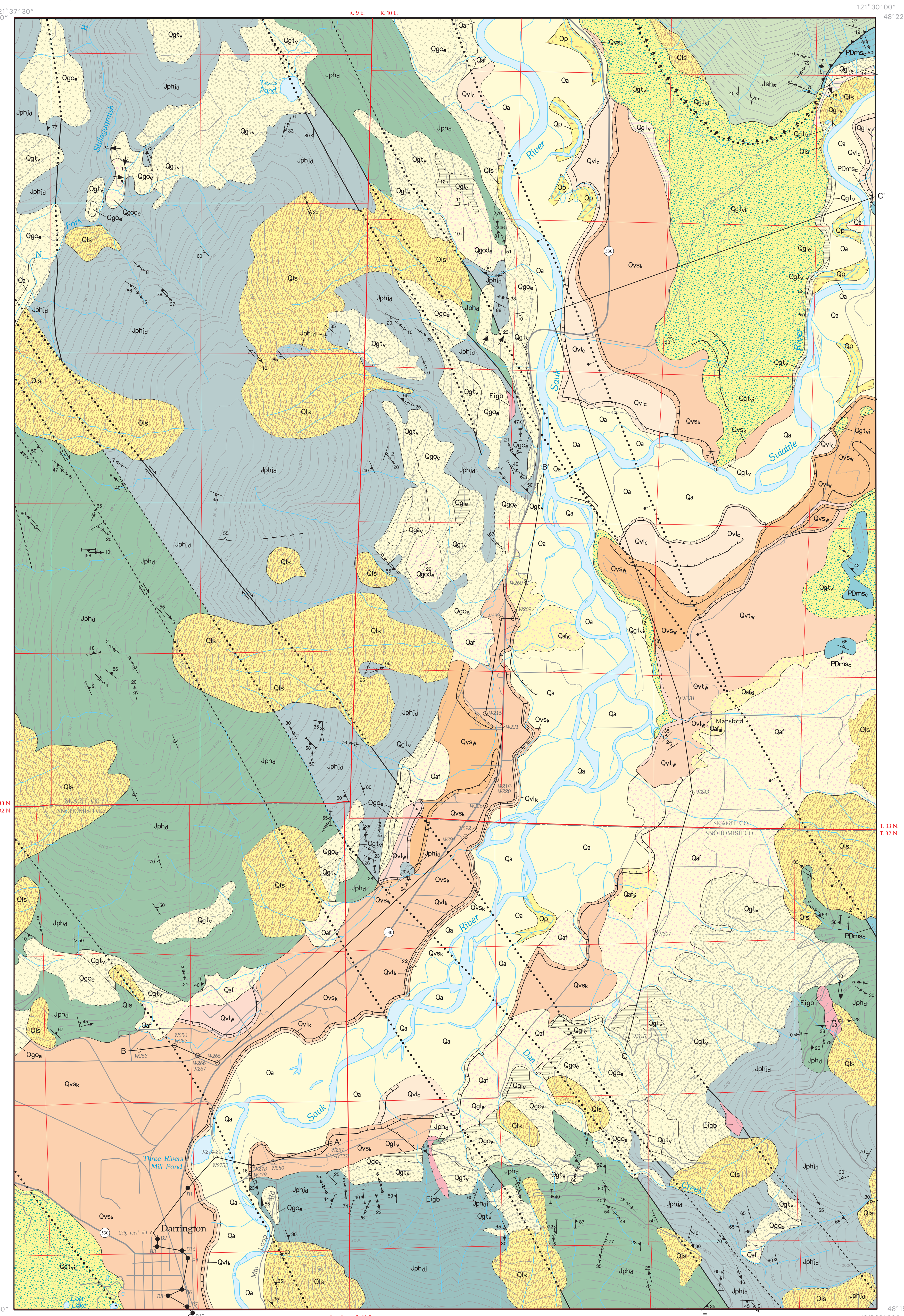
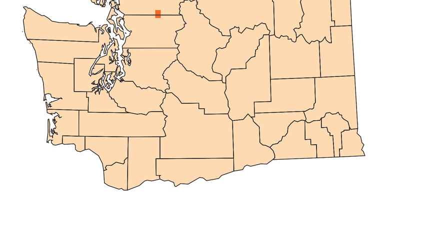
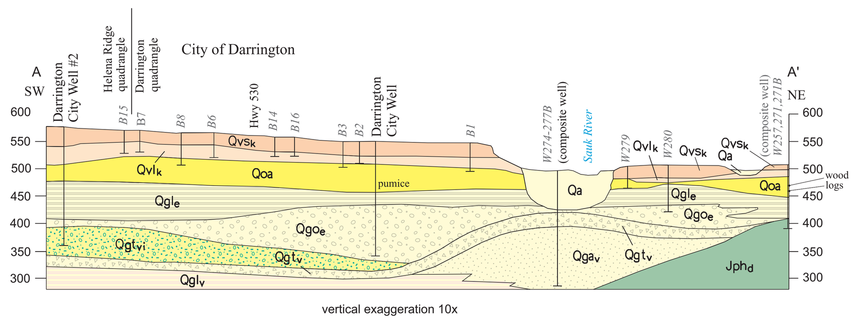
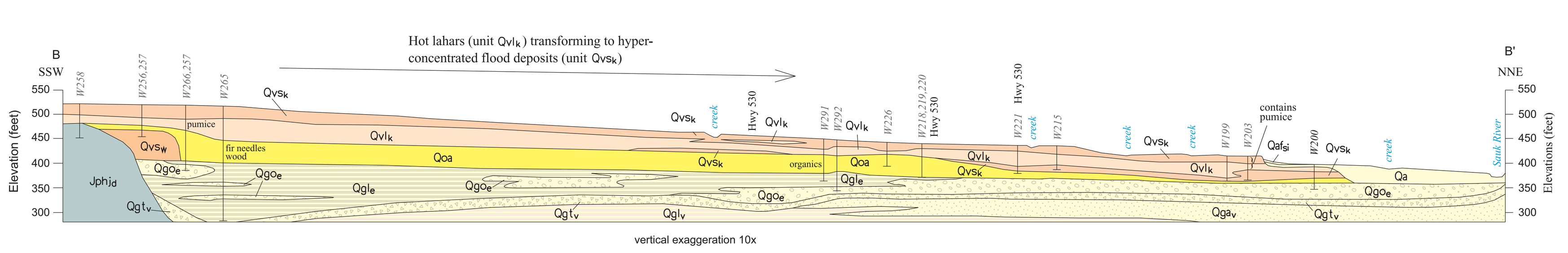


