STATE FOREST LAND
SEPA ENVIRONMENTAL CHECKLIST

Purpose of checklist:

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Please answer each question accurately and carefully, to the best of your knowledge. You may need to consult with an agency specialist or private consultant for some questions. You may use "not applicable" or "does not apply" only when you can explain why it does not apply and not when the answer is unknown. You may also attach or incorporate by reference additional studies reports. Complete and accurate answers to these questions often avoid delays with the SEPA process as well as later in the decision-making process.

Questions in italics are supplemental to Ecology's standard environmental checklist. They have been added by the DNR to assist in the review of state forest land proposals. Adjacency and landscape/ watershed-administrative-unit (WAU) maps for this proposal are available on the DNR internet website at ***http://www.dnr.wa.gov/sepa****. These maps may also be reviewed at the DNR regional office responsible for the proposal. This checklist is to be used for SEPA evaluation of state forest land activities.*

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Instructions for Lead Agencies:

Additional information may be necessary to evaluate the existing environment, all interrelated aspects of the proposal and an analysis of adverse impacts. The checklist is considered the first but not necessarily the only source of information needed to make an adequate threshold determination. Once a threshold determination is made, the lead agency is responsible for the completeness and accuracy of the checklist and other supporting documents.

Use of checklist for nonproject proposals:

For nonproject proposals (such as ordinances, regulations, plans and programs), complete the applicable parts of sections A and B plus the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D). Please completely answer all questions that apply and note that the words "project," "applicant," and "property or site" should be read as "proposal," "proponent," and "affected geographic area," respectively. The lead agency may exclude (for non-projects) questions in Part B - Environmental Elements –that do not contribute meaningfully to the analysis of the proposal.

A. BACKGROUND

1. Name of proposed project, if applicable:

   Timber Sale Name: **CENTAURUS** *Agreement #* **93570**

2. Name of applicant: **Washington Department of Natural Resources**

3. Address and phone number of applicant and contact person:

   DNR Northwest Region
   919 North Township Street
   Sedro Woolley, WA 98284
   (360) 856-3500

   Contact person: Laurie Bergvall

4. Date checklist prepared: **06/08/2016**

5. Agency requesting checklist: **Washington Department of Natural Resources**

6. Proposed timing or schedule (including phasing, if applicable):

   a. *Auction Date:* **01/25/2017**
   b. *Planned contract end date (but may be extended):* **03/31/2019**
   c. *Phasing:*

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain. **Yes. Several roads will remain open for future management activities.**

Timber Sale:

a. *Site preparation:*
   Harvest units may be treated with herbicides prior to planting. Assessment for treatment will occur after completion of harvest.

b. *Regeneration Method:*
   Hand plant conifer seedlings within two years after completion of harvest.

c. *Vegetation Management:*
   Treatment to be assessed in 3-5 years. Competing vegetation may be treated by manual cutting and/or herbicide.

d. *Thinning:*
   Treatment to be assessed in 10 to 15 years for pre-commercial thinning. A commercial thinning is possible in 25 to 45 years.

Roads: **The SK-ML, SK-110, SK-11002, SK-11020, SK-121, SK-136, and SK-13607 roads will continue to be used for future timber sales and forest management activities.**

Rock Pits and/or Sale: **The Virgo and Quark pits will continue to be used for future timber sale road construction and road maintenance activities. Onsite rock may be used for road construction, if rock sources are discovered along haul routes or within the sale area.**

Other: **None.**

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

☐ *303 (d) – listed water body in WAU:* ☐ *temp* ☐ *sediment* ☐ *completed TMDL (total maximum daily load):*
☐ *Landscape plan:*
☐ *Watershed analysis:*
☐ *Interdisciplinary team (ID Team) report:*
☒ *Road design plan:* **Available at Northwest Region Office.**
☒ *Wildlife report:* **Available at Northwest Region Office.**
☐ *Geotechnical report:*
☒ *Other specialist report(s):* **Biologist Review dated July 14, 2016.**
☐ *Memorandum of understanding (sportsmen's groups, neighborhood associations, tribes, etc.):*
☒ *Rock pit plan:* **Available at Northwest Region Office.**
☒ *Other:* **State Soil Survey, 1992; Policy for Sustainable Forests, December 2006; Final Habitat Conservation Plan (HCP) & Environment Impact Statement, September 1997, Geotechnical Memorandum from NW Region Licensed Engineering Geologist dated August 12, 2016.**

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain. **None known.**

10. List any government approvals or permits that will be needed for your proposal, if known.

☒ *FPA #* ☐ *FHPA* ☐ *Burning permit* ☐ *Shoreline permit* ☐ *Incidental take permit*
☐ *Existing HPA* ☐ *Other:*

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

a. *Complete proposal description*:
The proposal is a variable retention harvest, with an estimated harvest volume of 5,700 MBF of timber, on State-managed trust lands. The harvest removals will occur via both ground-based and cable yarding systems. The proposal is adjacent to private commercial timberland as well as State-managed land.
Approximately 168.4 acres were evaluated for harvest; this has been reduced to approximately 125.1 net harvest acres due to wildlife habitat, unstable slopes, existing road acres and stream buffers. The proposed timber sale consists of 2 variable retention harvest

(VRH) units and right-of-way (ROW) harvest located within the westside western hemlock zone. Unit #2 is divided in 5 sub-units. The net harvest area was determined using a global positioning system (GPS) device.

Rock pits will be utilized with this proposal. Rock pit names are listed in A.7.
Road work will be completed as part of this proposal, as listed in A.11.c.

b. *Timber stand description pre-harvest (include major timber species and origin date), type of harvest, overall unit objectives.*
Unit #1 of this proposed harvest is in a mixed conifer stand. The stand mainly consists of Douglas-fir, western redcedar, and western hemlock. The 50-year DF (Douglas-fir) site index is 125 feet in the unit. Stand originated between 1938 and 1947.

Unit #2 of this proposed harvest is also in a mixed conifer stand. The stand mainly consists of Douglas-fir, western redcedar, and western hemlock. The 50-year DF site index ranges from 122 to 138 feet in the unit. Stand originated between 1943 and 1944.

Objectives for this sale are to generate revenue for the State trust beneficiaries, protect water quality, maintain site productivity, and maintain wildlife habitat through a leave tree retention strategy, while meeting or exceeding all guidelines set forth in the DNR Habitat Conservation Plan (HCP), Policy for Sustainable Forests, and Forest Practices Rules and Regulations

c. *Road activity summary. See also forest practice application (FPA) for maps and more details.*

Type of Activity	How Many	Length (feet) (Estimated)	Acres (Estimated)	Steepest Side Slope Road Crosses
Construction		**6,582**	**2.42**	**50**
Reconstruction		**0**		**0**
Abandonment		**0**	**0**	**0**
Pre-haul maintenance		**42,810**	**15.73**	
Temporary construction		**1,695****	**0.62**	**40**
Bridge Install/Replace	**0**			
Culvert Install/Replace (no fish)	**3***			

This refers to only typed stream crossings and does not include relief culverts.
*****Of the length listed for Temporary Construction in the above table, zero feet up to the entire length listed may be built.***

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal

description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

a. *Legal description:* :

The proposal is located in Section 1 of Township 36 North, Range 5 East and Sections 16 and 17 of Township 36 North, Range 6 East.

Rock Pit: Section 6 of Township 36 North, Range 6 East.

Pre-haul Maintenance: Sections 7, 8, and 18 of Township 36 North, Range 6 East.

b. *Distance and direction from nearest town (include road names):* **This proposal is located approximately 11 miles east of Sedro-Woolley, on the SK-ML road.**

c. *Identify the names of all watershed administrative units (WAU). See also landscape/WAU map on DNR website: http://www.dnr.wa.gov/sepa under the topic "Current SEPA Project Actions – Timber Sales" for a broader landscape perspective.*

WAU Name	WAU Acres
HOWARD CREEK	**39425**

13. Discuss any known future activities not associated with this proposal that may result in a cumulative change in the environment when combined with the past and current proposal(s). (See digital ortho-photos for WAU and adjacency maps on DNR website http://www.dnr.wa.gov/sepa for a broader landscape perspective.)

No cumulative change in the environment is expected from the combination of past and future activities with this proposal. This proposal as well as past and future activities either meet or surpass Forest Practice Rules by complying with the commitments of the HCP and as such protect water quality and mitigate environmental impacts. Data in the table below was reported in the Department's GIS database on June 30, 2016.

Howard Creek WAU:

Land Manager	Acres	% of WAU
DNR	**6,283**	**15.9**
Federal	**3,809**	**9.7**
Other (Private & Other Public Land)	**29,333**	**74.4**

Past Activities in the Howard Creek WAU:

The following table reports timber harvest activity in the Howard Creek WAU within the past seven years on both DNR managed lands and non-DNR managed lands. The data was compiled from the Department's database on approved forest practice permits. This table is based on the best available information as reported in the Department's GIS database on June 30, 2016.

Past harvest:

WAU Name	DNR Harvest Acres: Even-aged	DNR Harvest Acres: Uneven-aged	Non-DNR Harvest Acres: Even-aged	Non-DNR Harvest Acres: Uneven-aged	DNR Harvest Acres: Salvage	Non-DNR Harvest Acres: Salvage
Howard Creek	**138**	**60**	**1,319**	**0**	**0**	**7**

Note: This information is derived from activity locations collected by varying methods ranging from hand drawn maps to precise GPS collection. No verification of map accuracy or activity completion is conducted. Totals may not be the sum of all harvest types due to overlapping activities. The same land may be counted more than once if, in the past seven years, more than one forest practice application has been approved for different harvests (even-age for example).

DNR Managed Lands – Future Harvests.

The following data was reported in the Department's GIS database on June 30, 2016. No attempt was made to predict future timber harvests on private land. The current proposal acreage is not included in the future harvest calculations.

WAU Name	Estimated Sale Acres through 2023
Howard Creek	**377**

Future forest management activities in the Howard Creek WAU may include road building, rock pit expansion, silvicultural work and timber harvesting. Activities occurring on DNR managed land will follow Forest Practices Rules, Habitat Conservation Plan (HCP) guidelines, and the Policy for Sustainable Forests – policies designed to minimize environmental impacts. Future forest management activities on privately managed, non-DNR lands will be subject to Forest Practice Rules.

