WASHINGTON STATE DEPARTMENT OF
Natural Resources

DOUG SUTHERLAND
Commissioner of Public Lands

MEMORANDUM

To: Laura Vaugeois – Forest Practices
Karl Wegmann - Geology

From: Bill Lingley – Geology

Date: July 31, 2003

Subject: East/West Humptulips Watershed Analysis -- Review

Summary

Dieu and Shelmerdine (1999) have produced a thorough and credible mass wasting and sedimentation module covering the East and West Fork Humptulips Watershed. Dieu and Shelmerdine identified essentially all definite and probable landslides, and their report should be sent out for final external review following addition of one new 300-acre mass wasting unit to the database. This module appears to meet or exceed U.S. Forest Service and Washington State standards current at the time the work was completed. I crosschecked their findings in several key areas with analysis of geomorphology, aerial photography, and slope/convergence ratios (SLPSTAB) and with two days of fieldwork. These areas included about a third of the watershed and most areas of steeper terrain.

This is a relatively stable watershed. Normal unstable slope criteria (WAC 222-16-050(1(d(i, A-E))) will be effective in precluding delivery to public resources with the exception of the aforementioned 300-acre slope. This southeast-facing slope is located directly northeast of the Donkey Creek Road mostly in Sections 12 and 13 of T21N R9W and includes a large damaging landslide.

Introduction

This memorandum is the first report prepared as part of the landslide hazard zonation project (Vaugeois and others, 2002) and follows the protocol for Priority #1 Watersheds developed by you (Wegmann and Vaugeois, 2003). These cover watershed analyses that are partly or mostly complete and address only State and fee lands. Consequently, this memorandum and related work cover only the southern third of the East/West Humptulips watershed.

The draft East/West Humptulips Watershed Analysis (Olympic National Forest and Rayonier, Inc., 1999) was completed during 1999, except for the Prescriptions and Summary sections, which have not been prepared. The mass wasting and surface erosion modules are combined as a sedimentation module that was prepared by Dr. Julie Dieu of Rayonier, Inc. and Bill Schelmerdine, a P.E. and geologist with the Olympic National Forest.

Methods

I reviewed the watershed analysis and briefly interviewed Bill Shelmerdine during mid-July. On July 14 and 15, 2003, I performed a reconnaissance field investigation of those areas identified as having higher potential for slope instability. These areas include:

1) Representative meander bends along the East and West Forks of Humptulips River,
2) Hills southeast of the Humptulips FS Station,
3) The west face of Cougar Mountain,
4) Steep west-facing slopes between the West Fork Humptulips bridge and the Humptulips FS Station, and
5) Hills between the East and West Forks of the Humptulips drained by Jones and Furlough Creeks and the East Fork of the Humptulips River.

These areas cover about a third of the State and fee lands within the watershed and most of the steeper terrain. Much of this area has been clearcut facilitating effective field observation and adding to the reliability of this review. I did not check the Burnt Hill area.

Additional rule-identified unstable slopes including many meander bends, inner gorges, convergent headwalls, and bedrock hollows were identified using the Burnt Hill 7.5-minute topographic sheet (U.S. Geological Survey, 1990) and a slope percentage map Karl Wegmann constructed using DNR GIS coverages. This work was checked using a SLPSTAB map of the area produced by Laura Vaugeois. Relevant literature was reviewed including key mapping by Rau (1986), which was not referenced in the Module A – Sedimentation Assessment (Dieu and Shelmerdine, 1999).

Key Questions

1. *Are the majority of landslides in the basin adequately identified?*

Yes.

Shelmerdine and Dieu map about twenty landslides most of which are meander bend failures or earth slides. They map three debris flows and two deep-seated failures in the basin. This mapping has been checked carefully because the northern portions of the watershed are known for severe debris flows and my analysis of geomorphology and SLPSTAB map suggests several areas of unstable terrain in the study area. However, field observation, aerial photographic analysis of selected areas, and a brief review of my work by Dave Norman all indicate that the southern portion of the basin is remarkably stable and that the Dieu/Shelmerdine mapping is accurate. The few new failures observed during the Landslide Hazard Zonation Project (LHZ) either post-date the Dieu/Shelmerdine work or are oriented such that they cannot be observed easily on aerial photographs.

Rau (1986) maps an important fault, the Wiskah thrust, bringing Crescent Formation basaltic rocks southwestward over Humptulips Formation siltstones. This is a key structure as the Humptulips Formation southwest of the fault is the least stable unit in this part of the watershed. Here, several areas of hummocky terrain and arcuate subbasins are present and interpreted as relict earth flows. Shelmerdine and Dieu map one of these along Furlough Creek as part of their Geomorphic Terrain Unit 71- Earth flows/slumps (Map A-2), but because this is a deep-seated feature and unlikely to deliver as a result of forest management, it is not shown on their Mass Wasting and Surface Erosion Events Map A-1. Eight similar features identified herein are all

"questionable" status and relict. These topographic anomalies are very old and only one has any likelihood of delivering sediment to public resources. More importantly, it appears the landslide disturbed soil was so weak that subsequent erosion removed the entire landslide deposit leaving a scarp and scar, which have subsequently revegetated.

