

Sand Point Count and Geochemical Data in the Fall City and Carnation 7.5-minute Quadrangles, King County, Washington

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EXPLANATION

The attached Excel spreadsheets provide sand point count and geochemical data obtained during our geologic investigation of the Fall City 7.5-minute quadrangle. The reader is urged to examine the data in conjunction with the geologic map and explanatory pamphlet in Dragovich and others (2007). Figure 1 provides the sample locations for both data sets. (See two Carnation quadrangle point count samples noted below.)

POINT COUNT DATA

The sand point count data is presented as six sheets within one spreadsheet entitled “point count data”. The latitude and longitude location of the two point count sand samples obtained from the Carnation quadrangle north of the Fall City 7.5-minute quadrangle are provided in the sheet entitled “raw point counts and locations”. The data in each sheet is briefly explained in Table 1. Note that the “granitic lithics” point count category includes mostly phaneritic intrusive clasts such as granite but may also include minor quartz-feldspathic metamorphic lithics such as metasandstone or quartz-feldspathic gneiss fragments which can be difficult to differentiate from granites at the scale of observation. See Table 2 below for the formation name of the geologic unit symbols (for example Qgt(v)) provided in each sheet.

Table 1. Basic information provided in each excel sheet of file “point count data”.

Sheet	Notes
Raw point counts and locations	Provides the raw point count numbers for each category of minerals or lithic clasts as well as the total number of counted clasts. Provides the 7.5-minute quadrangle location (Fig. 1) or lat-long if located in the Carnation 7.5-minute quadrangle.
Point count grain percentages	Give the percentage of each grain as normalized to 100% from the raw point count data.
Point count statistics by unit	Provides the minimum, maximum, average and standard deviations of the mineral and lithic clasts categories in percent for each geologic unit. Also provides the same statistics for the total volcanic lithic clast and total metamorphic lithic clast categories. See Table 2 for the names of the geologic units. Also note the modal “difference” between samples 06-60D and 06-42K provided on the bottom row. Data shows that unit Qa alluvium is similar modally to unit Qc(o) ancient alluvium. (See geochemistry of these sands in other spreadsheet and Dragovich and others [2007] for discussion.)
Raw point counts for QFL	Provides the raw point count data required for the QFL categories given in the next sheet. Excludes mineral or grain categories not required for this calculation such as calcite or chlorite, etc..
QFL	Quartz (Q), feldspar (F), and lithic (L) percentages based on the “raw point counts for QFL” data sheet (above). Gives QFL percentages with chert calculated as both a Q or L fragment.
QmQpPF	Raw point count data and monocrystalline quartz (Qm), polycrystalline quartz (Qp) and potassium feldspar (PF) statistics. See Dragovich and others (2007) for a discussion of these data. For example, note the compositional differences between glacial and nonglacial geologic units.

Table 2. Rock unit list for the Fall City quadrangle. See spreadsheets for unit symbols. Italicized unit symbols contain either geochemical or sand point count information.

UNIT SYMBOL	GEOLOGIC UNIT
Holocene Deposits	
Qp	Peat
<i>Qa</i>	<i>Alluvium</i>
Qls	Landslide deposits
Qaf	Alluvial fan deposits
Af	Artificial fill and modified land
Recessional deposits of the Vashon Stage of the Fraser Glaciation	
<i>Qgik</i>	<i>Kame deposits</i>
Qgie	Esker deposits
<i>Qgog</i>	<i>Gravelly outwash deposits; undivided gravelly facies</i>
<i>Qgic</i>	<i>Ice contact deposits, undivided</i>
Qgi	Ice contact diamicton
Qgod	Deltaic deposits
Qgof	Fluvial recessional deposits
<i>Qgos</i>	<i>Sandy outwash deposits (mostly lake deposits)</i>
Qgl(r)	Glaciolacustrine (lake) deposits
Vashon glacial deposits of the Fraser Glaciation	
Qgt(v)	Till
<i>Qga(v)</i>	<i>Advance outwash deposits</i>
<i>Qgl(v)</i>	<i>Advance lake deposits</i>
<i>Qc(o)</i>	<i>Olympia nonglacial (continental) deposits</i>
Pre-Fraser glacial and non-glacial deposits	
Qgn(pf)	Pre-Fraser drift (For undivided glacial and nonglacial deposits). Locally divided into:
<i>Qgo(p)</i>	<i>Older outwash tentatively assigned to the Possession glaciation</i>
Qgt(p)	Older till tentatively assigned to the Possession glaciation
Oo	older outwash (Double Bluff glaciation or older)
Ot	older till (Double Bluff glaciation or older)
Oot	Older older till
Whidbey Formation	
Qc(w)	Whidbey Formation sands, silts and peats
Tertiary volcanic and sedimentary rocks (cross-sections only)	
Ovc	Ohanapecosh Formation
Mvc	Vasha Park tuff
OEn	Blakely Formation (shallow marine sediments)
Ev	Volcanic rocks of Mount Persis
Tertiary Volcanic and Sedimentary Rocks of the Puget Group	
Ec(r)	Renton Formation
<i>Evt(t)</i>	<i>Tukwila Formation, breccias and tuffs</i>
<i>Evs(t)</i>	<i>Tukwila Formation, tuffs and volcanic sediments</i>
Ec(t)	Tiger Mountain Formation
Em(r)	Raging River Formation
Ei	Intrusives of the Raging River Valley
Tectonic Zone	
Tz	Mylonite, protomylonite, cataclasite and zones of moderate to low temperature tectonic disruption in fault zones
Cretaceous-Jurassic Metamorphic rock	
KJm	Western mélange belt