The Department's Habitat Conservation Plan (HCP) outlines strategies to protect federally listed threatened and endangered species, and species that are in danger of being listed in the future, as well as uncommon habitat types found on forest lands in western Washington. HCP riparian buffers intended to protect salmon and trout habitat were applied to this proposal, and will be applied to all future sales in the vicinity. The HCP identifies large, structurally unique trees and snags as uncommon habitats that need to be protected. An average of 8 trees per acre will be left in the proposed harvest units. These trees will function for future snag and large structurally unique tree recruitment.

The Interim Strategy for the Marbled Murrelet in the North Puget Planning Unit, under the Department's HCP, requires Department field staff to search for and delineate any "newly identified" marbled murrelet habitat in the vicinity of any proposed timber sales. These stands may be deferred from timber harvest throughout the remainder of the Interim Strategy (with occasional exceptions made to allow road and/or yarding access into non-habitat areas), and may be considered to be left un-harvested for a longer period of time under the Department's yet-to-be-developed Long-Term Strategy for marbled murrelets. Field staff have determined that no "newly identified" marbled murrelet habitat exists in or near the proposal. This has been verified by a region biologist. Therefore, the proposal meets all requirements of the Interim Strategy and provides for potential requirements of proposed Long-term Strategy options.

B. ENVIRONMENTAL ELEMENTS

1. **Earth**

a. General description of the site (check one):
☐Flat, ☐Rolling, ☒Hilly, ☐Steep Slopes, ☒Mountainous, ☐Other:

1) *General description of the WAU or sub-basin(s)(landforms, climate, elevations, and forest vegetation zone).*
The Howard Creek WAU is located in Township 36 North, Ranges 5, 6, and 7 East and Township 37 North, Range 5 East, in Skagit and Whatcom counties. The entire WAU lies within the westside western hemlock zone, and has an elevation range of 347 to 5,904 feet. Climate is moderate with 77 inches of average annual precipitation. All aspects are fairly evenly represented. The major timber type is conifer with mixed hardwoods. Ages throughout the WAU are 0-90 years. There are also some small patches of old-growth forest.

2) *Identify any difference between the proposal location and the general description of the WAU or sub-basin(s).*

The proposal is consistent with formations and cover types found throughout the Howard Creek WAU.

b. What is the steepest slope on the site (approximate percent slope)?
120%

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils.

Note: The following table is created from state soil survey data. It is a roll-up of general soils information for the soils found in the entire sale area. It is only one of several site assessment tools used in conjunction with actual site inspections for slope stability concerns or erosion potential. It can help indicate potential for shallow, rapid soil movement, but often does not represent deeper soil sub-strata. The actual soils conditions in the sale area may vary considerably based on land-form shapes, presence of erosive situations, and other factors. The state soil survey is a compilation of various surveys with different standards.

State Soil Survey #	Soil Texture	% Slope	Mass Wasting Potential	Erosion Potential
4789	**V.GRAVELLY LOAM**	**3-30**	**INSIGNIFIC'T**	**LOW**
9162	**GRAVELLY SILT LOAM**	**30-65**	**MEDIUM**	**MEDIUM**
4790	**V.GRAVELLY LOAM**	**30-65**	**LOW**	**MEDIUM**
6700	**V.COBBLY LOAM**	**30-65**	**MEDIUM**	**MEDIUM**
4792	**MONTBORNE-RINKER-COMPLEX**	**30-65**	**No Data**	**No Data**

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

1) *Surface indications:*

Proposal area has inner-gorge/incised stream channels in the vicinity.

The statewide landslide inventory (LSI) screening tool indicates an "uncertain" polygon, #32215, overlapping portions of Unit #2. Other polygons in the vicinity of Unit #2 include #31641, #32209, #32213, #32214, #32217, and #32225. The landslide database is maintained by the Washington Department of Natural Resources, Forest Practices Division. The LSI includes landslides mapped during many different projects including large-scale geologic mapping, watershed analyses, landscape planning, and landslide hazard zonation, in addition to other case studies and mapping efforts. A large majority of landslides identified by these projects are mapped by remote review with minimal field verification. In addition, dormant and ancient deep-seated landslides are mapped in many projects included in the LSI. A large number of the remotely identified landslides and deep-seated features have been mapped with a questionable, probable, or unknown certainty. As a result, the LSI database is meant to be used as a screening tool and field verification is a necessary step in confirming the absence, presence, and extent of mapped features, as well as their actual level of activity/instability

Several landslides not identified on the LSI screening tool were recognized during office and field reviews. See memo from Licensed Engineering Geologist for additional information.

2) *Is there evidence of natural slope failures in the sub-basin(s)?*
☐*No* ☒*Yes, type of failures (shallow vs. deep-seated) and failure site characteristics:*
Isolated shallow failures are located in various inner-gorged/incised stream channels.

3) *Are there slope failures in the sub-basin(s) associated with timber harvest activities or roads?*
☐*No* ☒*Yes, type of failures (shallow vs. deep-seated) and failure site characteristics:*
Shallow failures have been observed on road cut slopes in the Howard Creek WAU.

Associated management activity:
Past road construction and maintenance. Such failures are far less likely to occur with current road building and harvest practices. Current forest practice and HCP regulations protect streams with buffers and leave trees, and culverts are sized for peak flow events.

4) *Is the proposed site similar to sites where slope failures have occurred previously in the sub-basin(s)?*
☐*No* ☒*Yes, describe similarities between the conditions and activities on these sites:*

Some of the streams within and adjacent to this proposal have similar topography to streams that have experienced slope failures in the past. Additionally, the Licensed Engineering Geologist discusses road related failures downslope of Unit #2c in the geotechnical memorandum.

5) *Describe any slope stability protection measures (including sale boundary location, road, and harvest system decisions) incorporated into this proposal.*
Timber sale boundary tags were placed along slope breaks of the inner gorge features so that none of these features are inside of a harvest area.

No timber harvest or road construction will occur on potentially unstable slopes. Roads were designed to minimize ground-based yarding distances to an average of 600 feet or less and to access cable landing locations for areas requiring cable yarding.

A State lands Licensed Engineering Geologist (a Forest Practices "qualified expert") has reviewed the proposed activity, both in the office and in the field, and prepared a memorandum. Please refer to the memo for additional information.

e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill.

Approx. acreage new roads: **2.42** *Approx. acreage new landings:* **4.0** *Fill Source:* **Native (bank run) materials.**

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.
Minor erosion may occur from freshly exposed soils along road cut slopes and embankment slopes. Erosion could result from road and landing construction during periods of heavy rainfall or as a result of yarding during periods of saturation. Additionally, erosion could result if ditches and culverts are not properly installed and maintained during and after the harvest operation. Road use during unfavorable weather conditions may contribute to an increased potential for surface erosion.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? *Approximate percent of proposal in permanent road running surface (includes gravel roads):*
Less than 2% of the site will be covered in permanent road running surface.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any: *(Include protection measures for minimizing compaction or rutting.)*
Measures are in place to help reduce and control erosion.
Riparian (RMZ) buffers as described in B.3.a.1.b and c. will be retained.

For harvest activities, ground-based operations will be limited to sustained slopes generally 35% or less, except for the use of self-levelling harvesters which may be used on sustained slopes up to 50%. The lead end of the logs will be suspended during yarding to reduce soil disturbance. Skid trails will be water-barred as necessary.

To control road related erosion, road pioneering will generally not extend more than 500 feet beyond completed construction, culverts will be installed concurrently with construction of the road subgrade, and culvert outlets will not terminate on unprotected soils. All exposed soils resulting from road construction will be revegetated the year these roads are constructed.

2. Air

a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known.
Minor emissions are anticipated from equipment exhaust and road dust created by truck traffic. Slash piles may be burned. If slash piles are burned, it will be done in compliance with the State of Washington, Department of Natural Resources Smoke Management Plan.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.
None

c. Proposed measures to reduce or control emissions or other impacts to air, if any:
If slash is burned, it will be burned in adherence to the State's Smoke Management Plan.

3. Water

a. Surface Water:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. *(see timber sale map available at DNR region office, or forest practice application base maps.)*
Yes, there are seasonal and perennial streams located in or adjacent to this proposal.

a. *Downstream water bodies:*

All water flowing through this proposal drains to the South Fork of the Nooksack River.

b. *Complete the following riparian & wetland management zone table:*

Wetland, Stream, Lake, Pond, or Saltwater Name (if any)	Water Type	Number (how many?)	Avg RMZ/WMZ Width in feet (per side for streams)
Unnamed Stream	**5**	**6**	**30-foot equipment limitation zone**
Unnamed Stream	**4**	**7**	**100**
Unnamed Stream	**3**	**2**	**156**

c. *List RMZ/WMZ protection measures including silvicultural prescriptions, road-related RMZ/WMZ protection measures, and wind buffers.*
All existing roads through RMZs will be monitored during hauling to ensure ditchwater and road runoff will not enter or otherwise adversely affect water quality or RMZ function. Corrective action such as straw bales, silt fencing, rock-lined ditches, and sediment traps will be installed/constructed if necessary.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

☐*No* ☒*Yes (See RMZ/WMZ table above and timber sale map available at DNR region office.)*
Description (include culverts):
Timber will be felled immediately adjacent to RMZs as described in the table in B.3.a.1.b. Timber will be felled in the RMZs for the purpose of road construction. Timber will be felled away from the streams where practicable to avoid damage to trees within the RMZ. Where yarding over type 5 streams is necessary, the leading edge of logs will be suspended to avoid disturbing the stream banks. One cable yarding corridor, in Unit #2c, may require a few trees to be removed from the RMZ. This corridor is anticipated to be parallel with the RMZ and not perpendicular, i.e. the corridor is not for yarding across the stream and RMZ.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.
None.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. *(Include diversions for fish-passage culvert installation).*

☐*No* ☒*Yes, description:*
All water flow may be temporarily diverted through bypass culverts or retained behind (or pumped around) coffer dams during culvert installations. Also, typed waters may be temporarily diverted, if culvert replacement is deemed necessary, through the course of operations, on typed water crossing on existing roads.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

☒*No* ☐*Yes, describe location:*

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

☒*No* ☐*Yes, type and volume:*

7) *Does the sub-basin contain soils or terrain susceptible to surface erosion and/or mass wasting? What is the potential for eroded material to enter surface water?*
Yes. Data on the following table was reported in the Department's database on June 30, 2016. This data is not available by sub-basin.

