain Basalt overlain by fanglomerate facies related to the Ringold Formation which appears to be essentially at the attitude of original deposition (Figure 1). The surface of the bench is highly irregular, the feature being cut by a series of steep-sided north-trending

valleys cut into the basalt flows and interbeds of the Saddle Mountains Formation standing on end or overturned dipping steeply south, and into the fanglomerate along the outer margin of the bench. East-west valleys are also developed along the bench. It is these that Bentley suggests are graben-like features formed by tensional deformation on the upper plate of the Saddle Mountains thrust. Reidel suggests that these features are nothing more than differential erosion of the interbeds within the Saddle Mountains Formation. The two concepts are illustrated in Figure 1. Upon examining field relations at the west end of Smyrna Bench where the Wanapum section standing on end was walked inside (south) of undeformed (Ringold) fanglomerate, I am inclined toward the latter and simpler explanation. As much of the bench surface is mantled by Holocene and locally Plestocene (?) loess, it is often difficult to see exposures. The inner margin of Smyrna Bench is bounded by a steep scarp formed by Wanapum and Grande Ronde basalt flows standing on end or overturned.

3. Lind Coulee exposures and trenches.

a. A series of three exposures and two trenches along the south side of the Lind Coulee arm of Potholes Reservoir (Sec. 6, T17N, R29E). This area was identified by Grolier and Bingham (1978) as a locale where the "Roza was thrust over brown tuffaceous sand of the Ringold Formation." The U. S. Bureau of Reclamation has been investigating this area as part of their continuing dam safety program for O'Sullivan Dam.

b. The most easterly exposure shows basalt over what is identified as older Pliestocene loess. The fault zone is a complex shear zone about two metres thick consisting of gouge zone at the base of the overlying basalt dipping 55-60 degrees south. At the base of the shear zone is a

lower shear zone in the older loess. Large fragments of sheared older loess lie between the two major shear zones. This configuration has led the Bureau's consultants to suggest two stages of movement with an estimated 5 metres of Pleistocene displacement. The exposure is overlain by less than one metre of undisturbed Holocene colluvium.

c. The central exposure shows a thin (< one metre) simple gouge zone dipping 45 degrees south with Roze Basalt thrust over old Pleistocene loess (?). The gouge zone contains caliche. The exposure is overlain by about a metre of Holocene loess.

d. The westerly exposure shows fault zone dipping about 60 degrees south where about a metre thick, partly calcified gouge zone overlies the older Pleistocene loess (?), in turn overlain by 2-3 metres of badly shattered basalt breccia, overlain by basalt. Although poorly constrained possible displacement of a 13-35 ky soil horizon in the hanging wall is suggested but requires further investigation for confirmation.

e. Two shallow trenches were excavated across what was interpreted as a fault line scarp between the eastern and central exposures. Both trenches show similar relationships. Holocene loess overlying basalt directly or calichified sand on basalt on the south (up) side of the scarp and the loess or calichified sand underlain by older flood sand on the north (down) side of the scarp. The age of the flood sand is based on the antiquity of the caliche zone. The sands are interpreted as being deposited in against a fault line scarp. There is no displacement of the flood sands, caliche or loess. No fault zone in the basalt could be seen.

4. Smyrna Bench trench.

This trench was excavated across a very subtle scarp on the surface of Smyrna Bench in Section 36, T16N, R26E. The underlying geology is not well exposed though the trench appears to be outboard (north) of steeply dipping Elephant Mountain. Based on aerial photography, the scarp was believed to be a continuation of the thrust fault exposed at the west end of Smyrna Bench. The trench exposes 3 to 4 m of Holocene loess overlying calcareous Pleistocene (?) soil. Fragments of the Pleistocene (?) soil up to nearly a metre across are found in the lower portion of the Holocene loess. This has tempted the Bureau's consultants to interpret this as evidence of tectonic rollover in loessic soils across the scarp. However there is no evidence of faulting in the trench. The Pleistocene (?) soil fragments appear to be consistant to normal development of a colluvial deposit on a gentle slope.

5. Summary

None of the trenches excavated were diagnostic in terms of uncovering fault zones. The exposures along Lind Coulee arm are clearly diagnostic, but the date of the latest movement must await positive dating of the older Pleistocene loess.

