GEOLOGIC MAP GM-12

STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES

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GEOLOGIC MAP GM-12

THICKNESS OF UNCONSOLIDATED SEDIMENTS, PUGET LOWLAND, WASHINGTON

By

JOHN B. HALL and KURT L. OTHBERG

Prepared in cooperation with
UNITED STATES GEOLOGICAL SURVEY
1974

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TO ACCOMPANY
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SOURCES OF DATA, PLOTTING METHODS, AND LIMITATIONS

The isopach map is based on records from about 280 oil and water well logs, mapped surface exposures of bedrock, and subsurface seismic profiling data. The well-log data had two basic controls on the mapping: (1) some drillings penetrated bedrock and therefore provided the most direct thickness information, and (2) some deep drillings did not penetrate the base of unconsolidated deposits and therefore provided a limiting thickness below which the bedrock surface must lie. Thicknesses from seismic profiling were based on the change in depth of seismic velocity horizons.

Because of the spread of data points, the great range in thickness values, the small scale of the map, and suspected complex local relief on the buried bedrock surface, a contour interval of 400 feet was selected. Certainly the map cannot be expected to provide the detail necessary for local subsurface needs.

Using the outlines of exposed bedrock as a zero isopach contour, the subsurface contours were interpolated and drawn in accordance with the data points. In some areas, lack of data required extrapolation of contours. In these situations, structural trends and the patterns of most probable continental ice scour were considered for the final pattern determination.

This map should be considered as a first approximation. Additional data will change some aspects of the map. However, the map does provide a reasonable, generalized picture of the accumulation of unconsolidated sediments within the Puget Lowland. As such, it should prove valuable for its intended primary use—the analysis of past and future earthquake intensity and ground acceleration.

GEOLOGIC SETTING

The Puget Lowland lies between the Cascade Range on the east and the Olympic Mountains and Vancouver Island on the west. Generally speaking, the lowland is a north-south elongate structural trough, modified by Pleistocene deposition and erosion, lying approximately within 500 feet of present sea level.

Unconsolidated Pleistocene deposits cover a large part of the surface of the Puget Lowland. The bedrock surface underlying these deposits varies considerably in relief. Geophysical data indicate that large discontinuities exist in the rocks making up the Puget Trough (Danes and others, 1965; Stuart, 1961; Kaarsberg, 1967). It appears that the bedrock consists of several blocks that may have moved vertically relative to one another. The concentration of seismic activity in the Puget Lowland suggests the probability that faults bordering these blocks are tectonically

active today. This activity is also indicated by contemporary differential changes of ground elevation in the region (Crosson, 1972; Rasmussen, 1967; Sylwester and others, 1971; Rogers, 1970).

Deposition of unconsolidated sediments has largely filled the structural downwarps, resulting in a uniformly undulating topographic surface of relatively low relief. This gentle topography is broken only occasionally by protruding bedrock hills. The exposed bedrock consists predominantly of lower to middle Tertiary marine sedimentary and volcanic rocks.

Most of the unconsolidated sediments are probably of Pleistocene age. However, there are exposures of uncondolidated sediments as old as Miocene in Pierce County (Crandell and Gard, 1959; Walters and Kimmel, 1968). Well logs indicate that in most areas consolidated Tertiary rocks are separated from Pleistocene unconsolidated glacial deposits by a distinct unconformity. However, in some well logs this unconformity is not apparent, and the change from unconsolidated to consolidated sediments is interpreted to be gradational. In the basins where unconsolidated sediments are the thickest, sedimentation may have been nearly continuous from middle to late Tertiary through the present.

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EXPLANATION

THICKNESS DATA POINTS 1/

● Location of borehole that reached bedrock

○ Location of borehole that did not reach bedrock

□ Location of thickness based on seismic profile interpretation

ISOPACH CONTOURS 2/

Bedrock contact and zero contour

Interpolated contour

Extrapolated contour

N

5 0 5 10 MILES

400 FOOT CONTOUR INTERVAL SHOWING FEET BELOW GROUND SURFACE

SOURCE OF DATA

1/ The majority of the data points were obtained from oil and water well logs. Data points located in the various waterways were obtained from seismic information. Contacts of bedrock with the surface were based on geologic maps and unpublished information.

VALIDITY

2/ Isopach contours are the authors' interpretation of accumulated data. As additional data are gathered, it is expected that the present interpretation will be altered. This map should be considered and used only as a first approximation.

123° 122° 48° 47°

PUGET SOUND

SEATTLE

TACOMA

For sale by Department of Natural Resources, Olympia, Washington Price $1.00