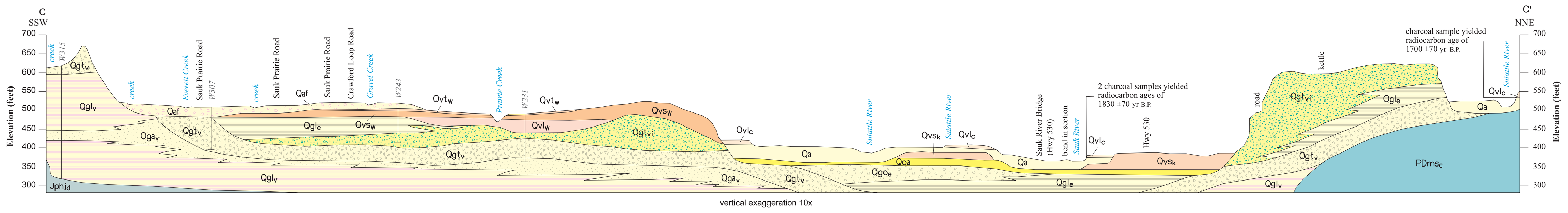
## Geologic Symbols

### Well and Borehole Symbols









## Description of Map Units

### QUATERNARY SEDIMENTARY AND VOLCANIC DEPOSITS

#### Holocene Nonglacial Deposits

#### Late Pleistocene and Holocene Glacier Peak Volcanic and Sedimentary Deposits

*Chocolate Creek Assemblage*

*Kennedy Creek Assemblage*

*White Chuck Assemblage*

#### Pleistocene Glacial Deposits

*Deposits of the Fraser Glaciation*

Everson Interstade

Vashon Stade

Qgl$_v$ **Advance glaciolacustrine deposits (Pleistocene)**—Clay, clayey silt, silt, silty clay, and silty fine sand with local dropstones; locally contains fine- to medium-grained sand lenses and beds; stiff; well-sorted; thinly bedded or laminated. Silts and clays are dark gray, blue gray, and gray, weathering to pale yellowish brown; 1 to 4 cm (0.4–1.6 in.) thick rhythmite bedding (varves?) common, normally graded from sand to silty clay. Soft-sediment and (or) ice-shear deformational features are common and include tilted and contorted bedding, overturned folds, and flame structures; overturned fold geometries are consistent with ice shear during ice advance up the major river valleys. Locally overlain by and interbedded with unit Qga$_v$ (cross sections A–A′, B–B′, C–C′).

### TERTIARY INTRUSIVE ROCKS

Eigb **Gabbro (Eocene)**—Gabbro or diabase dikes, sills, and small irregular intrusions; nonfoliated; equigranular, medium-grained; greenish gray; some of the bodies appear to intrude faults; contains hornblende (commonly uralitic), plagioclase (mostly labradorite), and minor clinopyroxene phenocrysts; common alteration minerals include disseminated calcite, quartz, sulfides, and sericite. Although not directly dated, gabbros are probably Eocene and possibly Oligocene in age and may represent feeder bodies for volcanic rocks near the map area (Jones, 1959; Vance, 1957; this study; Dragovich and others, 2002a).

### MESOZOIC TO PALEOZOIC LOW-GRADE METAMORPHIC ROCKS (BLUESCHIST FACIES)

Thrust-faulting and nappe formation in the Northwest Cascades System occurred in the Cretaceous (~110–90 Ma) (see Brown, 1987). The Chilliwack Group of the Excelsior nappe of Tabor and others (1994) structurally underlies the Shuksan nappe in the northeast part of the Darrington quadrangle.

