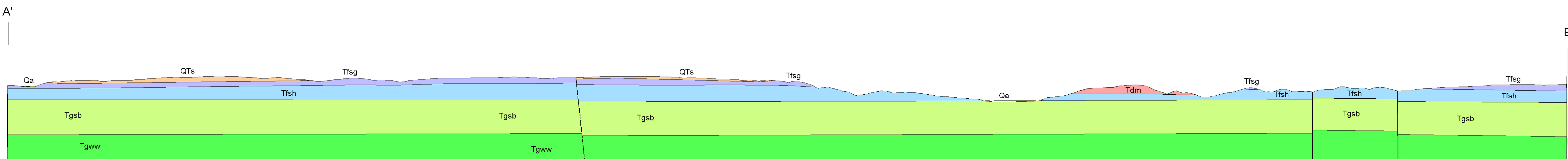
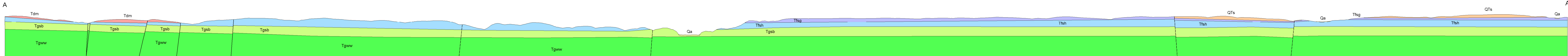
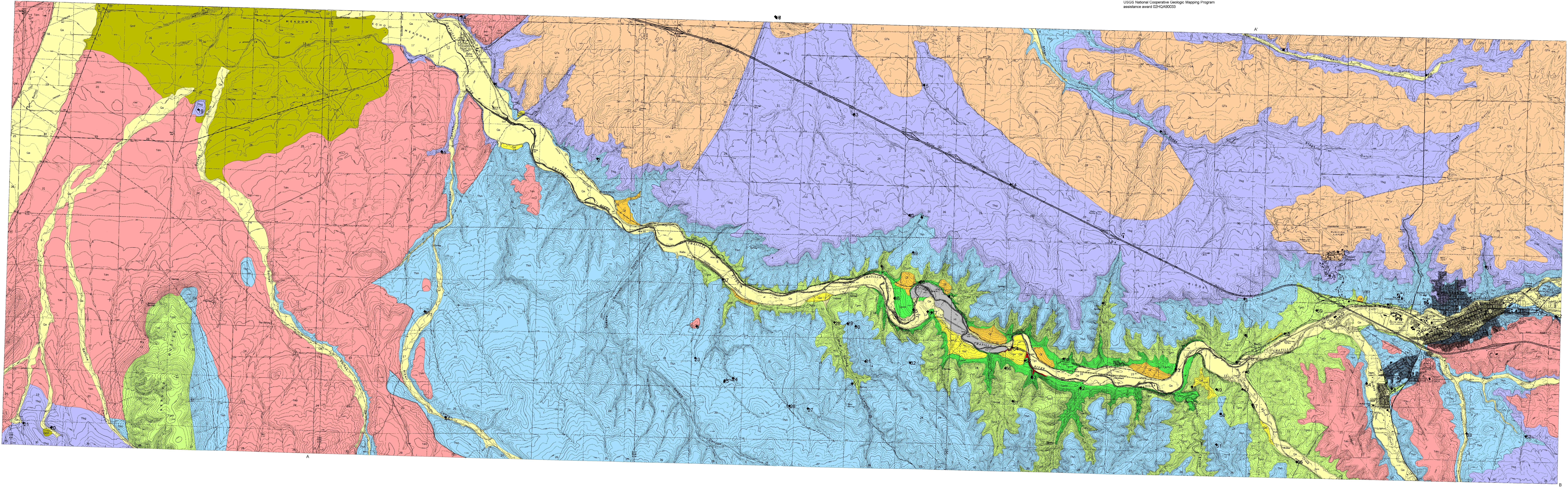


Preliminary Geologic Map of Service Buttes, Echo, Nolin, Barnhart, and Pendleton 7.5' Quadrangles (west to east), Umatilla County, Oregon

Open-File Report O-95-20 (originally published as part of OFR O-93-11)  
Mapping by V.S. McConnell  
for OR Dept. of Geology and Mineral Industries  
Vicki S. McConnell, Acting State Geologist  
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"The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government."

