



**DEPARTMENT OF  
NATURAL RESOURCES**

**FOREST RESOURCES DIVISION**

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September 7, 2023

**TO:** Nick Chicano, Forester, Rainier District, South Puget Sound Region Susie

**FROM:** Wisehart, LEG #20120267, QE, Forest Resources Division

**SUBJECT:** Geologic Field Summary for the Sylvan Pearl Timber Harvest, King County, Washington

This letter documents my observations of potentially unstable slopes in and around the Sylvan Pearl timber sale during field reconnaissance on April 25 and June 8, 2023 with Nick Chicano, State Lands Unit Forester and Nicole Vonberckefeldt, State Lands Forester.

This letter includes my landform interpretations, the key observations that I used to make those interpretations, and the mitigation options we discussed. This letter is not intended to document the full scope of the geologic review that I conducted for this sale, nor is it intended to satisfy the requirements for a Class IV-Special Forest Practices Application. I conclude that the proposed forest management activities exclude all Forest Practices potentially unstable slopes and landforms, commonly referred to as rule-identified landforms.<sup>1</sup>

Prior to the field visits, I conducted a remote review with the assistance of Jennifer Parker, LEG and QE, using Washington State Department of Natural Resources (DNR) GIS data including:

- Digital orthophotographs from 1990's, 2006, 2009, 2010, 2011, 2015, 2017, 2019, 2021
- 1-meter resolution light detection and ranging (lidar) data acquired in 2021
- Digital 1:100,000-scale geologic map<sup>2</sup>
- Forest Practices Landslide Inventory layer
- Spatial timber sale data from South Puget Sound Region personnel

Susie Wisehart (LEG #20120267) is a "qualified expert" for timberland slope stability evaluation, as designated by the DNR.

### Category E rule-identified landforms

There are four recent shallow landslides, which meet the criteria for Category E rule-identified landforms around the proposed units (SL-1 through SL-4, Figure 1). SL-1 is downslope of the 5470 Road and northeast of Unit 1. SL-2 is an area of unravelling rock and soil that requires routine ditch cleanup. SL-3 initiated as a side case failure approximately 12 to 15 years ago that likely delivered to Boundary

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<sup>1</sup> WAC 222-16-050 (1)(d)(i).

<sup>2</sup> Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Waite, R. B., 2000, Geologic map of the Snoqualmie Pass 30 x 60 minute quadrangle, Washington: U.S. Geological Survey Geologic Investigations Series Map I-2538, 1 sheet, scale 1:100,000, with 57 p. text.

Creek (Justin Gardner, State Lands Engineer, personal communication, September 7, 2023). The road has been repaired and is intact. There are no existing culverts above these landslides and new proposed cross drains are designed to avoid shallow landslides.

SL-4, southwest of Unit 5, spans between the 5470 Road switchback, but has not impacted the road. This landslide appears to be caused by concentrated water from the culvert upslope on the 5470 Road. To reduce the amount and energy of water flowing into this landslide, the road plan includes adding a culvert approximately 200 feet upgrade and riprap at the culvert outlet above the slide (Figure 1). We discussed leaving the current culvert in place to avoid causing new instability nearby on similar slopes with a new culvert location. SL-5 is a small recent, shallow landslide above an old grade west of Unit 6.

I identified one recent, bedrock deep-seated landslide west of Unit 6. Here, I observed an approximately 10-foot tall headscarp, disturbed internal drainage network, and primarily alder and devils club. This was bound out of the timber sale (Figure 1).

### **Bedrock hollows, convergent headwall, and inner gorges**

We verified three bedrock hollows in Unit 1, which are protected with non-tradeable leave tree areas. The foresters field-verified one bedrock hollow in the northwest portion of Unit 5. This is also protected with a non-tradeable leave tree area. There are numerous other possible bedrock hollows around the proposed units. A cluster of them make up a convergent headwall northeast of Unit 5. This convergent headwall also appears to contain deep-seated landslides (Figure 1).

The inner gorge slopes around the units are defined by 70 percent and steeper, stream adjacent slopes. We verified the tops of inner gorges where slopes break approximately 10 degrees. The inner gorges are excluded from the proposed harvest (Figure 1).