Howard Creek WAU: soil data may not be available for 100% of the WAU

Erosion Potential	Acres	% in WAU
High	2847.0	7.2
Medium	23103.7	58.6
Low	7244.8	18.4
Variable	76.0	0.2
No Data	1851.7	4.7
N/A	58.0	0.1

Mass Wasting Potential	Acres	% in WAU
High	2052.6	5.2
Medium	20220.1	51.3
Low	4833.3	12.3
Insignificant	6140.2	15.6
No Data	1851.7	4.7

8) *Is there evidence of changes to the channels in the WAU and sub-basin(s) due to surface erosion or mass wasting (accelerated aggradations, erosion, decrease in large organic debris (LOD), change in channel dimensions)?*

☐*No* ☒*Yes, describe changes and possible causes:*

HOWARD CREEK WAU SUB-BASIN 5:

Some aggradations and channel movement have been observed in the South Fork of the Nooksack River. These changes might be due to mass wasting that occurred in the Howard Creek drainage in the fall of 2003. It is not known to what extent some of the smaller tributary drainages have experienced any channel changes.

9) *Could this proposal affect water quality based on the answers to the questions 1-8 above?*

☐*No* ☒*Yes, explain:*

This proposal includes both the harvest of timber and road work. The removal of overstory vegetation will temporarily reduce interception of water and increase infiltration and saturation of water into the forest floor which could temporarily increase overland flow.

RMZ buffers (see B.3.a.1.b) and other harvest-system control measures ensure that any overland flow from disturbed soil areas will filter through substantial amounts of forest-floor vegetation before entering any perennial stream channels.

Road work disturbs surface soils where some temporary surface erosion is likely to occur, especially with the first winter rains following road work at culvert installation locations and road abandonment related culvert removal locations. These installations and removals will follow Forest Practices Rules and RMAP requirements to minimize any erosion-related water quality impacts.

See question B.1.h, B.1.d.5., B.3.a.1.c, and B.3.d. for a partial listing of some of the specific erosion protection measures.

10) *What are the approximate road miles per square mile in the WAU and sub-basin(s)? Are you aware of areas where forest roads or road ditches intercept sub-surface flow and deliver surface water to streams, rather than back to the forest floor?*

☒*No* ☐*Yes, describe:*

Howard Creek WAU: 4.4 road miles per square mile.
As reported in the Department's GIS database on June 30, 2016. This data is not available for sub-basins.

11) *Is the proposal within a significant rain-on-snow (ROS) zone? If not,* ***STOP HERE*** *and go to question B-3-a-13 below. Use the WAU or sub-basin(s) for the ROS percentage questions below.*

☐*No* ☒*Yes, approximate percent of sub-basin(s) in significant ROS zone:*

Please refer to table at B.3.a.12 for sub-basin data.

Or, approximate percent of WAU:

Howard Creek WAU: 66.7% in significant ROS zone (peak rain-on-snow zone and snow-dominated zone).

As reported in the Department's GIS database on June 30, 2016.

12) *If the proposal is within the significant ROS zone, what is the approximate percentage of the WAU or sub-basin(s) within the significant ROS zone (all ownerships) that is (are) rated as hydrologically mature?*

The following data was reported in the Department's GIS database on June 30, 2016.

WAU or sub-basin(s)	ROS acres:	% sub-basin in significant ROS zone	DNR hcp-managed forest land acres in ROS:	% DNR hcp-managed forest lands in ROS:	% DNR managed lands rated hydrologically mature
Howard Creek Sub-basin 5	**3,482**	**46.69%**	**510**	**14.66%**	**52.67%**

It is not readily known what the hydrologic maturity is on other ownerships.

13) *Is there evidence of changes to channels associated with peak flows in the WAU and sub-basin(s)?*

☐*No* ☒*Yes, describe observations in the WAU and in the sub-basin(s):*

Channel changes have occurred at the WAU level. It is difficult to separate the effects of peak stream flow increases from the effects of mass wasting in stream channels. The effects are interrelated and often occur during the same storm events (see B.3.a.8).

14) *Based on your answers to questions B-3-a-10 through B-3-a-13 above, describe whether and how this proposal, in combination with other past, current, or reasonably foreseeable proposals in the WAU and sub-basin(s), may contribute to a peak flow impact.*

The scientific data used to develop the Department's HCP policy on rain-on-snow suggests the following: Measurable damage to salmonid fish habitat (i.e. destabilization and transport of coarse woody debris, excessive sedimentation that fills in pools, and destruction of salmon redds) occurs when peak flows are increased by an amount equivalent to what would be generated by increasing the 10 year 24 hour storm by 1 inch. This threshold is believed to be exceeded in sub-basins that have at least 1/3 of their area in the significant rain-on-snow zone, and less than 2/3 of the forest in the rain-on-snow zone is in a hydrologically mature state.

In accordance with the agency's Significant Rain-on-Snow (SROS) strategy, this proposal does not manage for hydrologic maturity because the agency manages less than 50% of the SROS zone in the Howard Creek WAU subbasin 5. It is not believed that managing for hydrologic maturity will result in significant benefits unless half or more of the SROS of a subbasin is managed by the DNR.

15) *Is there water resource (public, domestic, agricultural, hatchery, etc.), or area of slope instability, downstream or downslope of the proposed activity that could be affected by changes in surface water amounts, quality, or movements as a result of this proposal?*

☒ *No* ☐ *Yes, possible impacts:*

16) *Based on your answers to questions B-3-a-10 through B-3-a-15 above, note any protection measures addressing possible peak flow/flooding impacts.*
As stated in B.3.a.14, this proposal is not expected to cause a substantial increase in peak flows. In order to minimize the risk of road failures during peak flow events, all culverts utilized in new road construction will be sized to withstand a 100-year-flood event. Culverts and ditches will be periodically maintained so that they remain functional. Storm patrols will be conducted as necessary on existing and newly constructed roads to identify and address potential erosion problems.

b. Ground Water:

1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known.
Channelized water through ditches and culverts emptying out onto the forest floor will increase surface saturation in localized areas, but it is not expected to affect ground water.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.
Minor amounts of oil and lubricants could be inadvertently spilled as a result of heavy equipment use. No lubricants will be disposed of on site.

3) *Is there a water resource use (public, domestic, agricultural, hatchery, etc.), or area of slope instability, downstream or down slope of the proposed activity that could be affected by changes in groundwater amounts, timing, or movements as a result this proposal?*

☒*No* ☐*Yes, describe:*

a. *Note protection measures, if any.*
Does not apply.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.
Storm water runoff from landings and road surfaces will be collected by ditches, then diverted through cross drain culverts onto the forest floor. Culverts will be placed to minimize the amount of ditch water entering existing streams.

2) Could waste materials enter ground or surface waters? If so, generally describe.

☐*No* ☒*Yes, describe:*
Erosion and mass wasting are unlikely, provided appropriate forest practices outlined in the timber sale contract are used during road construction and timber harvesting near all waters. Some logging slash my enter type 5 streams. Minor spills of petroleum products resulting from logging operations may occur on roads or landings but it is unlikely that any waste material could enter any surface or ground water.

a. *Note protection measures, if any.*
Existing regulations and contract requirements regarding spill prevention and waste cleanup will be followed.

3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe.
It is not likely to alter drainage patterns of the forested landscape.

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any: *(See surface water, ground water, and water runoff sections above, questions B-3-a-1-c, B-3-a-16, B-3-b-3-a, and B-3-c-2-a.)*

On roads, constructed ditches, cross-drain culverts, drain dips, and water bars will be used to control road related runoff. Straw, grass seeding, or other appropriate methods may be used on any soil exposed cut and fill slopes during the course of this proposal in order to prevent sediment movement. Roads and landings will be crowned to avoid water accumulation. Falling and yarding away from all seasonal streams will be applied where feasible. All activities associated with this proposal will meet or exceed Forest Practices standards and will follow the Habitat Conservation Plan. See also B.1.d.5 and B.1.h.

4. Plants

a. Check the types of vegetation found on the site:

☒deciduous tree:
☒alder, ☒maple, ☐aspen, ☒*cottonwood,* ☐*western larch,* ☐*birch,*
☒other: **Bitter Cherry**

☒evergreen tree:

☒ *Douglas fir,* ☐ *grand fir,* ☒ *Pacific silver fir,* ☐ *ponderosa pine,* ☐ *lodgepole pine,* ☒ *western hemlock,* ☐ *mountain hemlock,* ☐ *Englemann spruce,* ☒ *Sitka spruce,* ☒ *red cedar,* ☐ *yellow cedar,* ☐ other:

☒ shrubs:

☒ *huckleberry,* ☒ *salmonberry,* ☒ *salal,* ☐ *other:*

☐ grass
☐ pasture
☐ crop or grain
☒ wet soil plants:

☐ cattail, ☐ buttercup, ☐ bullrush, ☐ skunk cabbage, ☒ *devil's club,* ☐ other:

☐ water plants:

☐ water lily, ☐ eelgrass, ☐ milfoil, ☐ other:

☐ other types of vegetation:
☐ *plant communities of concern:*

b. What kind and amount of vegetation will be removed or altered? *(See answers to questions A-11-a, A-11-b, B-3-a-1-b and B-3-a-1-c. The following sub-questions merely supplement those answers.)*
As described in A.11, the overstory vegetation will be removed, with the exception of an average of eight trees per acre of 10 inches dbh or greater. This will ensure that a portion of the live trees that are best suited to the site, and /or exhibits desirable wildlife habitat characteristics will be left on site. Most of the current shrubs and herbaceous plants will be disturbed to varying degrees during the timber removal process of this proposal.

1) *Describe the species, age, and structural diversity of the timber types immediately adjacent to the removal area. (See color landscape/WAU and adjacency maps on the DNR website:*
http://www.dnr.wa.gov/sepa
Units are surrounded by timber from 5-90 years old, as approximated using agency GIS data and aerial photos.

2) *Retention tree plan:*
An average of 8 trees per acre will be left in clumps and individual scattered trees that are distributed across the proposed harvest areas. Numerous smaller trees, mostly western hemlock and western redcedar smaller than 10 inches dbh will also be left in these clumps, but were not counted in the total of 8 trees per acre. Representatives of all species currently found on site were designated for retention in order to preserve the current diversity of tree species found on the site. Trees were retained on and around several small pockets of wetland habitat that were too small to be buffered in accordance to the HCP wetland policy.

c. List threatened and endangered *plant* species known to be on or near the site.
None known.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:
Both units will be planted with conifer seedlings after harvest. See green tree retention plan in B.4.b.2.

e. List all noxious weeds and invasive species known to be on or near the site.
It is likely that Himalayan blackberry, bull thistle, Canadian thistle, butterfly bush, English ivy, holly, knotweed, Scotch broom, tansy ragwort, or common teasel may be found on or near the site.

