
Title: Post-Middle Miocene Geologic History of the Tualatin Basin, Oregon with Hydrogeologic Implications.

The geologic history and sedimentary fill of the Tualatin Basin after Columbia River Basalt Group (CRBG) emplacement is assessed and related to groundwater characteristics. The 334 m deep HBD-1 core from the Hillsboro Airport, provides the primary information for sediment characterization and is supported by over 2400 well logs and cores, and four seismic lines. The sedimentary section above the 26 m thick paleosol on the CRBG in HBD-1 is divided into two main groups: a 25 m thick section of Missoula flood sediments called the Willamette Silt overlies a 263 m thick fine-grained sequence of fluvial Neogene sediments.

Pollen, diatom and paleomagnetic data support dividing the Neogene sediments into a 230 m thick Pleistocene package and an underlying, 75 m thick Pliocene to upper Miocene unit. Heavy mineral and INAA chemical analyses indicate that the Neogene sediments were primarily derived from local highlands surrounding the Tualatin Valley.

The structure of the top CRBG in the Tualatin Basin exhibits two provinces, a larger northern subbasin with few faults cutting the Neogene sediments above the CRBG and a smaller, more complexly faulted, subbasin south and east of the Beaverton Fault.

Neogene sedimentation rates increased ten fold from the late Miocene-Pliocene to the Pleistocene, concomitant with increased basin subsidence. Comparison of Neogene basin evolution among Willamette Valley depositional centers reveals similarities among gravity and seismic reflection characters and subsidence timing between the
Tualatin Basin and the northern Willamette Basin and out of phase with the Portland Basin.

The Tualatin River CRBG nickpoint near the river's mouth has remained essentially unchanged since the Missoula floods filled the basin 12,700 years ago. This has kept the river from cutting back into the valley resulting in the low gradient evident today.

Elevated orthophosphate levels in the upper 140 m of the Neogene sediment section indicate that the sediments are a natural source of phosphorus supplied to groundwater. Groundwater conditions in the lower Neogene sediments promote stabilization of phosphorus as vivianite. The unconfined Willamette Silt aquifer and the underlying confined Neogene aquifers are distinct, separate hydrogeologic units and usually yield less than 40 lpm.