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## PLATE 1

**NOTICE**  
The map cannot serve as a substitute for site-specific investigations by qualified practitioners. Site-specific data may give results that differ from those shown on the map.

## MAP DISCUSSION

The Oregon City quadrangle is located in the southern Portland urban area in northwestern Oregon and consists principally of a gently rolling plateau cut by the canyons of the Willamette and Clackamas rivers and Abernethy, Beaver, and Root creeks and their tributaries. The southeastern end of the Tualatin Mountains extends into the northwestern corner of the quadrangle. Land use in the area at the time of mapping is a mix of urban, rural-residential, and agricultural-suburban lands, and the area is developing rapidly. This map was prepared with support from the U.S. Geological Survey, with the goal of improving the understanding of faults and seismic hazards in the Portland urban area.

The geology was mapped using field observations, drillers' logs from hundreds of approximately located water wells, geochemical analyses of volcanic rocks, and geochemically analyzed well sections (see Figure 1, below), as well as interpretation of high-resolution digital elevation models (DEMs) derived from light detection and ranging (lidar) data. Notes for the field observations, water well locations, geochemical data, and geochemically analyzed wells are provided in digital form in the appendices in the accompanying report. The map was compiled digitally in ArcMap™ using the lidar DEM as a base map.

The geology of the area consists entirely of Neogene volcanic and terrestrial sedimentary rocks, with extensive Quaternary surficial deposits. The oldest rocks in the quadrangle are middle Miocene basalt flows of the Columbia River Basalt Group, which are overlain by Miocene to Pliocene fluvial sedimentary rocks of the Troutdale Formation. These units are in turn overlain by Pliocene to Pleistocene lava flows and tephra from numerous local vents of the Boring volcanic field and by fluvial conglomerate deposited by the ancestral Clackamas River.