5. **Animals**

a. List any birds and other animals *or unique habitats* which have been observed on or near the site or are known to be on or near the site. Examples include:

birds: ☒hawk, ☐heron, ☐eagle, ☒songbirds, ☐*pigeon*, ☒other: **Murrelet, Goshawk**

mammals: ☒deer, ☒bear, ☒elk, ☐beaver, ☒other: **Coyote, Bat**

fish: ☐bass, ☐salmon, ☐trout, ☐herring, ☐shellfish, ☐other:

unique habitats: ☐*talus slopes,* ☒*caves,* ☐*cliffs,* ☐*oak woodlands,* ☐*balds,* ☐*mineral springs*

Murrelet: **A "high" quality marbled murrelet habitat site, managed as an occupied marbled murrelet site, is near the Virgo rock pit.**

Caves: **Three caves were found in Unit #1 during layout of the sale.**

Goshawk: **An active nest was found adjacent to the Europa timber sale, which is directly east of Unit #1.**

b. List any threatened and endangered species known to be on or near the site *include federal- and state-listed species).*

TSU Number	FMU_ID	Common Name	Federal Listing Status	WA State Listing Status
Virgo Pit	--	Marbled Murrelet	Threatened	Threatened
1	67041	Northern goshawk	Fed Spp Concern	Candidate

c. Is the site part of a migration route? If so, explain.
☒*Pacific flyway* ☐*Other migration route:* *Explain if any boxes checked:*
All of Washington is considered part of the Pacific Flyway. No impacts are anticipated as a result of this proposal.

d. Proposed measures to preserve or enhance wildlife, if any:

1) *Note existing or proposed protection measures, if any, for the complete proposal described in question A-11.*

Species /Habitat: **Mature Forest Components**
Protection Measures: **Retention tree plan described in B.4.b.2**

Species /Habitat: **Riparian Habitat**
Protection Measures: **Stream protection measures listed in B.3.a.1.b. and c. and B.3.a.2., soil protection measures listed in B.1.h., slope stability protection in B.1.d.5., and peak flow protection in B.3.a.16.**

Species /Habitat: **Marbled Murrelet**
Protection Measures: **A timing restriction will be applied to the Virgo rock pit, as it lies within 0.25 miles of an occupied marbled murrelet site. No activities associated with timber harvest, or road construction may take place from 1 hour before official sunrise to 2 hours after official sunrise; and 1 hour before official sunset to 1 hour after official sunset from April 1 to August 31.**

Species /Habitat: **Caves**
Protection Measures: **Three caves were identified near the eastern edge of Unit #1. The caves were assessed and determined by a Region biologist to be low value for habitat according to the Department's HCP. A 30-foot no-harvest buffer was put in place around the caves, and leave trees were added to increase the size of the buffer.**

e. List any invasive animal species known to be on or near the site.
None known.

6. Energy and natural resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.
Does not apply.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.
Does not apply.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:
Does not apply.

7. Environmental health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.
There is a minimal hazard from heavy equipment operations. There is a potential fire hazard if operating during severe fire weather conditions during the summer. The timber sale contract contains language that addresses hazardous materials spill prevention; hazardous material spill containment, control and cleanup; hazardous material release reporting. If any toxic or hazardous chemical spill occurs, or if past contamination is discovered, the Department of Ecology will be notified. The contract

also contains language for operations during fire season.

1) Describe any known or possible contamination at the site from present or past uses.
None known.

2) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity.
None.

3) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project.
Petroleum products such as gasoline, diesel, grease, and hydraulic fluid may be used and stored during the operating life of this project. In addition, various pesticides may be used on the site for vegetation management.

4) Describe special emergency services that might be required.
Firefighting by the Department of Natural Resources, possibly supported by local fire districts
Emergency medical and/or ambulance service for personal injuries.
Responses by the Department of Ecology if a spill were to occur.

5) Proposed measures to reduce or control environmental health hazards, if any:
Safe operation of equipment will be encouraged. Industrial restrictions and precaution levels regarding forest fire protection will be enforced. The timber purchaser will be required to have fire suppression equipment on site during the restricted fire season while harvest activity is going on and will cease if relative humidity falls below 30%.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?
None.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.
Noise from rock drilling/crushing machinery, rock blasting, road building, and logging equipment such as chain saws, yarding whistles, and log/dump trucks will increase noise levels during periods of operation, typically occurring between 4:00 a.m. and 5:00 p.m. on weekdays, on a short-term basis. Noise from road construction and harvest activity will be present in the immediate vicinity of this proposal during operations. Noise from log hauling will be present along the haul routes during operations.

3) Proposed measures to reduce or control noise impacts, if any:
Noise associated with harvest and road construction activity will be minimal anywhere but in the immediate vicinity of the proposal. Harvest activity and

log hauling are historic activities in the area and noise should not be present above customary levels.

8. Land and shoreline use

a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe. *(Site includes the complete proposal, e.g. rock pits and access roads.)*
Forest land. The proposal should not affect adjacent land uses.

b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use?
Yes. See B.8.a. No conversion is planned.

1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversize equipment access, the application of pesticides, tilling, and harvesting? If so, how:
All activities will be consistent with current Forest Practice Rules within the surrounding forestland.

c. Describe any structures on the site.
None.

d. Will any structures be demolished? If so, what?
No.

e. What is the current zoning classification of the site?
Industrial Forestry

f. What is the current comprehensive plan designation of the site?
Industrial Forestry

g. If applicable, what is the current shoreline master program designation of the site?
Not applicable.

h. Has any part of the site been classified as a critical area by the city or county? If so, specify.
No.

i. Approximately how many people would reside or work in the completed project?
Does not apply

j. Approximately how many people would the completed project displace?
Does not apply

k. Proposed measures to avoid or reduce displacement impacts, if any:
Does not apply

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:
The design of this project is consistent with current comprehensive and zoning regulations.

m. Proposed measures to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance, if any:
The proposal lands are managed by DNR for long-term commercial forestry. The Department developed a long-term Habitat Conservation Plan. See also A.8

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.
Does not apply

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.
Does not apply

c. Proposed measures to reduce or control housing impacts, if any:
Does not apply

10. **Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?
Not applicable.

b. What views in the immediate vicinity would be altered or obstructed?

1) *Is this proposal visible from a residential area, town, city, developed recreation site, or a scenic vista?*
☒*No* ☐*Yes, viewing location:*

2) *Is this proposal visible from a major transportation or designated scenic corridor (county road, state or interstate highway, US route, river, or Columbia Gorge SMA)?*
☒*No* ☐*Yes, scenic corridor name:*

3) *How will this proposal affect any views described in 1) or 2) above?*
Not applicable.

c. Proposed measures to reduce or control aesthetic impacts, if any:
Timber harvesting is a normal occurrence in the vicinity of the proposal, and recent timber harvests are visible throughout the area. Within and around the proposal area, un-harvested stands, stream buffers, and leave tree clumps will remain to reduce the visual impact. These residual stands will break up the view of the harvested area considerably, and will help maintain the aesthetic quality of the area. Additionally, the proposal area will be planted with conifer trees within two years of completion of harvest activities.

11. Light and glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?
Does not apply.

b. Could light or glare from the finished project be a safety hazard or interfere with views?
Does not apply.

c. What existing off-site sources of light or glare may affect your proposal?
Does not apply.

d. Proposed measures to reduce or control light and glare impacts, if any:
Does not apply.

12. **Recreation**

a. What designated and informal recreational opportunities are in the immediate vicinity?
Informal recreational opportunities exist in the vicinity. These include hiking, mountain biking, hunting, ORV use, berry picking, and mushroom picking.

b. Would the proposed project displace any existing recreational uses? If so, describe.
Temporary displacement of recreational activities could occur during periods of active harvest operations.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:
None.

13. **Historic and cultural preservation**

a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers located on or near the site? If so, specifically describe.
Please see response in B.13.c.

b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.
None known.

c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.
TRAX report shows an archaeological/ historical site in Section 1 of Township 36 North, Range 5 East, but it is not within the proposal area. A field survey of the proposal area was conducted, with several potential historical sites found in adjacent areas. Further field review was conducted by a State Lands cultural resource technician. Review of historic maps was also conducted, to verify site ages. Two historic sites were found adjacent to the project, and determined to not be affected by the proposal activities.

The Skagit River Systems Co-op and Upper Skagit Tribe were notified of this proposal on

April 20, 2016. A face to face meeting was held with representatives from various tribes on April 28, 2016 in order to provide more comprehensive information concerning this and other proposals. No concerns have been raised as of the submittal of this document.

d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.
Any cultural resources identified during operations will be protected. Should archaeological materials or cultural items be discovered during the course of operations, all work in the vicinity will be stopped and associated tribes and Department of Archaeological and Historic Preservation (DAHP) will be contacted.

14. **Transportation**

a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.
Please see WAU and adjacency maps on the DNR website under "SEPA CENTER". There are no public streets or highways that serve the site. There will be no addition of public roads to access the site as a result of this proposal.

1) *Is it likely that this proposal will contribute to an existing safety, noise, dust, maintenance, or other transportation impact problem(s)?*
No.

b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?
No.

c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?
Does not apply.

d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).
See A.11.c.

