UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DISTRIBUTION AND DESCRIPTION OF THE GEOLOGIC UNITS IN THE EVERETT QUADRANGLE, WASHINGTON

By

James P. Minard

Open-File Report 81- 248

This report is preliminary
and has not been reviewed for
conformity with Geological
Survey editorial standards
and stratigraphic nomenclature

Expanded Explanation

Qyal

Young alluvium

Clay, silt, and very fine sand to fine sand; unconsolidated, stratified, gray to brown. Contains abundant organic material. Medium to coarse sand and gravel underlies much of the fine-grained flood plain sediments, and is common in the small stream valley bottoms. Clasts are varied in composition[1]. The alluvium was derived from some or all the adjacent older sediments and from sources some distance up the main river valleys, beyond the boundaries of the quadrangle.

The alluvium is from 1 m to possibly 20 m thick. It occurs as present and former stream channel and flood plain deposits, and mostly is poorly drained. Peat deposits and buried logs and stumps are common in the flood plain of the Snohomish River. No attempt was made to map peat deposits or fill. For the location of some such deposits, see Smith (1976). Obvious areas of fill are west of the river near Lowell and along the shore of Port Gardner, also road and railroad embankments, and dikes or levees along Snohomish River and sloughs.

Qoal

Old alluvium

Sand and gravel; clean, stratified, gray to oxidized to shades of brown, with some sandy, pebbly, organic-rich silt. Includes colluvium, along the edges of the deposits, from adjacent steep slopes above. Clasts are varied in composition[1] and are derived from some or all adjacent older deposits.

The old alluvium is 1 to 5 m thick. It partly is a terrace landform several meters above the adjacent flood plain young alluvium. The old alluvium is partly covered by a series of young alluvial fans deposited by the numerous small streams flowing from the steep valley slope out on the flood plain. The old alluvium is mostly well drained. It lies unconformably on the older underlying deposits.

Qls

Landslide deposits

Clay, silt, sand, and gravel; intermixed debris from adjacent units transported downslope as landslides, slumps, and earth flows.

Only a few small slides are mapped in Pigeon Creek valley in the northwest part of the quadrangle. For additional possible landslides, refer to Smith (1976). The slides most often involve the three Vashon units: Qvt, Qva, and Qvn. The Qvn clay retards vertical internal drainage. Groundwater moves laterally atop the Qvn clay, sapping and undermining the overlying Qva sand all the way up to the Qvt. Some water moving down vertical joints and along clay layers in the Qvn, locally create low internal cohesion in that unit. Aided by these factors and the weight of the overlying Qva and Qvt, failure is common down into the Qvn.

Qvr

Recessional outwash and associated deposits, undifferentiated

Sand and gravel, mostly clean, permeable, stratified, gray to oxidized to shades of brown with some beds cemented by iron oxide. Fines upward. Clasts are varied in composition[1] and are derived from some or all the older adjacent units and ice-transported debris.

Generally only 2-4 m thick. Deposited by meltwater flowing from the receding Vashon glacier. Mostly well drained. Overlies older deposits conformably to unconformably.

Qvt

Vashon till

Clay, silt, sand, pebbles, cobbles, and boulders; non-sorted (diamicton). Looks like concrete mix. The till contains some lenses of stratified material, particularly in the lower part. Compact to locally cemented lodgment till, commonly called "hardpan". The till has a sheeting or fissility near and parallel to the surface and tends to spall and crumble where exposed. Varied texturally, mineralogically, and in clast composition[1]. It is similar to the adjacent older deposits, from which it was largely derived.

Outcrops of till are from 3 to 20 m thick in the quadrangle. The till was deposited directly by the ice as it advanced over bedrock and older Quaternary sediments. Its compactness partly results from the weight of the ice, which was hundreds of meters thick when it overrode the till. Drainage is good in the 1 to 3 m of loose, upper, weathered material, but water ponds and moves laterally along the buried "hardpan" surface. The till lies unconformably on or against older underlying deposits.

Qva

Vashon advance outwash

Sand with pebbles and some cobbles; clean, mostly gray, well-stratified, unconsolidated. Coarsens upward. Locally silty and oxidized to shades of brown. Clasts are varied in composition[1] and derived from adjacent older units and ice-transported debris.

The advance outwash is as much as 70 m thick in outcrop in the quadrangle. It was deposited as bar and channel sediment in and along meltwater streams flowing from the advancing Vashon glacier, and as deltas in ponded areas.

The advance outwash is one of the thickest and most extensive aquifers in the region. It lies conformably on the older underlying unit (Qvn). The advance outwash contains the Esperance Sand of Newcomb (1952) and Smith (1976) and includes the Upper Esperance coarse advance outwash of Smith (1976).

Qvn

Vashon glacial to pre-Fraser non-glacial deposits, undifferentiated

Clay, silt, and very fine to fine sand; contains some layers of peaty sand and gravel in the lower part. Along Port Gardner as much as 8 m of bedded, partly oxidized, very firm, medium to coarse sand is present below the gravel layers. Beds range from thick to thin to laminae.

The unit is as much as 50 m thick in outcrop in the quadrangle. Clay and silt beds are compact but may be unstable because of high moisture content, plasticity, and local vertical jointing. Mostly deposited in still to low velocity water, except for the lower, coarse stream deposits. The unit contains the Pilchuck clay and Admiralty clay of Newcomb (1952), and most of the Whidbey Formation of Smith (1976).

Qn

Pre-Fraser non-glacial deposits, undifferentiated

Sandy pebble gravel with alternate beds and lenses of medium to coarse sand. Partly oxidized to shades of brown and weakly to firmly cemented by iron oxide.

The unit is 6 to 7 m thick in outcrop in the quadrangle. It was largely deposited by streams. Basal contact relationships are obscured by younger alluvium.

Ts

Tertiary sedimentary rocks

Shale, siltstone, sandstone, and pebble conglomerate. Thin coal beds are common. Rock particles include quartz, quartzite, and volcanic rock pebbles, and a varied suite of sand grains, including quartz, feldspar, phyllite, mica and pyroxene clasts. Siderite concretions are common locally in the sandstone. Color ranges from dark gray and olive gray to reddish brown and tan. Typically, most exposed rocks are oxidized to shades of brown. Bedding ranges from thick to thin and shaly, concentric weathering is common. The rocks range from well-indurated to loose and crumbly.

The unit is about 50 m thick in outcrop in the quadrangle. It strikes generally north to northwest and dips west to southwest. It probably is Oligocene in age (Addicott, written communication, 11/02/78), and is similar to the Blakeley Formation to the south and rocks near Bulson Creek to the north. It crops out only in a small area in the southeast corner of the quadrangle.

[1] Rock types include basalt and metabasalt (greenstone), volcanic breccia, andesite, rhyolite, pink granite, gray granite, granodiorite, quartz-hornblende gneiss, schist, quartzite, vein and crystalline quartz, limestone, sandstone, conglomerate, shale, argillite, and phyllite. Sand in deposits include particles and minerals from some or all these rock types.

References Cited

Newcomb, R. C., 1952, Ground water resources of Snohomish County, Washington: U.S. Geological Survey Water Supply Paper 1135.

Smith, Mackey, 1976, Preliminary surficial map of the Mukilteo and Everett Quadrangles, Snohomish County, Washington: Washington State Department of Natural Resources, Division of Geology and Earth Resources Geologic Map GM-20.