#### Easton Metamorphic Suite of the Shuksan Nappe

The Easton Metamorphic Suite of Tabor and others (1994) includes the Darrington Phyllite, semischist of Mount Josephine, and the Shuksan Greenschist. These units are interlayered on mountain to outcrop scales and are interpreted to be oceanic crust (Shuksan Greenschist and part of the Darrington Phyllite) and submarine fan deposits (part of the Darrington Phyllite and the semischist of Mount Josephine). Semischist and phyllite are locally interlayered on a scale of millimeters to meters; these are interpreted as distal turbidite and basin-plain deposits. Shuksan Greenschist is mostly mid-oceanic-ridge metabasalt. Rocks of the Easton suite typically have a penetrative S1 (first-generation) foliation, with bedding transposed subparallel to S1 and abundant quartz segregation along S1. The Easton Metamorphic Suite is probably Jurassic (Armstrong and Misch, 1987; Brown and others, 1982; Brown, 1986, 1987; Gallagher and others, 1988; Tabor and others, 1994; Dragovich and others, 1998, 1999, 2000a).

**Darrington Phyllite and (or) semischist of Mount Josephine (Jurassic)**—Metasediments of the Shuksan nappe are divided into three map units on the basis of the percentage of interbedded phyllite and semischist:

Jph$_d$ 90–100% Darrington Phyllite
(0–10% semischist of Mount Josephine)

Jph$_{dj}$ 50–90% Darrington Phyllite
(10–50% semischist of Mount Josephine)

Jph$_{jd}$ 0–50% Darrington Phyllite
(50–100% semischist of Mount Josephine)

Darrington Phyllite consists of sericite-graphite-albite-quartz phyllite to graphitic quartz phyllite (metashale or metasiltstone) with rare interbeds of micaceous quartzite (metachert) and albite schist; some phyllite is bluish black to black due to disseminated graphite (relict organic matter); silver-colored phyllites are muscovite rich; metamorphic minerals include chlorite, epidote, muscovite, lawsonite, and rare garnet; large albite porphyroblasts observed locally. Phyllites characteristically display two to locally three generations of folding. The second generation of folding (F2) is the most conspicuous and commonly has a subhorizontal fold axis oriented west-northwest or east-southeast.

Semischist of Mount Josephine consists of lithic-subquartzose semischistose sandstone or feldspathic metawacke; rare metaconglomerate; light green gray, green gray, medium gray, and light bluish gray. Semischist typically contains abundant stretched relict sand grains of polycrystalline and monocrystalline quartz, albitized plagioclase, and sparse lithic fragments; metamorphic minerals are similar to those of the Darrington Phyllite (Jones, 1959; Morrison, 1977; Tabor and others, 1988, 1994, in press; Dragovich and others, 1998, 1999, 2000a).

Jsh$_s$ **Shuksan Greenschist (Jurassic)**—Mostly well-recrystallized metabasalt; strongly S1 foliated; locally includes iron- and manganese-rich quartzite (metachert) and graphitic phyllite interlayers; greenschist locally contains epidote segregations or primary layers and is mostly shades of greenish gray and weathers to light olive gray; blueschist is bluish gray to bluish green. Greenschist commonly layered on a centimeter scale; S1 foliation and layering are commonly folded on an outcrop scale. Relict igneous minerals locally include saussuritized and albitized plagioclase laths, actinolized hornblende, and rare clinopyroxene. Metamorphic minerals include albite, actinolite, epidote, and chlorite with lesser lawsonite, Mg-pumpellyite, muscovite, spessartine, and calcite. In rocks of the appropriate iron composition and oxidation state, Na-amphibole (for example, crossite) replaces actinolite as the primary metamorphic amphibole to form blueschist instead of greenschist; greenschist and blueschist are locally interleaved at outcrop scale (Haugerud and others, 1981; Brown, 1986; Tabor and others, 1988, in press; Morrison, 1977; this study).

#### Chilliwack Group of the Excelsior Nappe

The Chilliwack Group is largely volcanic arc in origin. U-Pb ages and fossils indicate that the Chilliwack Group is largely Permian to Devonian in age (see Tabor and others, 1994).

PDms$_c$ **Metasedimentary rocks (Permian to Devonian)**—Volcaniclastic metawacke, volcanic subquartzose metasandstone, and meta-argillite with minor marble and phyllite and rare chert and pebble metaconglomerate. Graded beds, rhythmites, and load casts locally prominent. Locally contains basaltic to rhyolitic greenstone. Greenstone includes breccia, tuff, and flows and is locally amygdaloidal and pillowed. Metamorphic minerals include albite, chlorite, epidote, and minor lawsonite, aragonite, and calcite. Rocks grade from slightly deformed to phyllitic with pronounced foliation generally subparallel to bedding (Tabor and others, 1988, in press; Vance, 1957; this study)

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# Geologic Map of the Darrington 7.5-minute Quadrangle, Skagit and Snohomish Counties, Washington


by

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2002


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