Summary of Roadway Stability Concerns along Banner Road Southeast between Southeast Banfill Road and Olalla Valley Road
May 2011

Banner Road was originally constructed between 1885 and 1912 by cutting into the hillside on the upslope side of the roadway and side casting excavated material downslope to provide a bench for the roadway. This side cast fill has resulted in a layer of loose to medium dense soil underneath portions of the roadway, which is subject to settlement, creep, and sloughing on steep slopes. Sloughing typically occurs when the side cast fill becomes saturated. Geotechnical borings encountered approximately 12 feet of side cast fill near the downslope edge of the roadway. Evidence of instability has been observed over the years, as cracks and small landslides have developed. Most evidence of slope movement has been found between the center of the road to the downslope edge of the road.

Most of the native soil is glacially overconsolidated, resulting in densely compacted, strong soil. However, natural wave action at the slope toe causes slow erosion and steepening of the bank that supports the layer of loose side cast fill. This bank steepening leads to the sloughing and shallow landsliding of the fill soil above it. While the rate of erosion at the bank appears slow, this will be further evaluated during design. Groundwater plays a key role in stability. In general, the more saturated the native and loose fill soil layers become, the weaker and more unstable they are.

The southern half of this roadway segment also has a slope above the roadway that is prone to sloughing material onto the roadway. The soil here is densely compacted glacial soil. As the soil weathers, it loosens and becomes prone to sloughing on the steep natural and cut slopes. We anticipate that typical sloughs from the slopes above the road would be a few cubic yards or smaller.

If the road subgrade is not improved, we anticipate soil creep that causes roadway settlement and cracking will continue. Small landslides that could affect at least one lane likely will occur periodically during exceptionally wet conditions. With this information in mind, improvements for roadway reconstruction to correct these problems could include:

- Constructing a fill wall on the downslope side of the roadway to replace or contain the existing layer of loose material. The wall should be embedded into the underlying dense native soil.
- Installing surface drainage that reduces stormwater infiltration and a subdrain system to collect groundwater underneath the roadway.
- Protecting the cut slope on upslope side of the roadway from weathering using shotcrete. If the cut slope was made at a slope of 3/4 horizontal to 1 vertical, little reinforcement would be needed. We anticipate short dowels would anchor the shotcrete to the cut face. While this proposal would be less steep than what exists today, it would require little encroachment onto private property. Laying the slope back even further to a typical slope of 1 1/2 horizontal to 1 vertical or flatter, which could then be vegetated, would eliminate the need for shotcrete to reduce weathering, but would cause greater property impacts.

These geotechnical observations and recommendations are generally derived from field observations and from four borings performed in the early 1990s for a geotechnical study along this section of Banner Road Southeast. Additional borings are not being performed for this study, but will be necessary for the final design of Banner Road if Alternative 1 is the preferred alternative.