GeoEngineers

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June 4, 2020

Merrill & Ring, Inc.,
agent for Grandy Lake Forest Associates, LLC.
P.O. Box 2264
Mount Vernon, Washington 98273

Attention: Jamie Hillery

Subject: Forest Practices Geotechnical Evaluation
Elephant Hair Harvest Unit
Section 14, T34N, R6E
Skagit County, Washington
File No. 1803-002-00

GeoEngineers, Inc. (GeoEngineers) is pleased to present the results of our forest practices geotechnical evaluation of the Elephant Hair Harvest Unit in the Day Creek Watershed Administrative Unit (WAU) in Skagit County, Washington. Prior to our site visit, the harvest unit had been evaluated and flagged by Merrill & Ring, Inc. (Merrill & Ring) with the intent of avoiding unstable areas. Merrill & Ring requested an evaluation by a "qualified expert" to confirm that the harvest boundaries in select areas had been appropriately flagged to avoid unstable areas and Rule-Identified Landforms (RILs), and to supplement the Forest Practices Application (FPA) to the Washington State Department of Natural Resources (DNR). A portion of the proposed harvest unit is within the groundwater recharge area (GWRA) of a glacial deep-seated landslide which may qualify this FPA for Class IV Special status.

This evaluation was performed by Mr. Andrew J. Caneday, a licensed engineering geologist (No. 2555) in Washington and designated by DNR as a "qualified expert" for timberland slope stability evaluation.

PURPOSE AND SCOPE OF SERVICES

The purposes of this evaluation were to: (1) evaluate areas of concern identified during our office review; (2) assess the potential impacts of the proposed forest practices on slope stability; and (3) provide mitigation recommendations to minimize potential adverse impacts on slope stability from harvest activities, if necessary. Specifically, we completed the following scope of services:

- Reviewed available maps, reports and other information pertinent to the site.
- Interpreted historical aerial photographs and Light Detection and Ranging (LiDAR)-derived imagery and maps of the site.

- Performed a field reconnaissance of the harvest unit.
- Evaluated the potential effects of the proposed harvest activities on slope stability in the project area.
- Evaluated the potential for sediment delivery to public resources in the event of a landslide within the unit, based on our office review and site reconnaissance.
- Provided this letter summarizing our observations, conclusions and recommendations.

SITE AND PROJECT DESCRIPTION

The proposed harvest unit is located approximately 11 miles to the southeast of Sedro Woolley, Washington, as shown in Figure 1, Vicinity Map. The proposed harvest area is in Section 14, T34N, R6E in Skagit County, Washington, as indicated in the Harvest Unit Plan, Figure 2. The area proposed for harvest is located on northeast-facing slope above Day Creek, a Shoreline of the State (Type S stream) and labeled as CK 1 on Figure 2. The unit is drained by several fish (Type F) and non-fish seasonal (Type Ns) and perennial (Type Np) streams that flow northeast to Day Creek. The ground within the harvest unit is generally planar and slopes to the northeast at an average gradient of 35 to 40 percent. The slope leading directly to Day Creek, as well as portions of the Type Ns and Np streams that drain the harvest unit, qualify as inner gorges and have already been flagged out of the harvest unit. Slope inclinations within these features can exceed 100 percent.

GEOLOGIC AND SOIL CONDITIONS

The published 1:24,000-scale geologic map for the area indicates that the proposed harvest unit is underlain by Vashon-age continental glacial till (Qvt), as shown in Figure 3, Geology and Soils Map (Whetten et al. 1979). Glacial till was observed within the proposed harvest unit, along the steep slopes leading to Day Creek. We also suspect that Quaternary mass-wasting deposits (Qls) may underlie the upper portion of the proposed harvest unit. The Qls deposits are likely derived from the recessional outwash (Qvr) terrace located upslope of the unit (see description for LS-3 below).

The proposed harvest unit is underlain by soils of the Jug and Montborne series (Washington State Division of Forest Land Management 1983). The jug soils are classified as very gravelly sandy loam on 0 to 30 percent (3620). These soils are "some excess" drained and have an insignificant mass wasting potential and a low erosion potential. The Montborne soils are classified as very gravelly loam on 30 to 65 percent (4790). These soils are moderately well-drained and have a low mass wasting potential and a medium erosion potential.