### **Non-rule-identified, bedrock deep-seated landslides**

Using lidar and field review, I identified relict, bedrock deep-seated landslides in and around the units (Figure 1). Our observations of these landslides include subtle, vegetated, arcuate headscarps; smooth topography; straight, mature conifer; upright, old growth stumps; vague lateral margins; and bedrock clasts (Miocene – Oligocene volcanic rocks of the Ohanapecosh (To) and Eagle Gorge (Teg) Formations<sup>3</sup>) in shallow hand-dug test pits and on the surface.

We also identified a dormant-indistinct, bedrock deep-seated landslide around Unit 6 (Figure 1). Here, we observed straight, mature conifer; upright old growth stumps; a back rotated bench; a sag pond; disturbed internal drainage; and a smooth body.

Because these deep-seated landslides are dormant-indistinct to relict and in bedrock, they do not meet criteria for rule-identified landforms. Deep-seated landslide toe slopes 65 percent and steeper are excluded from the proposed harvest (Figure 1). Deep-seated landslides with unknown activity levels are outside the proposed harvest units.

### **Forest Practices mapped landslides**

The Forest Practices Landslide Inventory (LSI) layer indicates numerous landslides around the proposed harvest. These are described as shallow landslides. During our field reconnaissance, we confirmed LSI

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<sup>3</sup> Tabor et al., 2000.

#12783 as an area with rock fall and shallow landslide processes. This is excluded from the harvest unit. The road requires frequent ditch clean out and is currently intact through this area. The other LSI polygons are excluded from the timber sale plan.

## Alluvial fans

There are two alluvial fans, one active and one relict, overlapping and near Unit 1 (Figure 1). The stream in the western, active fan flows in and out of the subsurface and appears to migrate across the fan. The stream above the eastern, relict fan goes subsurface before the apex of the fan. We did not observe evidence of stream flow across this fan.

The relict alluvial fan does not meet the definition of a sensitive site.<sup>4</sup> Because the stream associated with the active fan is a Nonfish-seasonal (NS) stream, my understanding is that harvest is allowed.

## Limitations

This memorandum is intended to summarize landform interpretations in and around the proposed Sylvan Pearl timber harvest to DNR's foresters and to document licensed engineering geologist involvement in the timber sale.

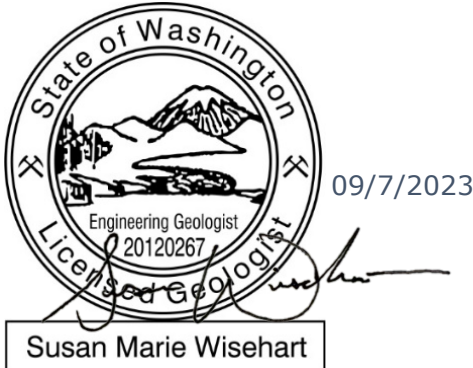
The conclusions presented in this memorandum are based on professional judgement and do not guarantee slope stability or absolute absence of risk. In addition, conclusions were developed using limited information including office-based screening tools and surficial geologic observations at the locations visited as they existed at the time of review. This review also included limited shallow hand-dug test pits and geologic exposures in the area reviewed, but does not include deeper subsurface exploration such as borehole drilling. Actual geologic conditions may differ from those presented in this report. Site conditions can change with time and additional relevant information may become available. If this occurs, geologic interpretations and recommendations may require modification. It is not possible to fully define the geologic conditions of the site based on this limited investigation; however, the work was performed using generally accepted practices in the field of engineering geology in the region at the time of this report. It is not possible to predict slope movement with certainty with the available scientific knowledge.

Do not rely on the interpretations or conclusions presented in this memorandum for any activities other than those evaluated for the proposed Sylvan Pearl timber harvest. If any changes in the proposed FPA or road plan are formulated or carried out differently in the field than what was evaluated, conclusions and recommendations shall not be considered valid unless those changes are reviewed in writing by the author. No one other than the DNR should rely on this report.