1) *How does this proposal impact the overall transportation system/circulation in the surrounding area, if at all?*
Apart from log hauling traffic during the course of operations, this proposal will have minimal impact on the overall transportation system in the surrounding area.

e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.
No.

f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and non-passenger vehicles). What data or transportation models were used to make these estimates?
The completed project will generate approximately 1-2 trips per year for management purposes, for the first 5-10 years after the completion of the proposal. Up to 25 vehicular

trips per day could occur during peak harvest activities. These trips would occur primarily between the hours of 4:00 a.m. and 5:00 p.m. on weekdays.

g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.
See B.14.f. Transportation effects will be temporary in nature during active operations.

h. Proposed measures to reduce or control transportation impacts, if any:
None

15. **Public services**

a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe.
No.

b. Proposed measures to reduce or control direct impacts on public services, if any.
None

16. **Utilities**

a. Check utilities currently available at the site:
☐ electricity ☐ natural gas ☐ water ☐ refuse service ☐ telephone ☐ sanitary sewer
☐ septic system ☐ other:
None.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.
None.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: _____

Name of signee FINNEGAN HOPPER

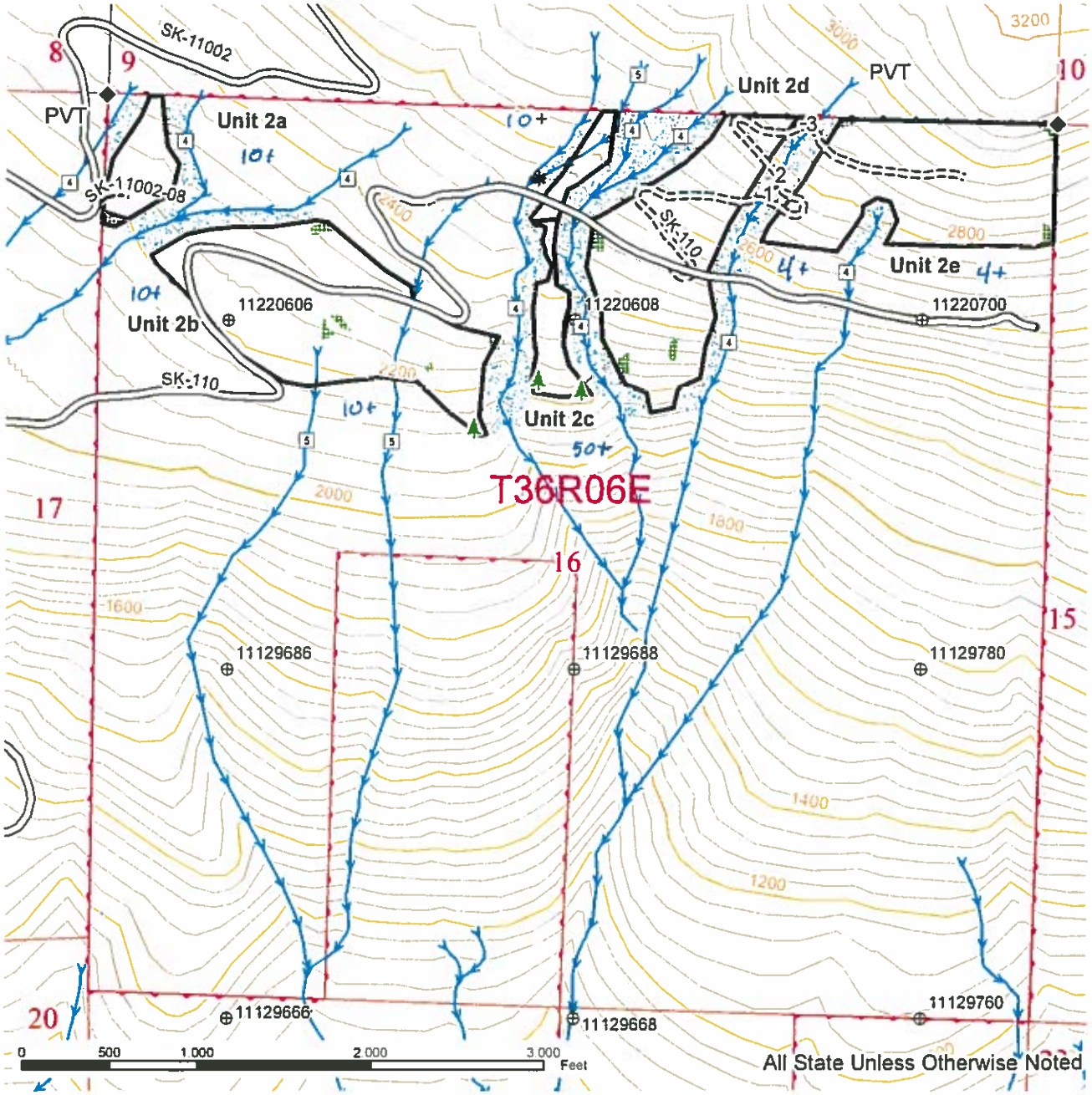
Position and Agency/Organization FORESTER 2, DNR

Date Submitted: 9/30/16

FOREST PRACTICES ACTIVITY MAP

SALE NAME: CENTAURUS
APPLICATION #: None

COUNTY(S): SKAGIT
TOWNSHIP(S): T36R05E, T36R06E



Sale Area	Existing Roads	Streams
Riparian Mgt Zone	===== New Construction	Stream Type
Leave Tree Area	—·— Temporary Construction	Stream Type Break
Rock Pit		Leave Trees

N

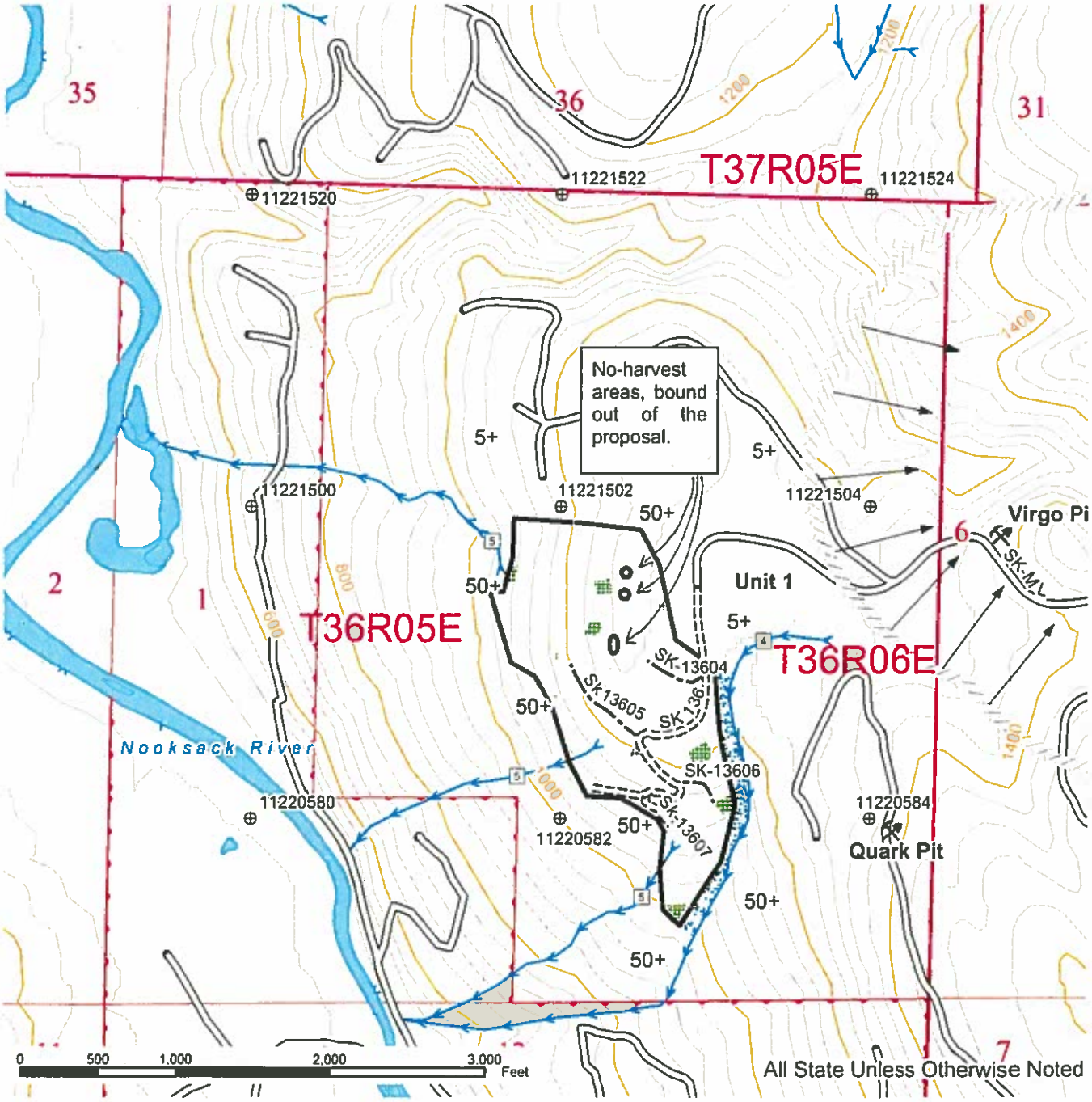
Prepared By: bbur490 06/16/2016

Modification Date: 9/1/2016

FOREST PRACTICES ACTIVITY MAP

SALE NAME: CENTAURUS
APPLICATION #: None

COUNTY(S): SKAGIT
TOWNSHIP(S): T36R05E, T36R06E



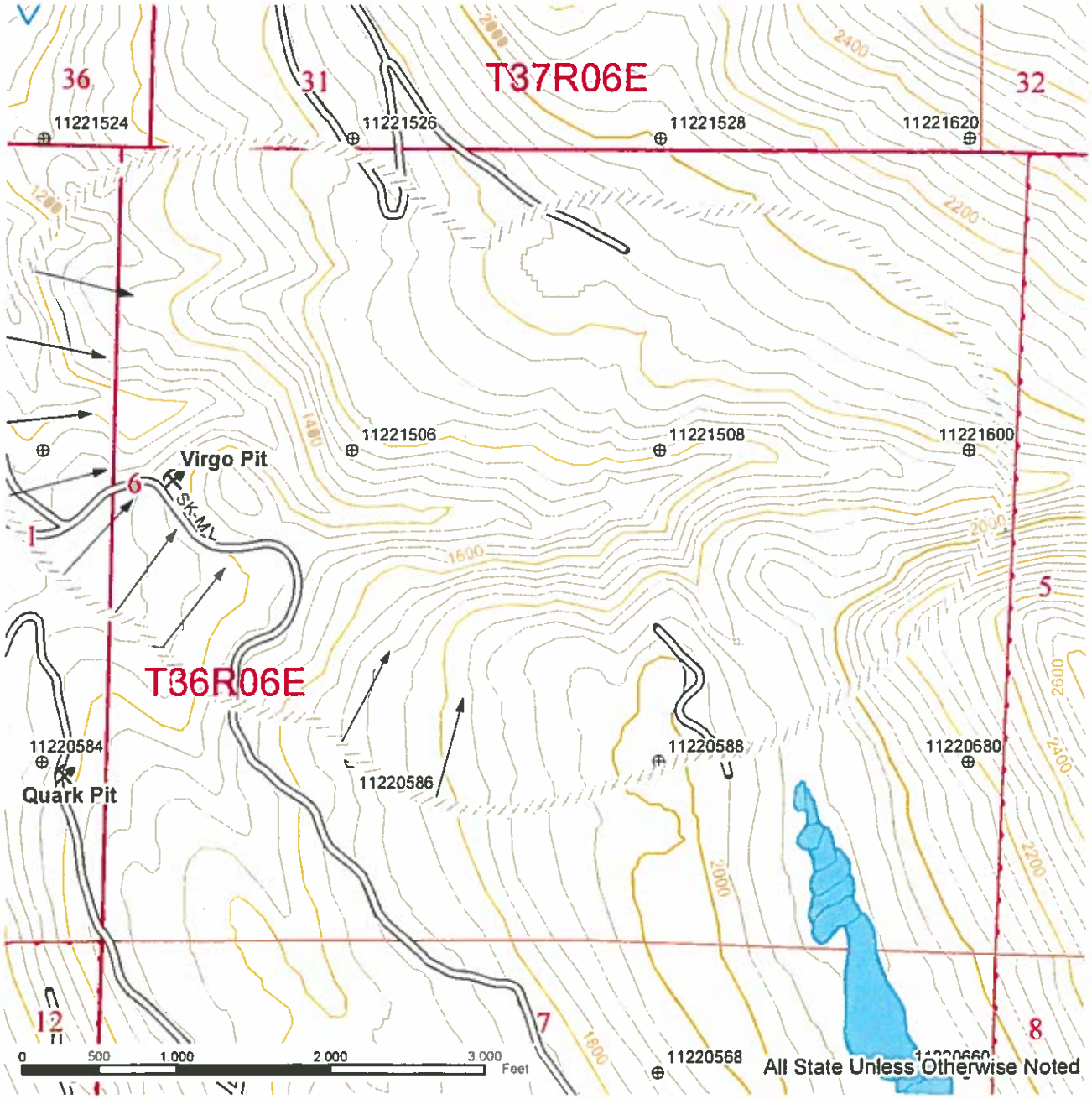
Sale Area	Existing Roads	Streams
Riparian Mgt Zone	New Construction	Stream Type
Leave Tree Area	Temporary Construction	Stream Type Break
Rock Pit	Timing Restriction	