LANDSLIDE ACTIVITY

Our assessment of the landslide activity within and adjacent to the proposed harvest unit is based on a review of the DNR statewide landslide inventory (LSI), a review of LiDAR-derived hillshades and topography, a review of aerial photography and orthophotos of the project site (various photos from 1941 to 2019), and our site reconnaissance.

Our evaluation indicates that there are several large, deep-seated landslides on the valley side slopes above Day Creek. A few of these landslides are located within or adjacent to the proposed harvest units.

The approximate location and extent of each landslide within or adjacent to the harvest units is shown in Figure 4, Landslide Activity Map. The following is a summary our findings:

- The DNR LSI shows a large, deep-seated landslide mapped within the northwest half of the proposed harvest unit. The mapping shown in the LSI is based on the 1:100,000-scale geologic map for the area. The 1:24,000-scale geologic map (Figure 3) shows a similarly shaped feature to the northwest of the proposed harvest unit. In our opinion, the mapped landslides depicted on both the 1:100,000-scale and 1:24,000-scale geologic maps do not exist. Based on our review of LiDAR data, the ground within the mapped landslides does not show typical indicators of mass wasting, such as an arcuate-shaped head scarp, hummocky topography, or lobate toe.
- Based on a review of LiDAR data, three failures were identified within and adjacent to the area proposed for harvest.
  - LS-1: A glacial, deep-seated landslide is visible on LiDAR and was confirmed during our site reconnaissance. The feature is adjacent to Day Creek, directly northeast of the proposed harvest unit. The landslide is approximately 250 feet wide and extends 330 feet upslope of Day Creek to an old railroad grade (see Site Observations 4 through 7 below). The sharp, bare, 15- to 20-foot-high head scarp exposes glacial till. The LiDAR data and field observations suggest LS-1 is active to recent based on the sharp, unvegetated head and side scarps, hummocky to benchy topography and back-tilted conifer on the landslide body. The deep-seated landslide was likely triggered primarily by undercutting of the slope by Day Creek; however, placement of fill and concentration of surface flow to the landslide by the old railroad grade may also have contributed to the failure. A portion of the GWRA of the landslide is within the area proposed for harvest.
  - LS-2: A failure identified during our site visit and visible on LiDAR adjacent to Day Creek, northeast of the proposed harvest area (see Site Observations 8 below). The 20-foot-high head scarp of the feature is near-vertical and oriented roughly north-south. The average thickness of the landslide is approximately 10 feet. The landslide is approximately 65 feet wide and extends about 75 feet above Day Creek. The scarp is sharp, unvegetated and exposes glacial till. The LiDAR data and field observations suggest LS-2 is on the borderline between shallow and deep-seated, although the primary sliding mechanism appears to be periodic shallow failures due to erosion at the base of the slope by Day Creek. The age of the feature is likely active to recent based on the sharp, unvegetated head and side scarps and presence of scattered, young alder on the slide mass. Regardless of the age and depth, both the landslide and area draining to the landslide are outside of the area proposed for harvest.
  - LS-3: A questionable deep-seated landslide identified on LiDAR and located mostly above and outside the proposed harvest unit; however, a portion of the toe of the deposit extends into the upper portion of the unit (see Site Observation 1). The feature is approximately 1,200 feet wide and extends about 1,300 feet downslope from the edge of the glacial outwash terrace. Although the ground within the feature is broadly hummocky to undulating, the head scarp and lateral margins are vague and dissected, making it difficult to discern whether the slope has experienced deep-seated movement. Day Creek is currently about 1,000 feet downslope (northeast) of the landslide toe. The LiDAR data and our field observations of the deposit suggest LS-3 is relict based on the vague, vegetated head and side scarps, undulating topography and presence of in-place, old-growth stumps on the deposit. Similar landslides in this area may have been triggered by a large seismic event after the end of the last continental glaciation (Noson, et al. 1988).

- Aerial Photography of the project site does not show signs of recent instability within the area proposed for harvest (Figures 5 through 9). The proposed harvest unit was last clear cut harvested in the mid to late 1940s and then thinned in the mid-1990s (Figure 7, 1998 Aerial Photograph). No signs of instability within the general areas of LS-1 through LS-3 are visible on the photographs.