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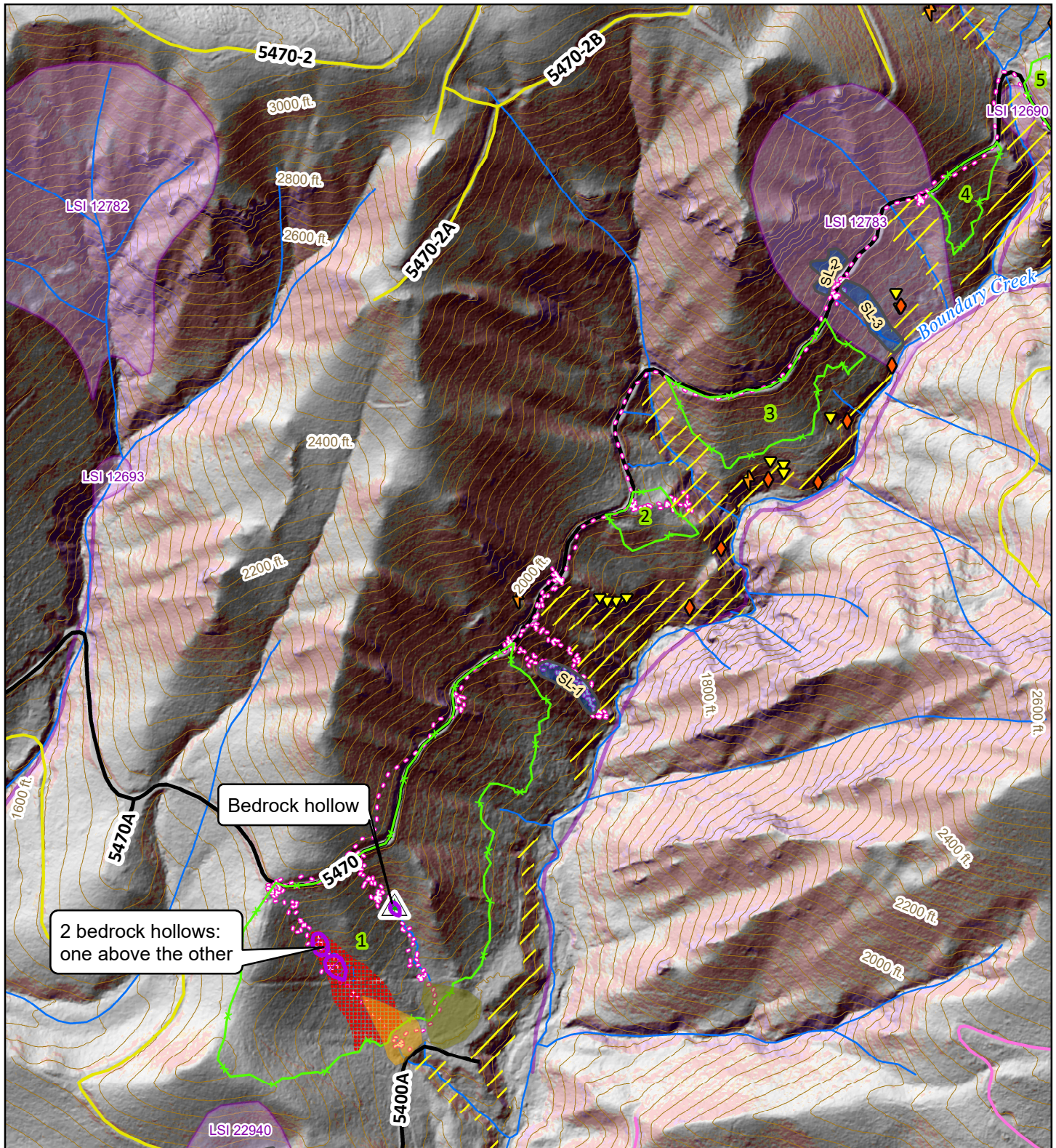
<sup>4</sup> WAC 222-16-010

ATTACHMENTS:            Figure 1 (4 sheets): Geologic Field Summary Map



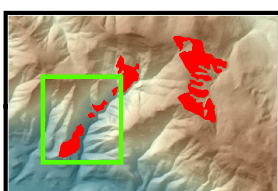
Susan Wisheart, LEG #20120267, QE  
State Lands Geologist  
Earth Sciences Program  
Forest Resources Division