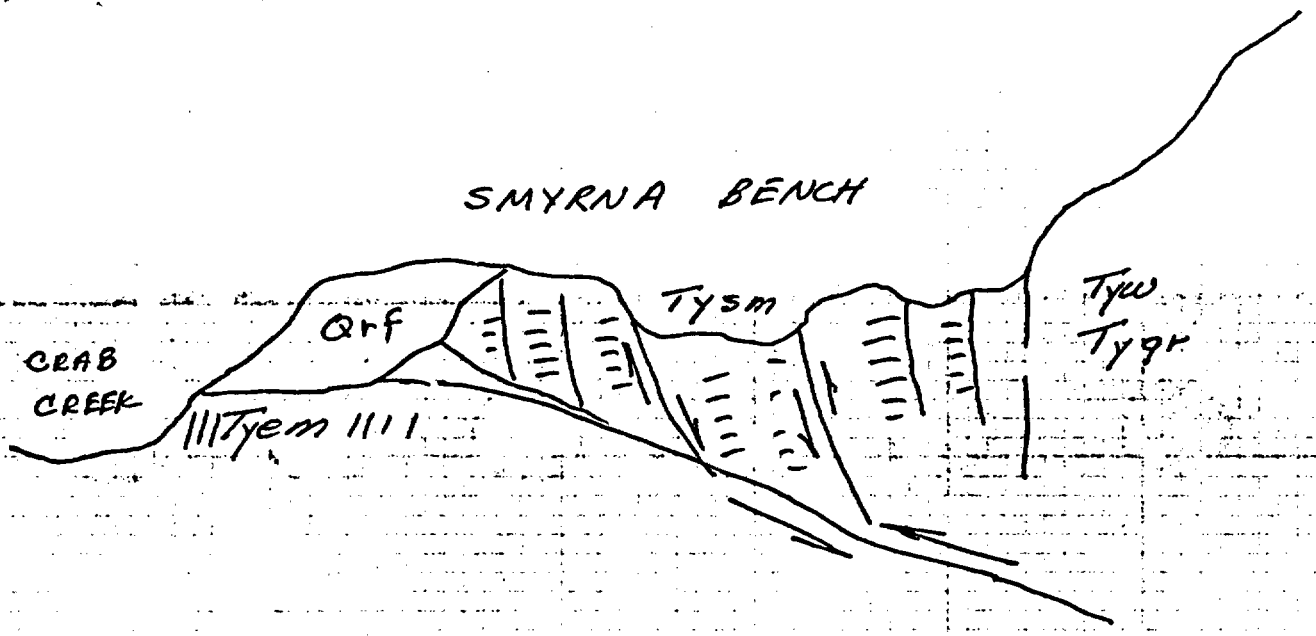

FIG 1a

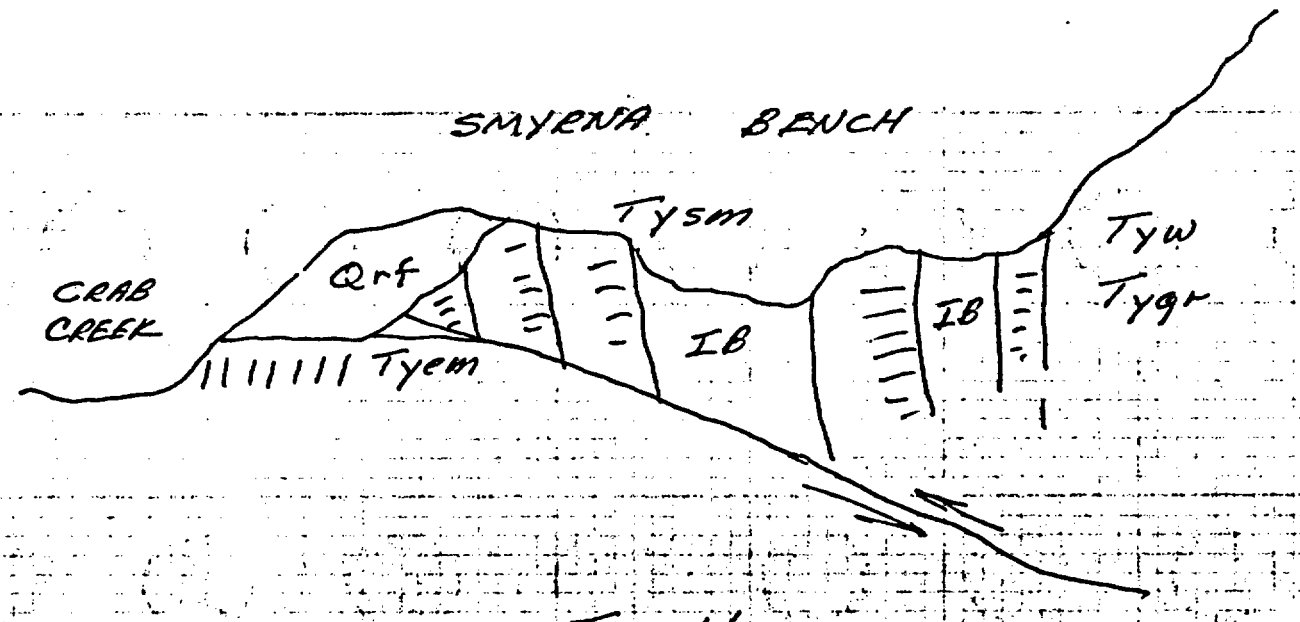

FIG 1b

LEGEND
Qrf - Ringold conglomerate
Tyem - Elephant Mtn (Saddle Mtns Basalt)
Tysm - Saddle Mtns Basalt (undifferentiated)
IB - Saddle Mtns interbeds
Tyw - Wanapum Basalt
Tygr - Grande Ronde Basalt

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