SITE OBSERVATIONS AND RECOMMENDATIONS

The following observations were made in the field on May 7, 2020, with Jamie Hillery of Merrill & Ring. The approximate location of each site observation is shown on Figure 2.

Site 1 is located within the groundwater recharge area for the glacial, deep-seated landslide LS-1 along Type Ns stream CK 4A. Site 1 is also located near the approximate toe of glacial, deep-seated landslide LS-3. The undulating ground in this area gently slopes to the northeast at approximately 35 percent and supports straight conifer and in-place old-growth stumps. The side slopes of stream CK 4A are gentle and well-vegetated. Glacial till is exposed within the stream banks. The toe and lateral margins of landslide LS-3 are vague and not readily visible on the ground in this area. Furthermore, we did not observe any evidence of reactivation of LS-3 in response to previous forest practices. In our opinion, LS-3 is likely relict in age.

Site 2 is the location of an exposure of glacial till within the stream channel of Type Ns stream CK 4A.

Sites 3 through 7 are located within or adjacent to the active, glacial deep-seated landslide LS-1. LS-1 is approximately 250 feet wide and extends 330 feet upslope of Day Creek. Site 3 is located at the sharp, near-vertical, 15- to 20-foot-high, bare scarp. The head scarp exposes glacial till. Sites 4 and 5 are located at the lateral margins of the landslide along an old railroad grade. The railroad grade within the limits of the landslide likely consisted of a large fill to cross stream CK 4A and has completed failed downslope. Through cuts to either side appear to direct surface flow towards the feature. The ground below the head scarp shows signs of active, deep-seated movement, including hummocky topography and a series of benches that step down the slope, likely rotated blocks. The slide body is inclined at 40 percent on average and supports primarily back-tilted to bowed conifer and alder. A split stump within the body of the slide (Site 6) indicates displacements of at least 10 to 15 feet downslope towards Day Creek. Day Creek is actively undercutting the toe of the landslide, where freshly exposed landslide deposits are visible (Site 7). LS-1 has been excluded from the proposed harvest area and unit boundary is located approximately 45 feet upslope of the landslide scarp. In our opinion, erosion at the toe by Day Creek in combination with concentration of surface water and placement of fill as a result of railroad construction are the likely failure mechanisms of landslide LS-1. The potential for deep-seated acceleration as a result of harvest within a portion of the GWRA is unlikely, in our opinion (see the section "Glacial Deep-Seated Landslide Assessment" below).

Site 8 is located near the scarp of landslide LS-2. The feature has a 20-foot-high sharp scarp that is mostly bare and exposes glacial till. Below the head scarp, the ground within LS-4 is inclined at 70 to 80 percent on average and supports young alder and bushy vegetation. The type of failure appears to be shallow, translational with depth of movement approximately 10 feet. The ground upslope of LS-1 is inclined at about 15 percent and primarily populated with straight conifer and old-growth stumps. In our opinion, LS-2 is likely active to recent in age and on the borderline between shallow and deep-seated movement; however, LS-2 and the associated GWRA are outside of the area proposed for harvest and, therefore, not subject to a glacial, deep-seated landslide assessment.

GLACIAL DEEP-SEATED LANDSLIDE ASSESSMENT

The GWRA of glacial deep-seated landslide LS-1 and the toe of glacial deep-seated landslide LS-3 were identified within the proposed harvest unit during our review of aerial photography and LiDAR and confirmed during our geologic reconnaissance of the site. Landslide LS-2 and the associated GWRA were determined to be outside of the area proposed for harvest. The approximate extents of the glacial deep-seated landslides and the associated GWRAs, if applicable, are shown in Figure 4.

Based on vegetation and slope morphology indicators from Keaton and DeGraff (1996), we classified the deep-seated activity level of landslides LS-1 as active to recent based on the sharp, unvegetated head and side scarps, hummocky to benchy topography, and back-tilted conifer on the landslide body. LS-3 is likely relict based on the vague, vegetated, dissected scarp and lateral flanks, undulating topography and presence of in-place, old-growth stumps on the scarps and body.

