

Research Project Status Report

April 1, 2008 – June 30, 2008

<i>Project Title</i> Subsurface Drainage for Landslide and Slope Stabilization		<i>Agmt./Task No.</i> T4120-10	<i>Item No.</i>	<i>Agency Bgt. No.</i>
<i>Research Agency</i> WSU/UBC		<i>Start Date</i> 3/2007	<i>Estimated Completion</i> 12/2010	<i>Revised Completion</i>
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<i>Funding Source</i> CA, MD, MS, MT, NH, OH, PA, TX, WA, WY		<i>Schedule Status</i> <input checked="" type="checkbox"/> On schedule <input type="checkbox"/> Ahead of schedule <input type="checkbox"/> On revised schedule <input type="checkbox"/> Behind schedule		
<i>Research Area</i> <input type="checkbox"/> Bridges & Structures <input type="checkbox"/> Environment <input checked="" type="checkbox"/> Highway Design & Safety <input type="checkbox"/> Mobility & Intermodal Planning <input checked="" type="checkbox"/> Operations & Materials <input type="checkbox"/> Traffic & Intelligent Transportation Systems Evaluation				
<i>Original Estimated Cost</i> \$ 300,000	<i>Revised Cost</i>	<i>% Funds Expended</i> 12%	<i>% Work Completed</i> 20%	
<i>Objective</i> (1) Provide best practices and guidance for subsurface drainage applications for slope stabilization, including subsurface investigation and testing, groundwater-flow characterization, analysis, drain configurations and design, installation methods, monitoring, and maintenance. (2) Evaluate new applications of existing materials and technologies, such as trenchless technologies (horizontal directional drilling, micro tunneling, guided boring, etc.) and other innovative technologies and materials, for stabilizing slopes using subsurface drainage.				

Project Progress:

Literature review on subsurface drainage applications was updated with information on ground water flow characterization and subsurface characterization.

We continued with the analysis of the changes in groundwater flow pattern and pore pressure distribution as a result of drain installations using the program TOUGH2 Version 2. The analysis of the WSDOT project on SR 101 at MP 69.8 was completed during this period. The soil parameters for the TOUGH 2 model was obtained from Kleinfelder's geotechnical report for this site. The computed results matched the instrumented data well. This validated model is currently being used to conduct a parametric study to evaluate the effect of the following variables on overall drainage pattern: Direction of drains (along the direction of flow, orthogonal to direction of flow, spacing between drains, the elevation of drains. The TOUGH model will also be used to study instrumented data obtained at other WSDOT sites.

New Period Proposed Activity:

- Continue the simulation of groundwater flow for other sites.
- Continue the parametric study for horizontal drains.
- Analyze geological, geographical conditions contributing to the performance of horizontal drains.
- Examine the effect of changes in ground water flow and pore pressure distribution on slope stability.