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<ul style="list-style-type: none"> <li> Harvest unit boundaries</li> <li> Non-Tradeable Leave Trees</li> <li> Leave Tree Area</li> <li> Non-Tradeable Leave Clump</li> <li><b>Alluvial fans</b></li> <li> Active</li> <li> Relict</li> </ul>	<ul style="list-style-type: none"> <li> Streams</li> <li><b>State Lands - Roads by Activity Status</b></li> <li><b>Road Status</b></li> <li> 1: Active</li> <li> 3: Decommissioned</li> <li> 6: Orphaned</li> <li> Geologist Tracks</li> <li> 40-ft. contour</li> </ul>	<ul style="list-style-type: none"> <li> Possible Shallow LS</li> <li> Possible bedrock hollow</li> <li> Possible inner gorge</li> <li> Bedrock hollow</li> <li> Inner gorge (approximate outline)</li> <li> Unknown, bedrock, deep-seated</li> <li> Active/recent, shallow</li> </ul>	<p><b>Forest Practices Landslide Inventory</b></p> <p><b>CERTAINTY</b></p> <ul style="list-style-type: none"> <li> Probable</li> </ul> <p><b>Slope Percent - Regulatory Thresholds</b></p> <ul style="list-style-type: none"> <li> 0 - 65</li> <li> 65-70 - DSL Toe</li> <li> 70-100 - Cat A Threshold</li> <li> 100+ - Cat A and oversteepened</li> </ul>
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Lidar acquired in 2021.



