The Clackamas River drainage within the western Cascade Range is approximately aligned with a northwest trending lineation defined by the Portland Hills and the Brothers Fault zone. This area is occupied by an extensive Columbia River Basalt sequence that is deeply incised by the Clackamas River and its tributaries. Two major basalt units of the Yakima Basalt Subgroup, including the Grande Ronde Basalt and the Frenchman Springs Member of the Wanapum Basalt, are distinguishable in a 515 meter to 550 meter accumulation. Of particular interest is the presence of five
distinct geochemical and paleomagnetic subunits within the Grande Ronde Basalt. These include, from oldest to youngest, the paleomagnetically normal (N₁) low MgO, reversed (R₂) low MgO, reversed (R₂) Prineville, normal (N₂) low MgO, and normal (N₂) high MgO geochemical types. Interbeds having wide lateral extent and ranging in thickness from 3 to 35 meters are numerous, indicating close proximity to a degrading highland. Composition of these units indicates contemporaneous Cascadian volcanism.

The structural grain of the area is primarily northwest with lesser northeast and north-south components. A general northwest dip of less than 10° predominates and reflects Cascadian uplift. Northwest faults cut the shallowly dipping Columbia River Basalt sequence in an en echelon pattern that is distributed across the entire area. Sense and magnitude of movement on all faults is highly varied. Both strike-slip and dip-slip faulting has been recognized, with the throw on normal faults commonly ranging between 100 and 200 meters. Graben structures are defined by faults in both the Fish Creek Airstrip and Roaring River areas. The basalt is most deformed along the northeast margin of the area where dips of 10° to 35° occur. An anticlinal fold is indicated by attitudes in the Roaring River area. Folding over the rest of the Clackamas River study area is of a very broad nature. Vertical fault planes, orientation of structures, and the presence of northwest
trending right-lateral strike-slip faults is consistent with a stress model of north-south compression and east-west extension.