Map Unit Explanation

Upper Cenozoic Surficial and Valley-Fill Deposits

- Modern lacustrine sediments (Holocene)
- Alluvial deposits (Holocene and late Pleistocene)
- Fluvial deposits (Holocene) and Pleistocene to Pre-Pleistocene
- Alluvial fan and debris deposits (Holocene) and Pleistocene to Pre-Pleistocene
- Massive flood sediments (late Pleistocene)

Tertiary Sedimentary Rock Units

- Fossiliferous and calcareous sediments (late Miocene and Pliocene to Holocene)

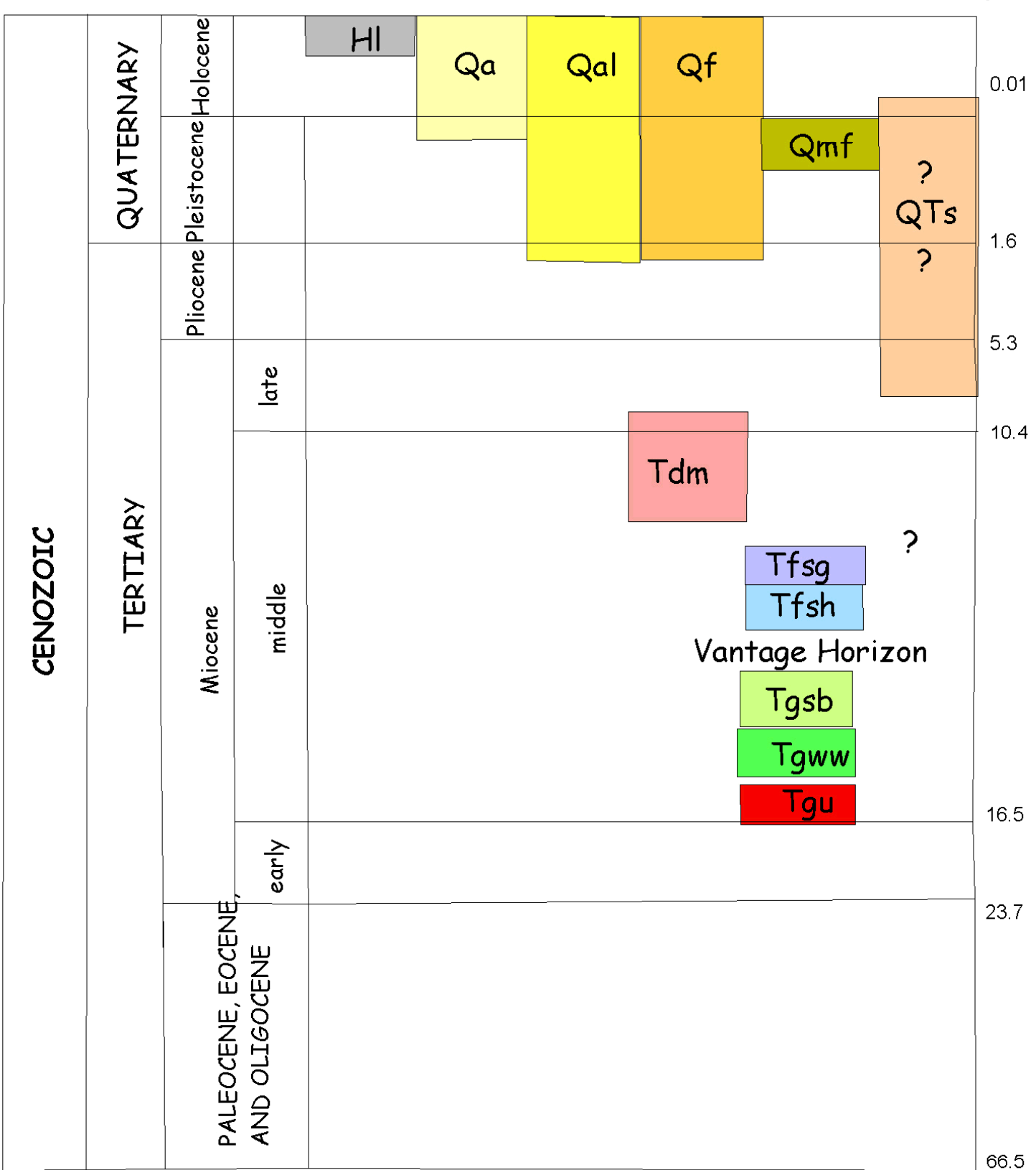
- Mudry and equivalent fluvial deposits (middle to late Miocene)

Tertiary Columbia River Basalt Group

- Wapinitia Basalt Formation, Seaside Clay Unit (middle Miocene)
- Wapinitia Basalt Formation, Seaside Yellow Unit (middle Miocene)
- Grande Ronde Basalt Formation, Seaside Blue Unit (middle Miocene)
- Grande Ronde Basalt Formation, Water Vapor Unit (middle Miocene)
- Grande Ronde Basalt Formation, undifferentiated (middle Miocene)

- Lineage Contact
- Fault: approximate location, dashed where uncertain or inferred, solid where covered by Quaternary deposits
- Geological sample locations

TIME ROCK CHART



After Berggren and others, 1985 and Kent and Gradstein, 1985