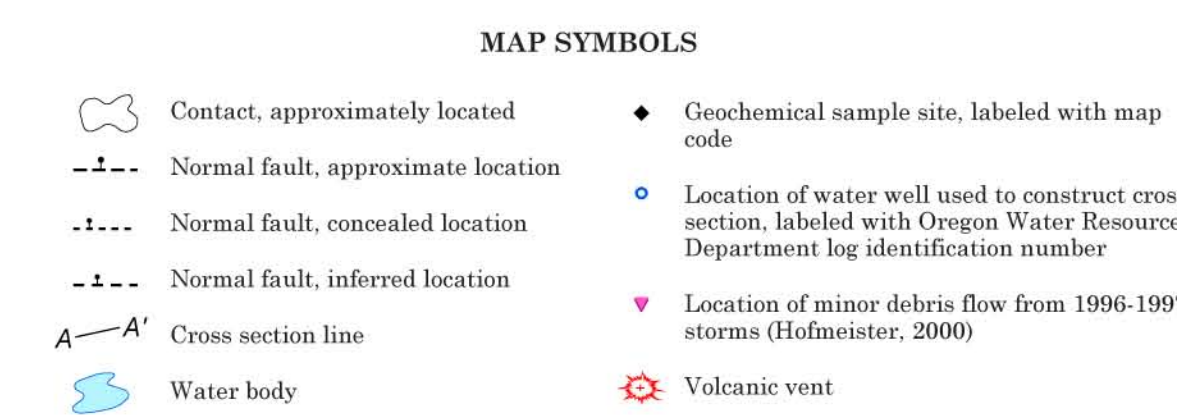
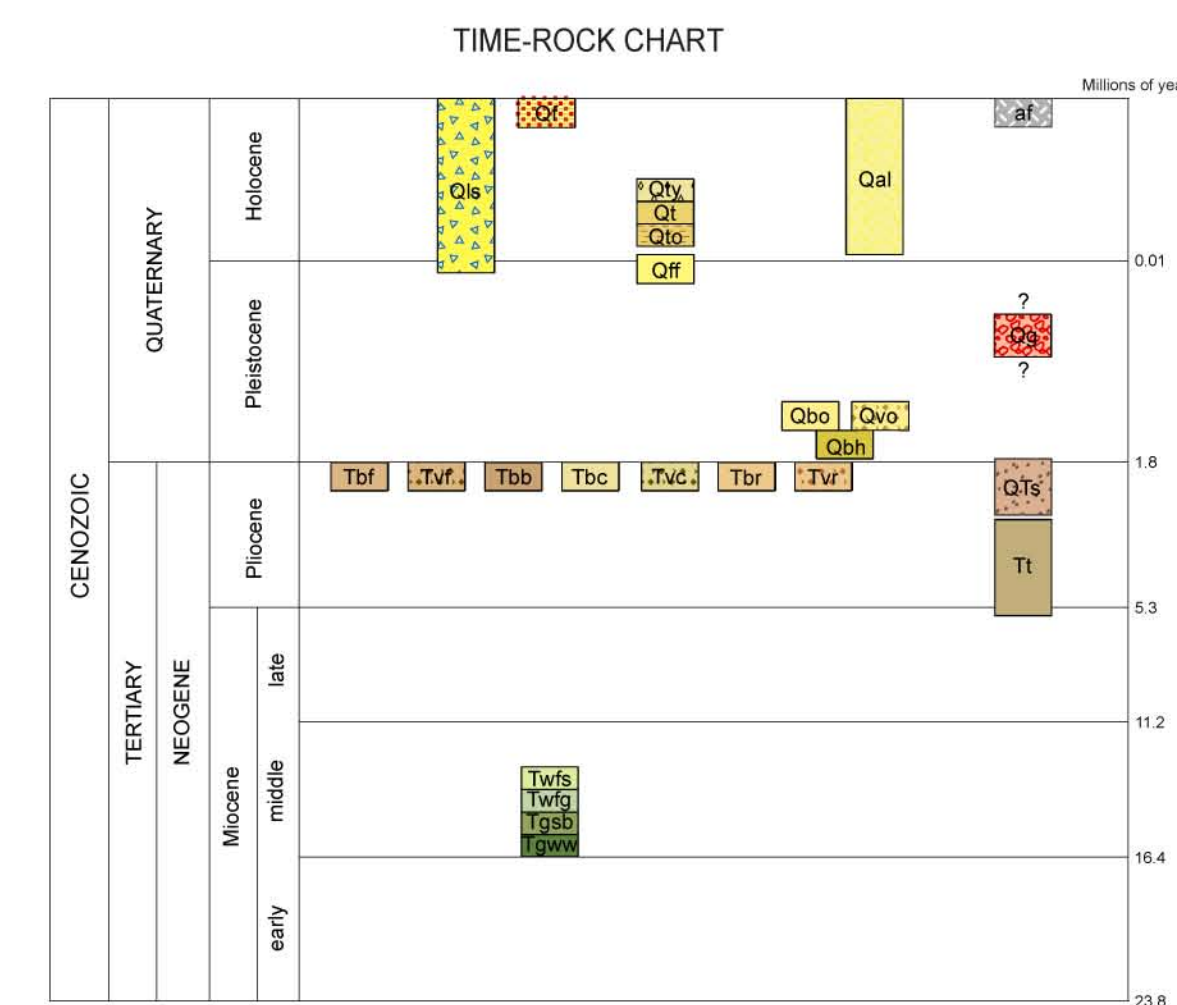
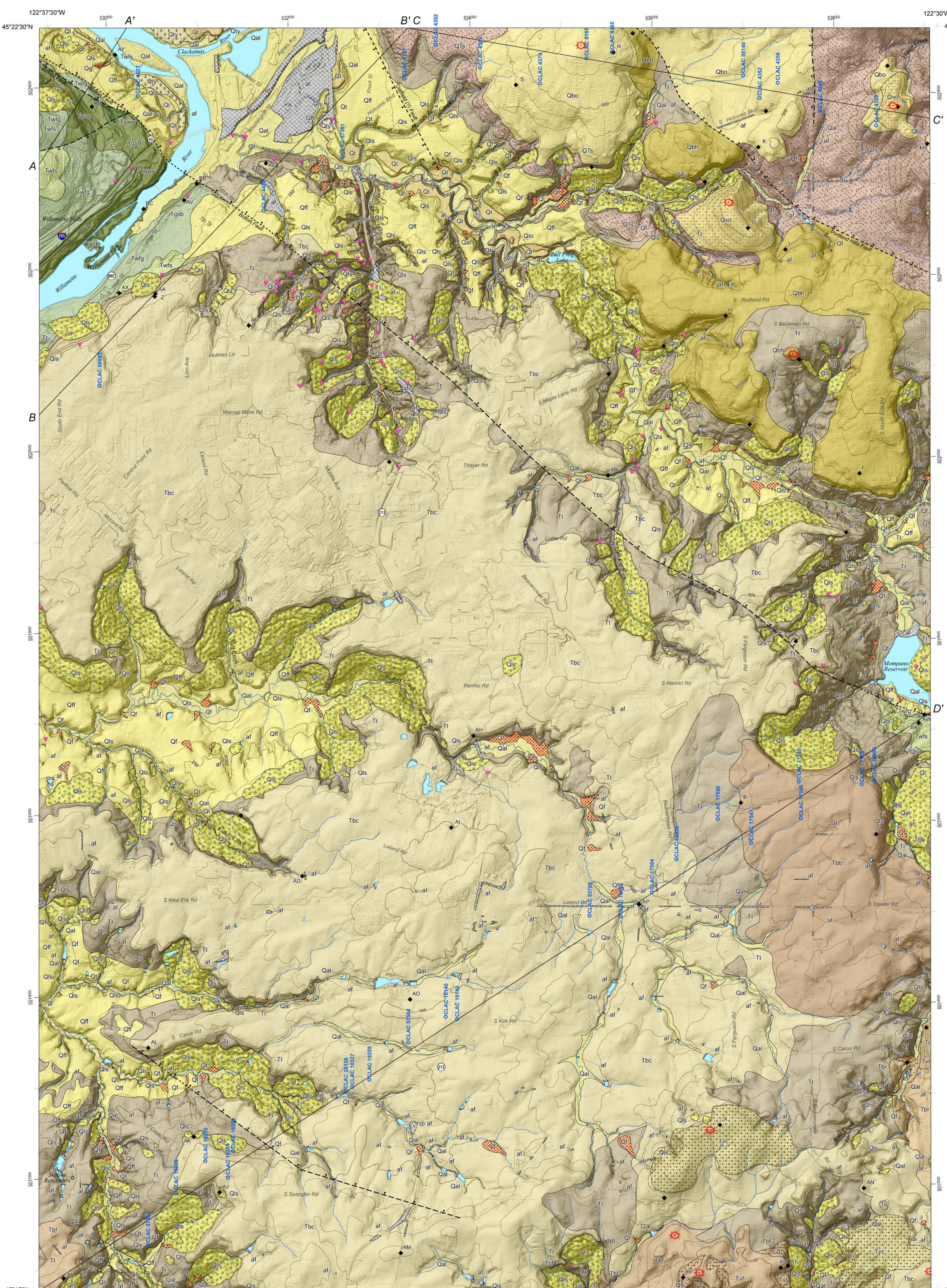
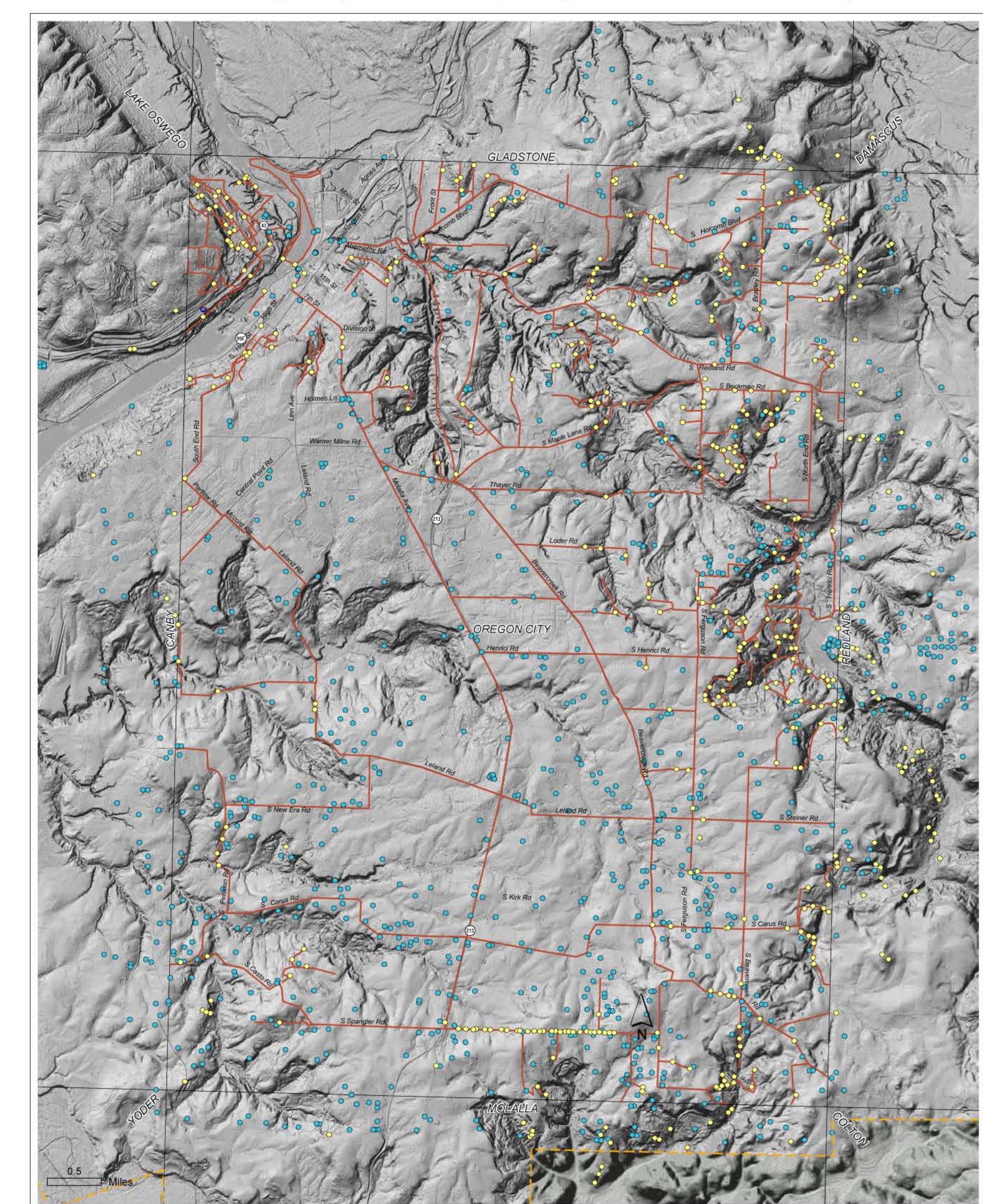
Quaternary surficial units include extensive deposits of silt and fine sand left by catastrophic outburst floods from Glacial Lake Missoula, terrace deposits cut into the Missoula deposits, and alluvium on the floodplains and in the channels of rivers and streams. Deposits of both shallow- and deep-seated soil and rock landslides are abundant, as are alluvial fans deposited by numerous debris flows. Artificial fill is widespread in the form of road embankments, culvert fills, and dams for small impoundments.