**Fig. 1**  
Sheet 1 of 4

**GEOLOGIC FIELD SUMMARY MAP**  
Sylvan Pearl

600 Ft.

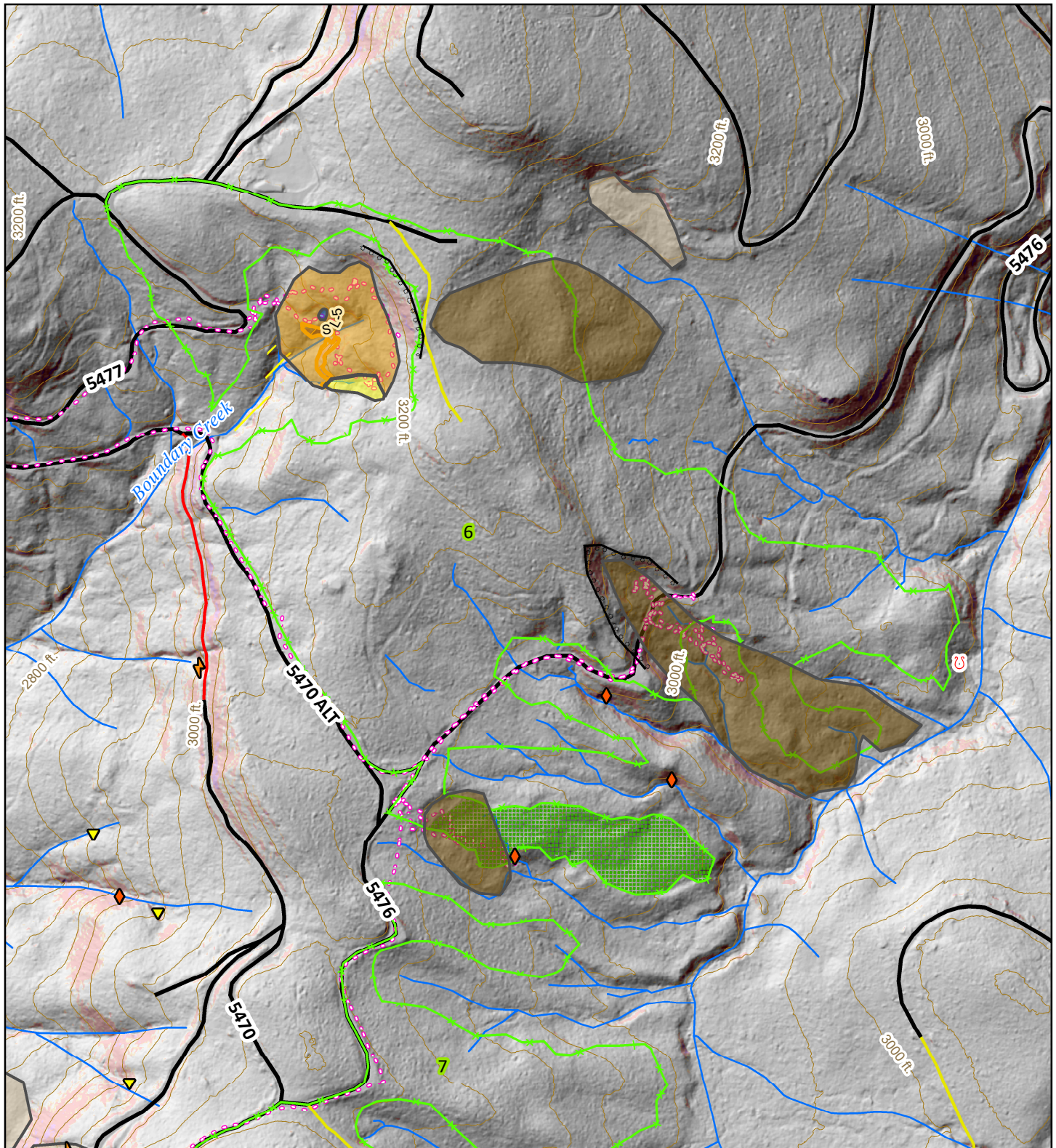
Scale 1:7,200

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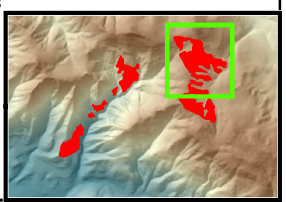


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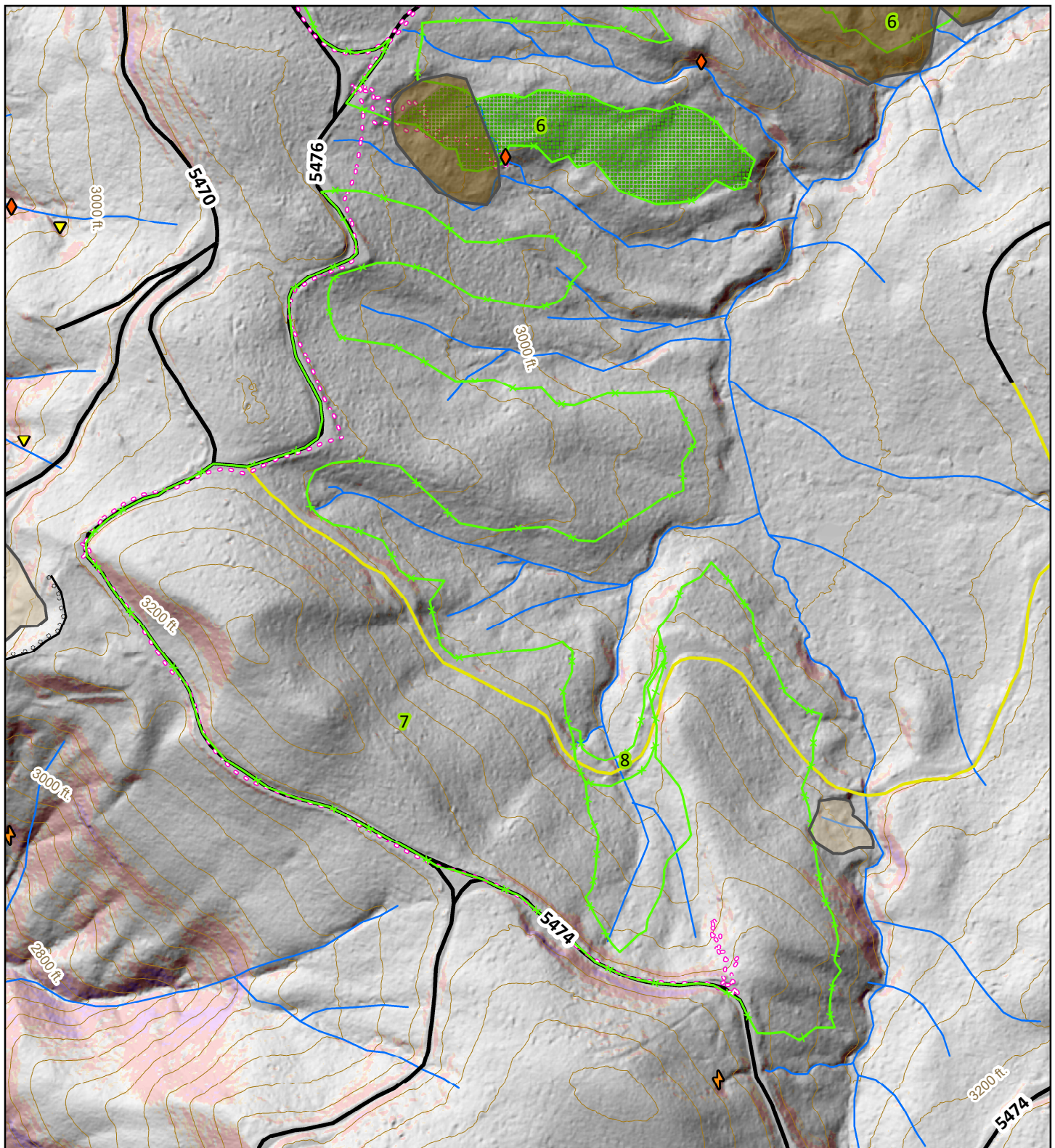