Geochemical Data

Geochemical analyses are provided for the Tukwila Formation and two Quaternary sand samples (Table 3). Geochemical analyses were performed at the Washington State University geochemistry laboratory in 2007. Analytical methods are provided in Johnson and others (1999). Geochemical data is provided in Excel file “geochemistry”. The Quaternary sands are modern Snoqualmie River alluvium (unit Qa) and probable ancient Snoqualmie River alluvium of the Olympia beds (unit Qc(o)). Dragovich and others (2007) state that, “the similarity between ancient and modern Snoqualmie River alluvium is best demonstrated by a comparison of December 2006 flood sands collected near Fall City (site 1) and elevated Olympia sands collected along Snoqualmie Ridge (site 4). Both contain very similar geochemical and sand point-count compositions (Dragovich, 2007). The geochemical similarity coefficient for these two samples is 0.94. These medium sands are modally similar with no category differing by more than 1.4% (greatest difference is monocrystalline quartz 22.9% and 21.5%).”

Sample No.	Rock Province	Sample and thin section notes	Township	Range	Sect.
06-32H	Tukwila Formation Cascade volcanic provenance	Tuff breccia with few dacitic(?) clasts. Sample appears homogeneous and contains no clasts and is composed of microlites of plagioclase in brownish glass matrix. Outcrop contains 1 cm long breccia fragments of similar comp and few possible more felsic clasts. Brownish red nature of matrix suggestive of alteration or oxidation. Suspect sample is all tuff matrix composed mostly of glass and lesser crystals no obvious larger clasts. Great clear glass with black very fine opaque minerals and aligned microlitic plagioclase in glass. Also contains large blocky plagioclase and distinct volcanic clasts of composition similar to the matrix. Sample appears welded with much alignment of plagioclase, microlites and lithics. Contains blades of clear, moderately birefringent clinopyroxene and brown chloritized clinopyroxene or possibly hornblende. Lithic-crystal-vitric tuff with some variation in color of glass of individual andesite lithic grains with wavy boundaries; dominantly lithic with much microlitic plagioclase.	23N	6E	6

	Tukwila Formation Cascade volcanic provenance	Crystal vitric tuff (possible these are hypabyssal intrusives but unlikely given following crops). Homogeneous texture and porphyritic appearance does give a shallow intrusive massive appearance. Likely welded. Three very clean fragments sent for geochemical analyses. Tuff or porphyry with brown hornblende and plagioclase phenocrysts. Contains large brown subhedral to euhedral hornblende and oscillatory zoned plagioclase. Hornblende and plagioclase to 2.5 mm long. Plagioclase looks resorbed. No free quartz obvious and contains some brown replacement material typical of the area but less extensive here. Matrix 50% by volume and is light golden brown to clear in color.	24N	6E	25
06-9C	Tukwila Formation Cascade volcanic provenance	Outcrop of volcanic sandstone cut by basaltic dike or possible sill. Basalt dike likely cross-cuts subtle bedding. Very thinly to thickly bedded fine volcanic sandstone and conglomerate containing abundant volcanic clasts (hyperconcentrated flood deposits in fluvial environment likely). Distal depositional Tukwila Formation environment with both volcanic sediments and tuffs. Submitted very clean fine-grained dark basalt. Dike looks petrographically similar to other dikes with abundant grains of equidimensional small plagioclase with some weak alignment and sugary grains of small clinopyroxene. Very little glass and significant opaque grains with very homogeneous overall appearance. Carbonate filled vesicles or carbonate after large scattered blades of plagioclase. Interlocking microlites of bladed plagioclase with a lot of small clinopyroxene and distinct flow alignment.	24N	7E	29-30
06-32R	Tukwila Formation Cascade volcanic provenance lahar clast in volcanic conglomerate	Good exposure of conglomerate with cobble size clasts. Clasts are subrounded and probably lahar. Rounded clasts contain hornblende and plagioclase to 3 mm long. Plagioclase oscillatory zoned, clear, and mostly euhedral. Deep brownish red pleochroic hornblende. Phenocrysts in a glassy matrix of clear to light brown material with small grains of opaque minerals and some of the brown replacement material common in the area. The large plagioclase blades are floating in microlitic matrix with minor interstitial glass. Alteration is relatively low for Tukwila Formation with brown hornblende still mostly intact.	24N	6E	36
06-6K	Tukwila Formation Cascade volcanic provenance	Tukwila formation tuff breccia with small coalified logs locally. Mostly massive with subtle bedding due to possible lapilli welding. Good exposure SW of Lake Alice on Snoqualmie Parkway. Contains small 1cm or less semi-welded lapilli of andesitic to dacitic composition. Sample is light green and likely chloritized possibly related to nearby hydrothermal alteration along faults. No thin section	24N	7E	35

06-42K-2	Olympia Nonglacial sediments (Olympia beds)	Trough cross-bedded fluvial sands behind house. Sand with a few pebbles locally. Mostly medium sand and well sorted and some fine sand. See point count data.	24N	7E	23
06-60D	Snoqualmie River recent overbank flood sands	Bridge at Fall City. Sands from December flooding. 2-m-thick sands accumulated behind bridge at Fall City. See point count data.	24N	7E	14

References Cited

Dragovich, Joe D.; Anderson, Megan L.; Walsh, Timothy J.; Johnson, Brendon L.; Adams, Tamara L., 2007, Geologic map of the Fall City 7.5-minute quadrangle, King County, Washington: Washington Division of Geology and Earth Resources Geologic Map GM-67, 1 sheet, scale 1:24,000, with 16 p. text. [<http://www.dnr.wa.gov/geology/pdf/gm67.pdf>]

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