N

FOREST PRACTICES ACTIVITY MAP

SALE NAME: CENTAURUS
APPLICATION #: None

COUNTY(S): SKAGIT
TOWNSHIP(S): T36R05E, T36R06E



Existing Roads
Timing Restriction
Rock Pit
Streams
Stream Type
Stream Type Break

N

Prepared By: bbur490 06/16/2016

Modification Date: 9/1/2016

TO: Finnegan Hopper, Forester
Hamilton Unit, Baker District
Northwest Region

FROM: John McKenzie
Licensed Engineering Geologist
Forest Resources Division
Northwest Region

SUBJECT: **MEMORANDUM**
In or Around Landslides
Centaurus Timber Sale

DATE: August 12, 2016

The purpose of this Memorandum is to briefly discuss shallow and deep-seated landslides in and around the Centaurus Timber Sale (Sale). Most of the landslides that are the subject of this memorandum are recorded in the Forest Practices Landslide Inventory (FPLI) database. A few discussed in this memorandum were not and only recognized during office review of LiDAR generated topography and review of aerial photographs, and subsequently reviewed in the field and confirmed. In addition, an opinion regarding the potential impact of the proposed harvest on the stability of these landslides following timber harvest is also provided. It should be noted that there are no Rule Identified Landforms (RILs) within the Sale.

This Memorandum is based on review of LiDAR derived topographic maps and slope maps, review of published bedrock and surficial deposits geologic mapping that encompasses the area of the timber sale, review of landslides cataloged in the FPLI database, review of pertinent orthophotographs and stereoscopic aerial photographs on file at the Northwest Region office, and field reconnaissance.

The Centaurus Timber Sale is composed of two units, Unit 1 being about 3½ miles northwest of Unit 2. Unit 1 is located in the western half of Section 1, T36N, R5E, about 8 miles north-northwest of Lyman (Figure 1). Units 2 has been subdivided into five subunits (lettered "a" to "e" on Figure 1) located in Section 16, T36N, R6E, about 6¾ miles north of Lyman (Figure 1); all in Skagit County. The Sale is located in the Howard Creek Watershed Administrative Unit (WAU). To date neither watershed analysis nor landslide hazard zonation have been prepared for this watershed. No RILs were noted Unit 1 or the subunits of Unit 2. Several slope stability issues related to "in and around" landslides were identified within or around the two Units. It is these "in and around" landslides that are the subject of this memorandum.

Field reconnaissance was conducted on March 23, June 8, and August 9, 2016. Areas traversed included the central, southwestern, western margins, and the northern portions of Unit 1. In Unit 2, field reviewed included areas of convergent and inner-gorge topography on the western margins of Unit 2c and slopes below Unit 2c, and hillside areas below an orphaned road well down slope of Unit 2e. Landslides and hillside areas along an active road (This road is between Unit 2e and the orphaned road just noted.) down slope of Unit 2e were also field reviewed.

PHYSICAL SETTING

The area of the Centaurus Timber Sale is located on western and southern flanks of Mount Josephine. Unit 1 straddles a subdued knob of bedrock on the western side of Mount Josephine. The Unit is characterized by gentle (25%) to locally steep (>65%) to very steep (>70%) south- to west- to north-facing planar and divergent slopes. The subunits of Unit 2 are located on southwest-facing slopes characterized almost everywhere by moderately steep (25 to 65%) slopes, save for the south-central area of Unit 2d, where steep (>70%) planar to divergent slopes are present, and a small area in the west-central portion of Unit 2e, where steep (>70%) planar slopes are found. Well-developed inner-gorge topography is present between portions of Units 2b/2c and 2c/2d. Unit 1 is drained by several generally westward-flowing Type-5 streams that are tributaries to the South Fork Nooksack River about 1,600- to 2,000-feet to the west. Unit 2 is drained by many Type-4 streams that all generally flow southward into the South Fork Nooksack River, about 4,500 to 6,000-feet to the south.

The geology of the Centaurus Timber Sale is characterized bedrock overlain locally by glacial debris and landslide deposits. Compilation of geologic mapping of the Skagit County area, including the area of the Sale, was published in 2000 by Lapen (*Geologic map of the Bellingham 1:100,000 Quadrangle, Washington; Washington Division of Geology and Earth Resources Open File Report 2000-5; scale 1:100,000*). This map shows the Sale is underlain by bedrock of the Jurassic age Darrington phyllite and semischist of Mount Josephine. As just noted, locally the bedrock is, in turn, overlain by glacial debris and landslide deposits of variable size and thickness. Glacial debris is mapped to underlie extensive areas of Units 2a and 2b. Though not mapped in areas of Units 1, 2c, 2d, and 2e, float suggesting the presents of glacial debris was noted in or near all those units. Landslides, large and small, are mapped to underlie areas adjacent to several subunits of Unit 2 and landslides were recognized in or around Unit 1. These landslides are discussed in more detail below in **LANDSLIDES**.

HARVEST HISTORY AND PROPOSED MANAGEMENT ACTIVITIES

Areas in and around Unit 1 were entered in the late 1940s and mid-1950s, as suggested on the timber harvest plan submitted by you. Review of the 1970 aerial photographs shows a line of alders curving around the hilltop in the central area of Unit 1. Between 1970 and 1987 no timber harvest or road building activity occurred in the area of Unit 1. The 1995 aerial photographs show an area about 1,200-feet west of Unit was cut, perhaps only a couple of years earlier. The

2001 aerial photographs show an area about 600-feet southwest of Unit 1 was harvested, also a couple of years earlier. Between 2003 and 2006 areas just east of and north of Unit 1 were cut and the road system that leads to the east and north sides of Unit 1 had been constructed. In Unit 2, review of 1978 aerial photographs suggests that the area was cut perhaps 20- to 25-years earlier. The two subparallel railroad and road grades that traverse the hillside area of Unit 2 are visible, though locally over grown, in the case of the lower grade. Between 1978 and 1996 no harvest occurred in or adjacent to Unit 2. By 2001 timber harvest had occurred adjacent to the west side of Unit 2a and on hillside areas about 400-feet down slope of Unit 2b, a year or two earlier. By 2006 additional timber harvest had occurred, within a couple of years earlier, in and about the areas of Units 2a and 2b. The 2013 orthophotographs show timber harvest on the slopes between Unit 2, and the upper road. It is proposed to harvest the timber in the Sale using VRH prescriptions with ground-based and cable-yarding systems. New road construction is proposed in both Units (Figures 2 and 3).

LANDSLIDES

Several landslides have been reported or observed in or around the several units of the Centaurus Timber Sale. Some of these landslides are recorded in the FPLI database, others were recognized during work for this Sale. These landslides vary from shallow to deep-seated, from relatively small to large slope-failures, from debris slides to rotational-translational failures. These landslides are discussed below. The landslides in and around Unit 1 are discussed first, followed by those around Unit 2. Their locations are shown on Figures 2 and 3.

UNIT 1 – During office and field review three deep-seated landslides were recognized in or around Unit 1; these landslides are not recorded in the FPLI database. These landslides are difficult to observe on aerial photographs. Shallow landslide processes were not observed in or adjacent to Unit 1. On Figure 2 the deep-seated landslides are numbered 1, 2, and 3. Each landslide is briefly described below:

Landslide 1 – The head of this landslides underlies the northwest corner of Unit 1. It is likely best characterized as a rotational-translational earthflow, and is about 1,050-feet long and up to about 500-feet wide. It is at least up to several tens of feet thick. It exhibits a subdued expression. Traverse of this landslide was hampered by abundant blow-down following the harvest to the west. Where trees were standing and stumps are present, they do not appear to be disturbed by landslide processes. A small wetland area is mapped at the head of the landslide and a Type-5 stream is mapped adjacent to the southern margin of Landslide 1.

Landslide 2 – The head of landslide underlies the southwest corner of Unit 1. It is likely best characterized as a rotational-translational failure. It is about 470-feet long and up to about 350-feet wide. It is estimated to be up to about a couple of tens of feet thick. It exhibits a subdued topographic expression and a high slope position. Trees and stumps on the landslide do not show evidence of disturbance, nor were ground cracks or any other

expression of active, recent, or historic movement observed. The upper reaches of a Type-5 stream border the northern margin of this landslide.

Landslide 3 – This landslide is "around" the southern boundary of Unit 1. No management activities are proposed on this landslide. It is likely best characterized as a rotational-translational earthflow, and is about 1,200-feet long and up to about 250-feet wide and is at least up to several tens of feet thick. It exhibits a very subdued expression. Trees and stumps on the landslide do not show evidence of disturbance, nor were ground cracks or any other expression of active, recent, or historic movement observed. There are no streams mapped adjacent to margins or at the toe of this landslide.