The structure of the map consists of a largely flat-lying sequence of volcanic and sedimentary rocks cut by two major and several minor N to NW trending faults. The Bolton Fault traverses the entire quadrangle and offsets all units except the Quaternary surficial deposits. The fault offsets Miocene rocks 225 m down to the NE, and Quaternary rocks 28 m in the same sense. The preferred slip rates for the Bolton Fault are 0.015 mm/yr based on Miocene rocks and 0.011 mm/yr based on Quaternary rocks. The Portland Hills Fault traverses the northeastern corner of the map and offsets all units except the Quaternary surficial deposits. The fault is inferred to offset Quaternary rocks 90 m down to the northwest. The preferred slip rate for the Portland Hills Fault is 0.075 mm/yr.

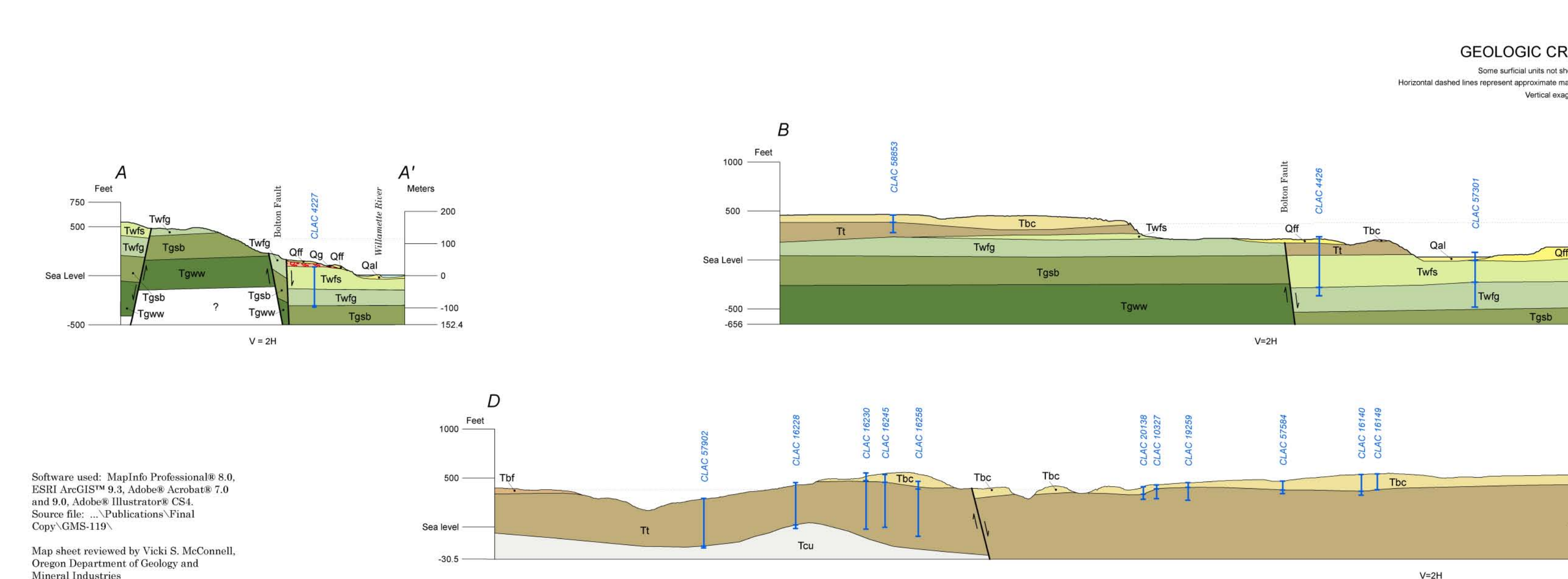
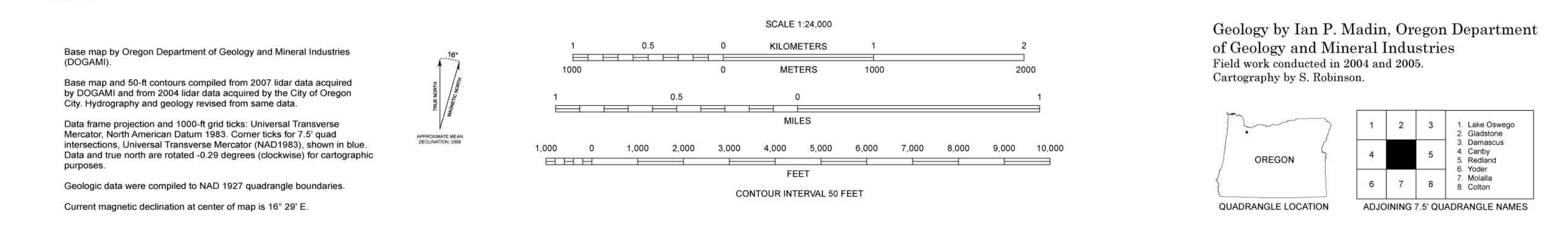
## REFERENCES