Lidar acquired in 2021.

<ul style="list-style-type: none"> <li> Harvest unit boundaries</li> <li> Leave Tree Area</li> <li> Streams</li> <li><b>State Lands - Roads by Activity Status</b></li> <li><b>Road Status</b></li> <li> 1: Active</li> <li> 5: Approved Abandoned</li> </ul>	<ul style="list-style-type: none"> <li> 6: Orphaned</li> <li> Geologist Tracks</li> <li> 40-ft. contour</li> <li> Possible Shallow LS</li> <li> Possible bedrock hollow</li> <li> Possible inner gorge</li> <li> Possible outer edge of meander bend</li> </ul>	<ul style="list-style-type: none"> <li> Inner gorge (approximate outline)</li> <li> Toe of DSL 65%+</li> <li> Possible Landslide Scarp</li> <li> Active/recent, bedrock deep-seated</li> <li> Dormant-indistinct, bedrock deep-seated</li> <li> Relict, bedrock deep-seated</li> <li> Unknown, bedrock, deep-seated</li> </ul>	<ul style="list-style-type: none"> <li> Active/recent, shallow</li> <li><b>Slope Percent - Regulatory Thresholds</b></li> <li> 0 - 65</li> <li> 65-70 - DSL Toe</li> <li> 70-100 - Cat A Threshold</li> <li> 100+ - Cat A and oversteepened</li> </ul>
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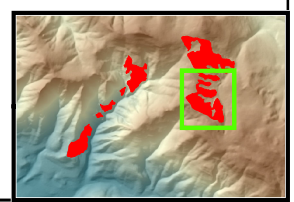


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Lidar acquired in 2021.

- |                                               |                             |                                              |
|-----------------------------------------------|-----------------------------|----------------------------------------------|
| Harvest unit boundaries                       | Geologist Tracks            | Unknown, bedrock, deep-seated                |
| Leave Tree Area                               | 40-ft. contour              | <b>Slope Percent - Regulatory Thresholds</b> |
| Streams                                       | Possible Shallow LS         | 0 - 65                                       |
| <b>State Lands - Roads by Activity Status</b> | Possible bedrock hollow     | 65-70 - DSL Toe                              |
| <b>Road Status</b>                            | Possible inner gorge        | 70-100 - Cat A Threshold                     |
| 1: Active                                     | Possible Landslide Scarp    | 100+ - Cat A and oversteepened               |
| 6: Orphaned                                   | Relict, bedrock deep-seated |                                              |



**Fig. 1**  
Sheet 4 of 4

**GEOLOGIC FIELD SUMMARY MAP**  
Sylvan Pearl

400 Ft. Scale 1:4,800

Washington State Department of Natural Resources