ABSTRACT

An abstract of the thesis of Barry A. Sanford for the Master of Science in Geology presented March 1, 2002

Title: The West Tidewater Earthflow, Northern Oregon Coast Range.

The West Tidewater earthflow, one of the largest in Oregon’s history, occurred in December of 1994. The earthflow is located approximately 15 km north of Jewel, Oregon near the summit of the Northern Oregon Coast Range Mountains. The earthflow is nearly 900 m long and 250 m wide, giving it a surface area of nearly 9 ha, or 22 acres. The volume is approximately 3.5 million m³. The earthflow occurred in low strength, well bedded, tuffaceous, carbonaceous, micaceous, clay-rich mudstone, and very fine-grained, feldspathic, clay-rich siltstone of the lower Miocene age Northrup Creek Formation. The soil clay fractions contain up to 90% smectite with indications of halloysite. This earthflow is a reactivation of an approximately 650-year-old landslide as determined by C-14 dating of uncovered buried trees. The failure mode is examined using a Janbu slope analysis and may include a double wedge failure near the headscarp. High soil pore water pressure is one of the major causes of this slope failure. Rainfall levels for October, November, and December of 1994 were twice the previous five-year average. Present day groundwater level within the basin is less than one meter below ground surface. The earthflow is partially controlled by two faults of regional extent that dissect the basin.
near the headscarp in NW-SE and NE-SW directions. The Inceptisol soils in the basin remain moist below 20 cm year around. Soil in the basin may have been further weakened due to loss of root strength following timber harvest on the site in 1991. Soil liquid limits range from 42% to 95%, with PI values ranging from 2% to 77%. Soil clay content ranges between 18% and 30%. Direct shear tests on the mudstone and siltstone bedrock in both drained and undrained conditions produced internal friction angles of 14-18°, with cohesion values of 4 - 8 kPa. Back calculations of study area soil strength using the modified Bishop method results in a residual friction angle of 20.7°. The failure mode of the earthflow is thought to be from the headscarp downward and is modeled using Janbu methods. The study includes a detailed topographic map and a failure analysis of the earthflow basin.