



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

PDR

NOV 28 1978

MEMORANDUM FOR: J. Carl Stepp, Chief
Geosciences Branch, DSE

FROM: Harold E. Lefevre, Geologist
Geology and Seismology Section
Geosciences Branch, DSE

THRU: Robert E. Jackson, Leader *REJ*
Geology and Seismology Section
Geosciences Branch, DSE

SUBJECT: FIELD OBSERVATIONS IN THE VICINITY OF THE
LAKE CAVANAUGH ROAD FAULT

PLANT NAME: Skagit Nuclear Power Plant, Units 1 and 2
LICENSING STAGE: CP
DOCKET NUMBERS: STN 50-522/523
RESPONSIBLE BRANCH: LWR-2; I. Peltier, LPM

Background

The USGS, in conjunction with their Townsend quadrangle mapping efforts, has identified and investigated offsets in glacial lake sediments along Lake Cavanaugh Road approximately 1-1/2 miles northwest of Lake Cavanaugh, near the confluence of Pilchuck Creek and Lake Creek. The exposure is about 13 miles southeast of the proposed Skagit site. The fault (fault zone), based upon currently available north-south SLAR imagery, appears to lie along the southern extension of the NW-SE trending Gilligan Creek lineament.

In an October 4, 1978 meeting in Bethesda, the NRC was informed by the USGS of the fault, as well as events leading up to its discovery. Investigations that have been conducted and are being planned by the USGS were also discussed. As described by James Minard of the USGS, the fault is exposed in a road cut along the north side of Lake Cavanaugh Road and consists of a series of six en-echelon faults cutting glacial lake sediments with accumulative offset and folding of about twenty-three feet. The faults lie on the west limb of a

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depression in the lake sediments. The east limb of the depression is folded and distorted, but not faulted. Some minor faulting is visible in the delta bottomset beds directly overlying the downwarp. The strike of the faults range from N 60°E to N 70°E. The fault zone dips range from 55°S to 75°S. The strike of the projection of the Gilligan Creek lineament here is about N20°W.

The origin of the feature has not yet been determined. The USGS, however, has considered the following possibilities:

- (1) Ice block melt
- (2) Ice Loading
- (3) Slump
- (4) Tectonic

Based upon a series (6) of auger borings along the Lake Cavanaugh Road, the USGS presently (October 4) favors the tectonic origin.

Site Visit of October 18, 1978

On Wednesday, October 18, 1978, in addition to examining the Lake Cavanaugh fault exposure and immediate vicinity, I conducted a general reconnaissance of accessible portions of the Deer Creek drainage to the east. I was accompanied by S. Pessl and J. Minard of the USGS while in the immediate vicinity of the fault. J. Minard and I made the reconnaissance trip through Deer Creek valley.

Lake Cavanaugh Road Fault

Recent erosion and slumpage on the road cut face generally obscured the fault exposure previously described by J. Minard at Bethesda on October 4. Those portions of the exposure presently available however appeared to conform to Mr. Minard's description. Fault displacement was observed in the lacustrine deposits along the western segment of the road cut as well as within the uppermost granular deposits (delta bottomset beds) in the central depressed portion of the exposure. No faulting was observed further to the east, although folding and distortion were prevalent.

Nearby Area

Two nearby exposures - a till along Lake Cavanaugh Road several hundred yards west of the fault exposure and a borrow pit (granular deposits) a few hundred feet north of the fault - were also visited. The till, which may be a part of the morainal dam responsible for forming the glacial lake in which the lake sediments were deposited, was undeformed. The granular deposits within the borrow pit however did contain a number of NE to E striking faults dipping to the SE-E. Offset on these faults is on the order of 1 to 2 ft. Although the origin of these faults is indefinite, it should be pointed out that displacement of these delta foreset beds is to be expected considering the environment within which these sediments were deposited. In fact, many recent slumps had occurred and are presently occurring on the borrow pit face. In this case coincidence of the trend of the lake sediment faults along Lake Cavanaugh Road and those in the borrow pit do not necessarily imply a common origin. The lake sediment displacements are definitely post-depositional while those displacements observed in the borrow pit would more likely have occurred during or shortly after deposition.

Deer Creek Drainage

A general auto reconnaissance was made of glacial deposits within the valley of Deer Creek from the Pilchuck Creek - Deer Creek divide eastward approximately six miles to the Deer Creek - Finney Creek divide. Reconstruction of a logging road bridge prevented reconnaissance further to the east in the Finney Creek valley. The purpose of the reconnaissance was an attempt to determine the presence of potentially mappable glacial horizons within the generally east - west Deer Creek - Finney Creek watersheds. The presence of these horizons could possibly enable Puget Sound Power and Light Company to address the tectonic stability of that area with particular reference to northwest-southeast trending structure. The following observations were made within the valley of Deer Creek: (1) the clearly-visible deposits are sporadic and are confined essentially to the north side of the valley, (2) no obvious widespread or continuous markers were noted, and (3) glacial deposit occurrences, although spectacular, were limited in extent and appeared to be restricted to a 3-4 mile area from the Deer Creek - Finney Creek divide westward.

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Conclusions

Faulting, not coincident in trend with faulting suggested by John Whetten along the Gilligan Creek lineament, in the vicinity of the proposed Skagit Nuclear Power Project, is clearly evident at Lake Cavanaugh Road. The possibility exists that the faulting origin is either tectonic or non-tectonic. Puget Sound Power and Light should conduct additional investigations in an attempt to determine the fault origin.

Harold E. Lefevre

Harold E. Lefevre, Geologist
Geology and Seismology Section
Geosciences Branch
Division of Site Safety and
Environmental Analysis

cc: R. Boyd
R. DeYoung
R. Denise
J. Stolz
I. Peltier
D. Caldwell
J. Kelleher
H. Lefevre
S. Wastler
R. Black
P. Leech
PDR
Local PDR
R. Morris, USGS
W. Hays, USGS
J. Minard, USGS