- Hofmeister, R. J., 2000, Slope failures in Oregon: GIS inventory for three 1996-97 storm events: Portland, Ore., Oregon Department of Geology and Mineral Industries Special Paper 34, 20 p.  
Palmer, A. R., and Geissman, J., 1999, 1999 Geologic time scale: Boulder Colo., Geological Society of America, 1 p.

Figure 1. Data map. Red lines show field traverses made; yellow dots are located field observations (see Appendix A); blue dots are approximately located water wells (see Appendix B). For reference purposes, gray lines are 7.5' quadrangle boundaries; gray lines are local roads with names labeled. Base map consists of 2004 and 2007 lidar-derived data with supplementary 10-m DEM. Scale is 1:62,000. Orange lines indicate southern extent of lidar coverage.



- Quaternary Surficial Deposits**
- Qal** Alluvial deposits (Quaternary) — Gravel, sand, silt, and clay deposited in the active channels and floodplains of rivers and streams.
  - Qts** Terrace deposits, younger (Quaternary) — Lowest silt and sand (?) deposits capping strath terraces inset into Missoula Flood deposits along Abernethy Creek and the Willamette River near its confluence with the Clackamas River.
  - Qti** Terrace deposits (Quaternary) — Intermediate-elevation silt and sand (?) deposits capping strath terraces inset into Missoula Flood deposits along Abernethy Creek and the Willamette River near its confluence with the Clackamas River.
  - Qto** Terrace deposits, older (Quaternary) — Highest silt and sand (?) deposits capping strath terraces inset into Missoula Flood deposits along Abernethy Creek and the Willamette River near its confluence with the Clackamas River.
  - Qff** Fan and flow deposits (Quaternary) — Mixed sand, silt, clay, gravel, and soil deposited by earthflows or debris flows.
  - Qf** Missoula (Bretz) flood deposits (Quaternary) — Silt, sand, and minor gravel deposited by floods caused by the repeated failure of the glacial ice dam that impounded glacial Lake Missoula.
  - Qls** Landslides (Quaternary) — Chaotically mixed and deformed masses of rock, colluvium, and soil that have moved downslope in one or more events.
- Pliocene-Pleistocene Boring volcanic field rocks**
- Qbo** Basaltic andesite of Outlook (Pleistocene) — Flow or flows of fine-grained grey diiktytaxitic olivine basaltic andesite.
  - Qbv** Outlook tephra (Pleistocene) — Ash, scoria, bombs and breccia of basaltic andesite of Outlook composition deposited on and around vents.
  - Qbh** Basaltic andesite of Hunsinger (Pleistocene) — Flow or flows of grey fine-grained, diiktytaxitic olivine basaltic andesite.
  - Tbc** Basalt of Canemah (Pliocene) — Flow or flows of grey medium-grained, diiktytaxitic olivine basalt.
  - Tbr** Canemah tephra (Pliocene) — Ash to bomb size tephra with minor basalt flows inferred from water well logs.
  - Tbr** Basaltic andesite of Root Creek (Pliocene) — Flow or flows of fine-grained grey basaltic andesite.
  - Tbr** Root Creek tephra (Pliocene) — Ash, scoria, bombs and breccia of basaltic andesite of Root Creek composition.
  - Tbf** Basaltic andesite of Fallsview (Pliocene) — Flow or flows of grey to black, fine- to medium-grained, diiktytaxitic olivine basaltic andesite.
  - Tbf** Fallsview tephra (Pliocene) — Ash, scoria, bombs, and breccia interbedded with the basaltic andesite of Fallsview.
  - Tbb** Basaltic andesite of Beaver Creek (Pliocene) — Flow or flows of grey fine-grained, weakly diiktytaxitic olivine basaltic andesite.
- Miocene-Pleistocene fluvial sedimentary rocks**
- Qts** Conglomerate (Pleistocene?) — Pebble to cobble conglomerate exposed in the walls of a small stream canyon in the extreme northwest corner of the map area.
  - Qts** Springwater Formation conglomerate and sandstone (Pliocene-Pleistocene) — Sandstone and conglomerate deposited by the ancestral Clackamas River.
  - Tt** Troutdale Formation sandstone, siltstone and mudstone (Miocene-Pliocene) — Mudstone, claystone, sandstone, and minor conglomerate and tuff.
- Miocene Columbia River Basalt Group lavas**
- Twfg** Wanapum Basalt, Frenchman Springs Member, basalt of Sand Hollow (Miocene) — Black medium-grained basalt flows with sparse plagioclase phenocrysts, well developed columnar jointing.
  - Twfg** Wanapum Basalt, Frenchman Springs Member, basalt of Ginkgo (Miocene) — Black medium-grained basalt flows with abundant plagioclase phenocrysts, well developed columnar jointing.
  - Tgsb** Grande Ronde Basalt, Sentinel Bluffs Member (Miocene) — Sentinel Bluffs Member (middle Miocene) — black fine-grained basalt flows with sparse plagioclase phenocrysts, well developed columnar jointing.
  - Tgww** Grande Ronde Formation, basalt of Winter Water (Miocene) — Flow or flows of fine-grained basalt.
  - Tcu** Columbia River Basalt, undifferentiated (Miocene) (shown only in cross section)



Software used: MapInfo Professional® 8.0, ESRI ArcGIS® 9.3, Adobe® Illustrator® 7.0 and 9.0, Adobe® Photoshop® CS4  
Source file: Publications\Final Copy\GMS-119

Map sheet reviewed by Vicki S. McConnell, Oregon Department of Geology and Mineral Industries

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