Landslide 1 is likely best characterized as dormant-distinct to dormant-indistinct (Forest Practices unstable-slopes board manual, 5/2016), or dormant-young to dormant-mature (*Keaton and DeGraff, 1996, in Turner, K.A. and Schuster, R. L. eds., Landslides Investigation and Mitigation: Transportation Research Board, National Research Council, Special Report 247; National Academy Press, Washington, D.C.*). Landslides 2 and 3 are likely best characterized as dormant-indistinct (Forest Practices unstable-slopes board manual, 5/2016), or dormant-mature (*Keaton and DeGraff, 1996, in Turner, K.A. and Schuster, R. L. eds., Landslides Investigation and Mitigation: Transportation Research Board, National Research Council, Special Report 247; National Academy Press, Washington, D.C.*).

UNIT 2 – The FPLI database shows the slopes below the several subunits and the lower portions on Units 2c an 2d are underlain by a very large deep-seated landslide. This landslide is mapped to extend from the area of the upper road down slope about 1 mile to the South Fork Nooksack River (Figure 1), and to be up to about 6,000-feet wide. This very large landslide is identified as 32215 in the FPLI database and is briefly discussed below. In addition, the FPLI database shows several relatively small landslides mapped on the slopes below Unit 2 or in inner-gorge topography between some of the subunits of Unit 2. These landslides are numbered 31641, 32209, 32213, 32214, 32217, and 32225 in the FPLI database. During office review and field reconnaissance the very large deep-seated landslide and several of the relatively smaller landslides could not be confirmed. Several landslides not recognized during preparation of the FPLI database were recognized during office and field review. On Figure 3 these office/field review landslides are numbered 4, 5, 6, 7, and 8. The FPLI database landslides and the landslides recognized during office and field review are briefly described below. The 5-digit numbers are landslides from the FPLI database; the single-digit numbered landslides are those recognized during office and field review. It should be noted that neither shallow nor deep-seated landslides were recognized underlying the several subunits of Unit 2.

Landslide 32215 is mapped (as shown on Figure 1) as a very large landslide and encompasses a wide range of topography including linear ridges and valleys, and drainages; however, topography typical of such a large landslide is not present at the scale mapped. A head scarp and lateral margins are not observable, casting doubt on the existence of this

landslide. Office review and field reconnaissance did reveal landslide topography within the mapped area of the very large landslide (Figure 3). These landslides, though, are much smaller than the very large Landslide 32215.

Landslide 31641 is mapped in the FPLI database to have initiated on inner-gorge slope down channel of Subunits 2c and 2d. Aerial photographic evidence and field evidence for this landslide is problematic. Where the location of this landslide as denoted on the FPLI database is observed on aerial photographs, suggestions of debris slide processes on inner-gorge slopes (very small light tones on the photographs) can be noted, but it is not conclusive. In addition, field evidence for channelized debris slides in the adjoining stream is not present. Over time the areas of the light tones appears to be come vegetated.

Landslides 32209 and 32217 are mapped in the FPLI database as channelized debris slides allegedly initiating at roads or next to roads. Review of aerial photographs and field review of the initiation areas and the channels down which they were to have flowed did not reveal evidence for these landslides. It should be noted that because of the time of occurrence (pre-1956) the evidence for these debris slides may have been largely diminished during the intervening time period between the 1956 photographs used for the FPLI and 1978 aerial photographs (earliest available) reviewed for this timber sale.

Landslide 32213 as mapped in the FPLI database appears to be a cut-slope failure. On aerial photographs the area where this landslide is mapped shows a very small light tone. Field review of the area of this landslide did not reveal evidence for this landslide.

Landslide 32214 is mapped in the FPLI database as channelized debris slide initiating in an area of inner-gorge topography between Subunits 2c and 2d. Review of aerial photographs and field review of this area did not reveal evidence for this landslide or a channelized debris slide. Where the location of this landslide as denoted on the FPLI database is observed on aerial photographs, suggestions of debris slide processes on inner-gorge slopes (very small light tones on the photographs) can be noted, but it is not conclusive. In addition, field evidence for channelized debris slides in the adjoining stream is not present. Over time the areas of the light tones appears to be come vegetated.

Landslide 32225 is mapped in the FPLI database as a road-fill failure. This landslide could be confirmed on aerial photographs and was observed during field reconnaissance. Though the debris slide track could not be confirmed.

Landslide 4 is a rotational translational landslide located about 260-feet down slope of Subunit 2c. It is about 900-feet long and up to 340-feet wide. It is estimated to be at least several 10s of feet thick. This landslide is characterized by subdued topography. Field reconnaissance of this landslide did not reveal evidence for on-going, recent, or historic movement. The current stand of timber and stumps did not show evidence of disturbance due to landslide processes. No ground cracks were observed.

Landslide 5 is a road related cut-slope failure located about 200-feet down slope of Subunit 2c. It is about 100-feet long and up to about 120- to 150-feet wide. The scarp (where visible) is up to about 1- to 1¼-feet high. The cut-slope failure toes out at the road and the road is not involved in the landslide. This cut slope failure developed following reconstruction, a few years ago, of the aforementioned road. The cut-slope failure does not appear to be active at this time.

Landslides 6, 7, and 8 are modest to relatively large deep-seated landslides located from 950- to 1,800-feet down slope from Subunit 2e. Landslide 6 was traversed several years ago during field review for the Neptune Timber Sale. Landslide 6 is relatively modest in size and characterized by subdued topography and showed no indications of on-going, recent, or historic movement. Landslides 7 and 8 are relatively large deep-seated landslides. These Landslides 7 and 8 were not field reviewed. Review of aerial photographs did not reveal evidence that these landslides are active, or have experienced movement.

Landslide 4 is likely best characterized as a dormant-indistinct (Forest Practices unstable-slopes board manual, 5/2016), or a dormant-mature (*Keaton and DeGraff, 1996, in Turner, K.A. and Schuster, R. L. eds., Landslides Investigation and Mitigation: Transportation Research Board, National Research Council, Special Report 247; National Academy Press, Washington, D.C.*). Landslide 6 is likely best characterized as a dormant-indistinct (Forest Practices unstable-slopes board manual, 5/2016), or dormant-mature (*Keaton and DeGraff, 1996, in Turner, K.A. and Schuster, R. L. eds., Landslides Investigation and Mitigation: Transportation Research Board, National Research Council, Special Report 247; National Academy Press, Washington, D.C.*).

CONCLUSIONS

Timber harvest in Unit 1 will result in cutting trees on Landslides 1 and 2, and portions of, or all of, the watershed areas of those landslides. Portions of the watershed area of Landslide 1 were harvested in the mid-2000s, about 10-years ago. A Type-5 Stream borders the southern margin of Landslide 1, and a Type-5 Stream borders the northern margin of Landslide 2. There is a potential that increased groundwater, generated by timber harvest in Unit 1, flowing down slope toward Landslides 1 and 2 could reactivate those landslides. However, it appears that past entries in the late 1940s and mid-1950s, and the more recent entry about 10-years ago did not have a noticeable impact on the stability of Landslide 1 or Landslide 2, if the entries had any impact at all. No timber harvest is proposed on Landslide 3, and about 25 percent of the watershed area of Landslide 3 will be cut. All of this landslide and watershed area was cut in the late 1940s. The toe area of this landslide was cut again in the late 1990s. Field review of Landslide 3 did not reveal evidence that these entries had a noticeable impact on the stability of Landslide 3, if the entries had any impact at all. In my opinion it is not likely that the proposed harvest will have a discernible impact, if any impact, on the short- or long-term stability of Landslides 1, 2, and 3.

Timber harvest in Unit 2 will result in increased delivery of groundwater down slope toward the landslides below Unit 2. As discussed above under **UNIT 2** in the **LANDSLIDE** section, several of these landslides 32209, 32215, and 32217 are judged to not exist. Thus there is not likely to be any impact in the case of these landslides. Landslides 31641 and 32214 are possible inner-gorge landslides. If they are real they appear to be revegetating, and not judged to present a hazard or risk to public resources with respect to the Centaurus Timber Sale. Landslides 32213, 32225, and 5 are road related landslides. Landslide 32213, if it is real, is a possible cut-slope failure located about 200-feet down slope of Subunit 2e. Landslide 32225 is a fill-slope failure located about 900-feet down slope of Unit 2e. And Landslide 5 is cut-slope failure about 400-feet down slope of Subunit 2e. Landslide 32225 is judged to be too far down slope to be impacted by timber harvest in Subunit 2e. The cut-slope failures, assuming Landslide 32213 is real, are localized and in the case of Landslide 5 slow moving, and if reactivated they would like deliver to the road and not likely travel any further than the road. Thus they would not likely adversely impact public resources. Landslide 4 is located about 260-feet down slope of Subunit 2c. Review of LIDAR generated topography suggests that only a very small portion of the watershed area of Landslide 4 will be cut. Thus it is anticipated that harvest in Subunit 2c will not likely have an adverse impact on the short-term or long-term stability of Landslide 4. Landslides 6, 7, and 8 are judged to be too far down slope (950 to 1,800 feet) of Subunit 2e to likely be adversely impact by timber harvest in Subunit 2e. The impacts of the additional groundwater generated by the harvest would likely be attenuated over the distance between Subunit 2e and Landslides 6, 7, and 8.

If you have any questions, please call.