Two probable debris flows were observed in the field and on aerial photography on the west face of Cougar Mountain. These are small features and may post date the Dieu/Shelmerdine mapping.

In conclusion, the area is remarkably stable and Shelmerdine and Dieu have done a good job of depicting landslides in the WAU.

2. *Do the Mass Wasting Map Units reflect reasonable assumptions based upon your review of the geology and landslides in the basin?*

   Yes.

   Shelmerdine and Dieu use the classification scheme of Sasich (1994) to subdivide the basin. For the purposes of this analysis, that scheme is acceptable.

3. *Are the hazard ratings assigned to the Mass Wasting Map Units reinforced by the distribution of landslides as shown in the Landslide Inventory for the WAU?*

   Yes.

   Most of the area is mapped as "Low Hazard". Areas of moderate and high hazard are mapped adjacent to the outside of meander bends and on Cougar Mountain. One exception is noted below.

4. *Are there landforms that seem to have a large number of landslides, but no associated Mass Wasting Map Unit?*

   Yes

   The only parts of the watershed with a large number of landslides are the outsides of meander bends along the East and West Forks of the Humptulips River. Statistically valid correlation of landslides and other mass wasting map units cannot be achieved.

   However, one arcuate, 300-acre slope is the site of a large deep-seated debris slide and has numerous other indicators of instability. It is currently depicted as have low mass wasting hazard (Map A-3). It is recommended that this area be included as a separate mass wasting unit and assigned a moderate hazard rating. This southeast-facing slope is centered in the SE/4, NW/4, SE/4 of Section 12, T21N, R9W. Shelmerdine and Dieu map a large deep-seated translational slide at the apex of convergence in the middle of this slope, which delivered to the East Fork of the Humptulips River and severely damaged part of the Donkey Creek Road. Abundant evidence of incipient failure is present along the Donkey Creek Road from a pass labeled 776T on the Burnt Hill 7.5-minute topographic map (U.S. Geological Survey, 1990), through this landslide, to the end of an east-plunging ridge in the SW/4 of Section 7, T21N, R8W. This unstable area and the included landslide are on a gradient of only 65%. Numerous lunate fractures, vegetation characteristics, and very wet ground all suggest that other convergent parts of this slope may be subject to failure in the future.

5. *Does the text describing the Mass Wasting Map Units do an adequate job in presenting the landform / geology information that a forester using this map would need to identify the features on the ground?*

Yes.

The watershed analysis primarily addresses highly unstable areas near Chester Creek and in the Crescent Formation basalts of the northern subbasins within the East/West Humptulips watershed. Therefore it's a little hard to wade through text that addresses State and fee lands in the southwestern most part of the watershed. However, landslide densities (as measured in events-per-square-mile) that are less than 0.3 will not be lost on any reader (Dieu and Shelmerdine, 1999. See Table A-3).

6. *Are there additions to the mass wasting assessment products?*

Yes.

A map showing the few new questionable and probable unstable features I identified; the relict earth flow scarps (mostly without landslide deposits), the debris flows on the west side of Cougar Mountain, and the unstable slope centered on Section 12, T21N, R9W, is being supplied to you under separate cover together with a Mass Wasting Inventory Data spreadsheet (Form A-1).

7. *Should Forest Practices Division send this Mass Wasting Assessment out for final external review?*

Yes

After addition of the 300-acre mass-wasting unit noted above, the East/West Humptulips Watershed Analysis Module A- Sedimentation Assessment will be ready to send out for review.

References

Dieu, Julie; Shelmerdine, Bill, 1999, Module A- Sedimentation Assessment. *IN* Olympic National Forest and Rayonier, Inc. East/West Humptulips watershed analysis; Draft: Olympic National Forest, 1 v.

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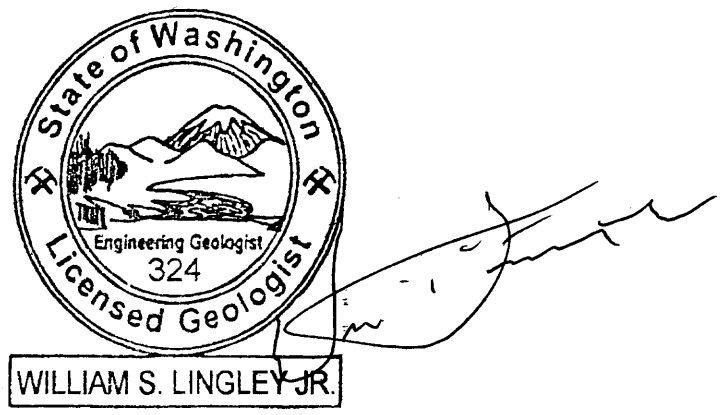
Respectfully submitted,



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