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Attachments:

Figure 1 Location Map
Figure 2 Landslide Map of Unit 1
Figure 3 Landslide Map of Unit 2

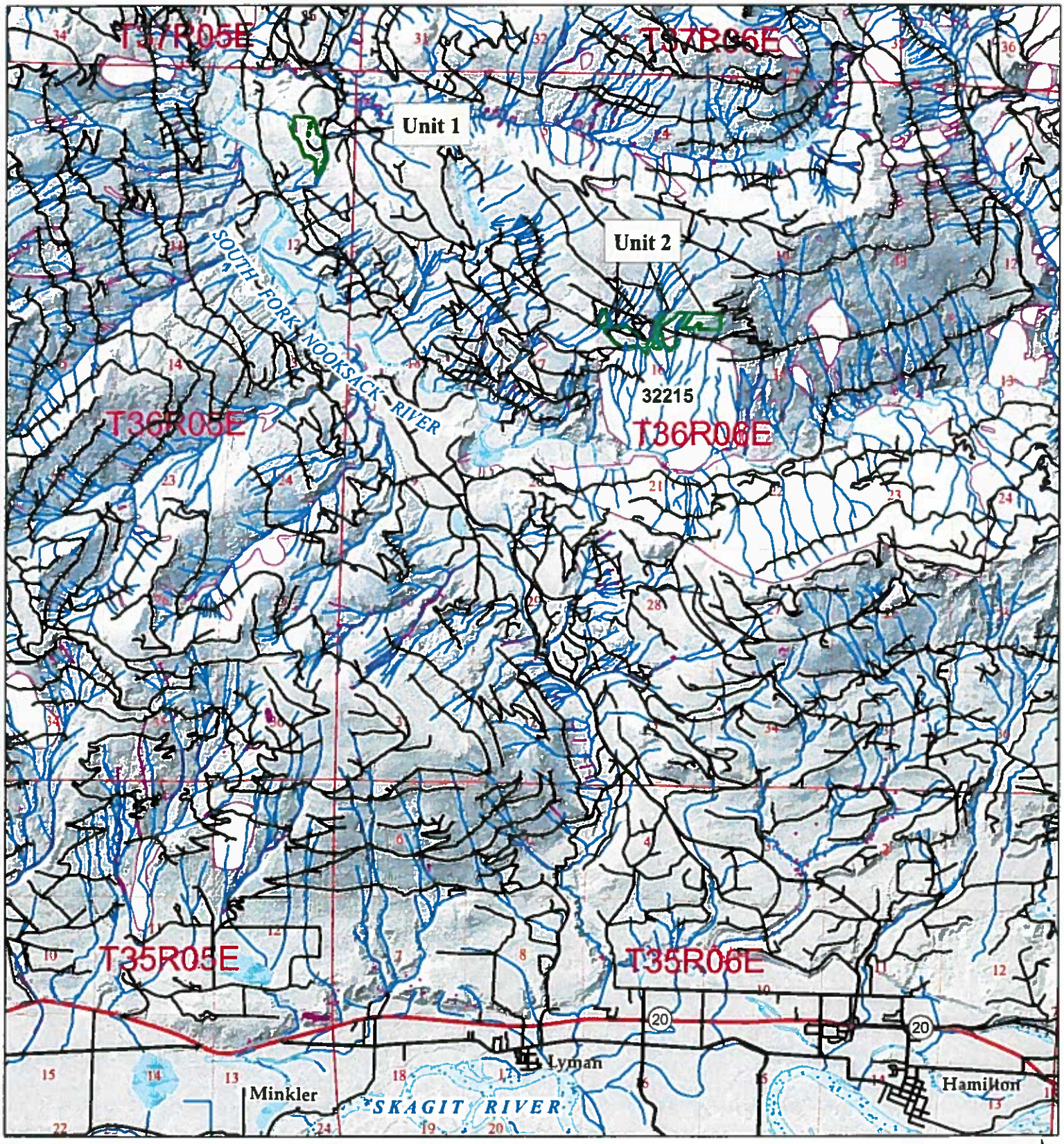

FIGURE 1 LOCATION MAP

Centaurus Timber Sale

1 inch = 1 mile

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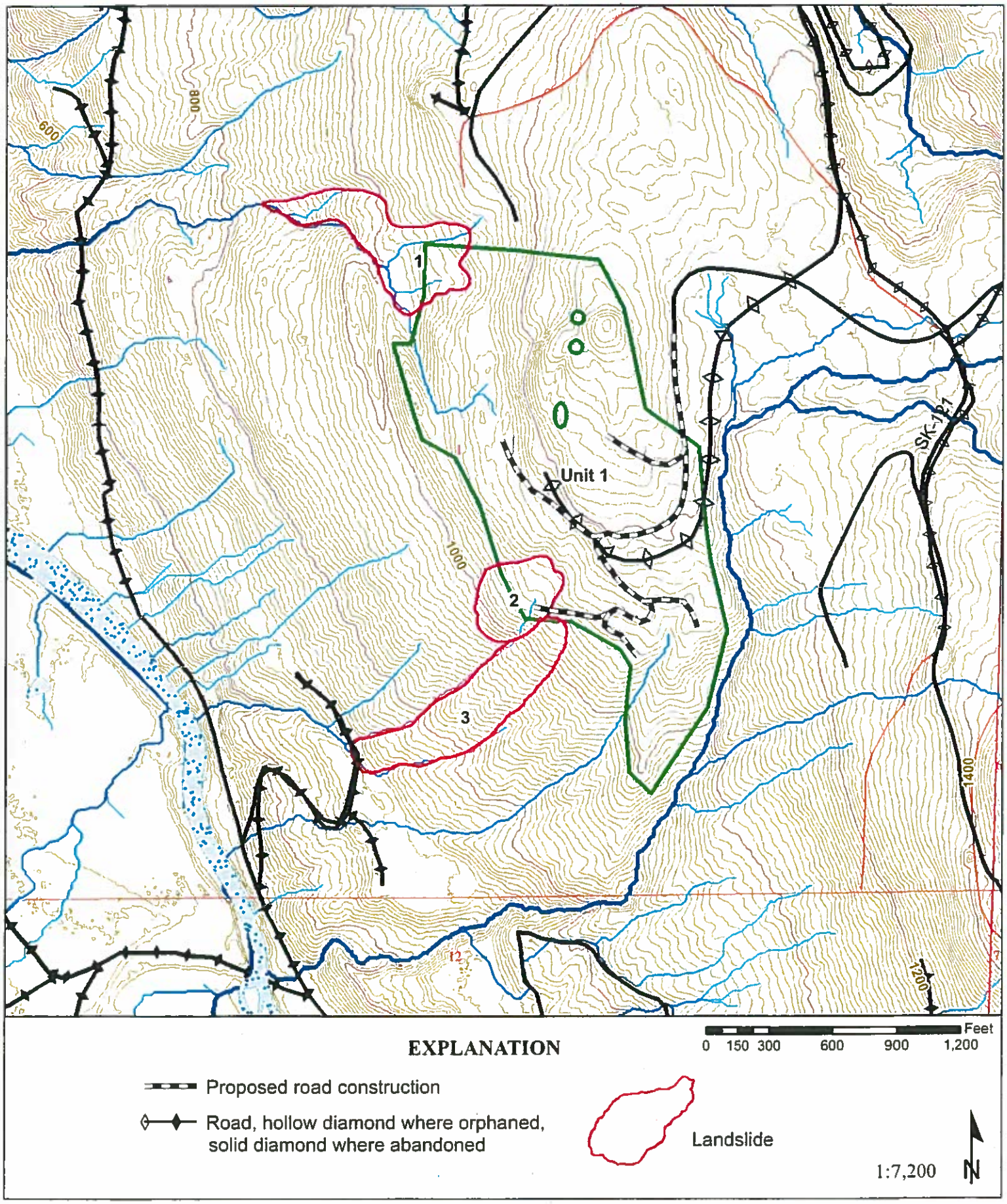

FIGURE 2 LANDSLIDE MAP OF UNIT 1

Centaurus Timber Sale

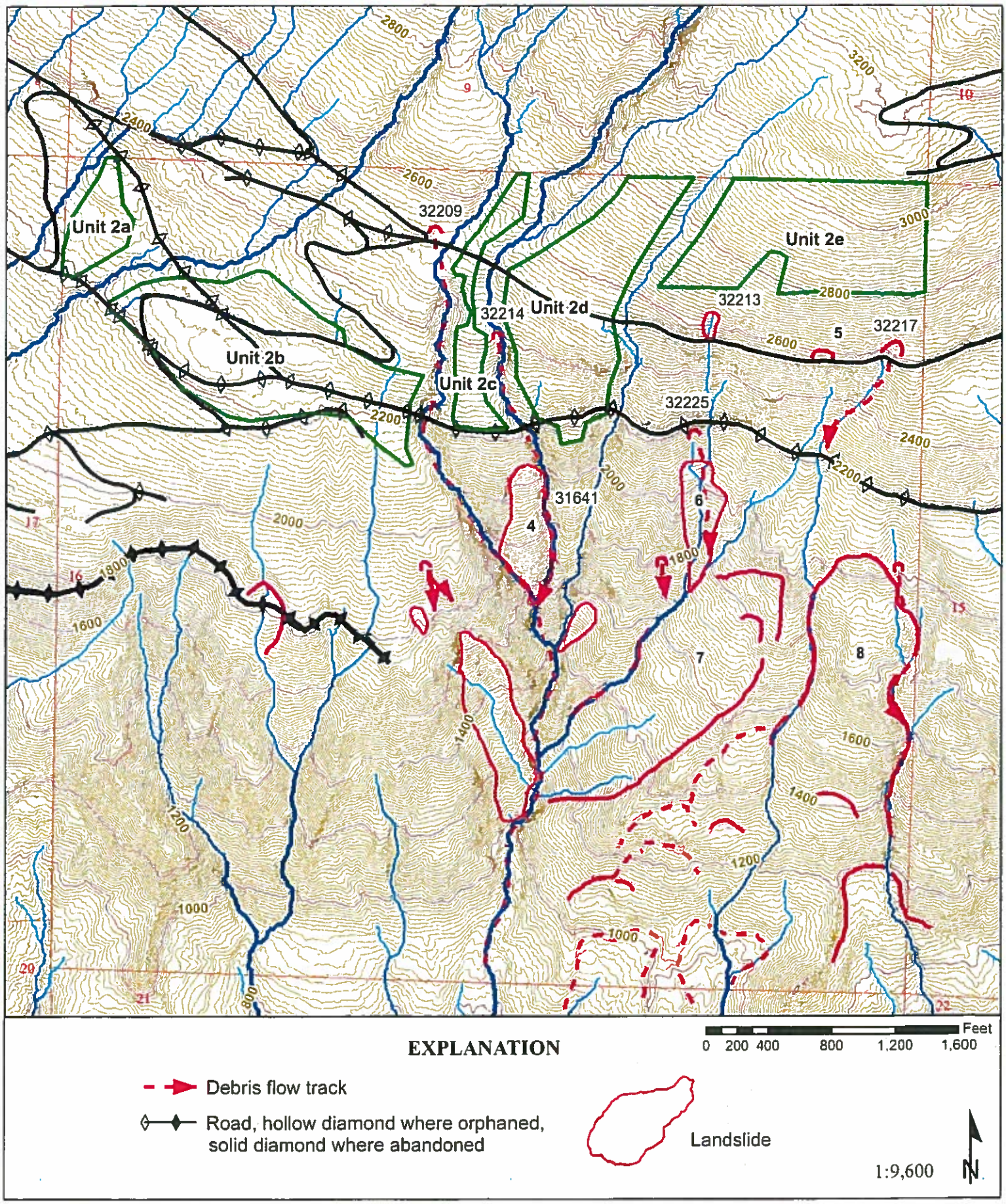

FIGURE 3 LANDSLIDE MAP OF UNIT 2

Centaurus Timber Sale