The effects of timber harvest within the glacial deep-seated landslides and associated GWRA were evaluated based primarily on a qualitative assessment of risk based on historical evidence of slope performance after previous forest practice activities; however, a quantitative assessment was also performed for LS-1 to evaluate the potential increase in groundwater recharge after timber harvest because the feature shows signs of recent movement. Bidlake and Payne (2001) developed empirical equations for estimating annual groundwater recharge based on soil type, land cover and annual precipitation. The empirical equations are shown in Table 1.

TABLE 1. ANNUAL RECHARGE TO GROUNDWATER EQUATIONS

Soil Type and Land Cover	Equation for Annual Recharge *R* (in)
Nonforest vegetation on soils formed on glacial outwash and other alluvium	$R = 0.806 * \text{Annual Precipitation} - 8.87$
Forest vegetation and soils formed on glacial outwash and other alluvium	$R = 0.633 * \text{Annual Precipitation} - 6.96$
Forest and nonforest vegetation on soils formed on glacial till or fine-grained sediments	$R = 0.388 * \text{Annual Precipitation} - 4.27$
Developed or urban land	$R = 0.194 * \text{Annual Precipitation} - 2.13$

Based on published geologic mapping and our site reconnaissance, the proposed harvest unit appears to be underlain by glacial till. Based on Table 1, the annual recharge (*R*) for an area underlain by glacial till or fine-grained sediments (low permeability) would not change after timber harvest. The presence of surface flow (stream CK 4A) along the portion of the LS-1 GWRA within the harvest unit suggests that groundwater recharge is limited in this area. However, for the purposes of this groundwater recharge assessment it was conservatively assumed that the proposed unit is underlain by glacial outwash. Table 1 provides an equation for both the forested and nonforested condition for ground underlain by glacial outwash, which allows for the estimation of change in annual groundwater recharge post-harvest. Based on National Oceanic and Atmospheric Administration (NOAA) precipitation data from the nearby Sedro Woolley station (https://www.ncdc.noaa.gov/cdo-web/), our calculations assume an annual precipitation of 49 inches. Table 2 summarizes the estimated change in annual groundwater recharge following timber harvest.

TABLE 2. ESTIMATED CHANGE IN ANNUAL GROUNDWATER RECHARGE POST-HARVEST

Landslide	Area of Landslide (ac)	Area of GWRA (ac)	Percent of Landslide/ GWRA Proposed for Harvest	Pre-Harvest Annual GW Recharge to Landslide/ GWRA (in/yr)	Post-Harvest Annual GW Recharge to Landslide/ GWRA (in/yr)	Percent Increase GW Recharge to Landslide/ GWRA Post-Harvest
LS-1	1.8	14	51.9%	24.1	27.5	14.2%

Assuming higher permeable material underlie the harvest unit, the total increase in groundwater recharge to the landslide LS-1 and associated GWRAs is estimated to be approximately 14 percent. As mentioned above, the estimated change in groundwater recharge is likely inflated since the harvest unit is underlain by glacial till which would likely limit vertical movement of surface water. Furthermore, previous forest practices included the complete clear-cut harvest of trees on the landslide and associated GWRA. These activities do not appear to have resulted in increased activity of LS-1. In our opinion, the estimated increase in groundwater recharge post-harvest has a low likelihood of resulting in acceleration of LS-1 based on historical evidence of slope stability after the previous forest practice activities. Continued movement of LS-1 is most likely associated with undercutting of the slope by Day Creek and concentration of surface flow to the feature by the existing railroad grade.

CONCLUSIONS

As required by DNR, the following are responses addressing Washington Administrative Code (WAC) 222-10-030 (1) (a,b,c):

In order to determine whether such forest practices are likely to have a probable significant adverse impact, and therefore require an environmental impact statement, the applicant must submit the following additional information, prepared by a qualified expert. The expert must describe the potentially unstable landforms in and around the application site and analyze:

(a) *The likelihood that the proposed forest practices will cause movement on the potentially unstable slopes or landforms, or contribute to further movement of a potentially unstable slope or landform:*

The proposed forest practices are unlikely to cause or contribute to further movement on potentially unstable slopes or landforms because the features that were recognized by this evaluation as unstable or potentially unstable have been removed from the proposed harvest. A portion of the GWRA of glacial deep-seated landslide LS-1 and the toe of landslide LS-3 is within the proposed harvest unit. Based on a review of aerial photography, LiDAR data and observations made in the field, LS-1 is an active landslide triggered by undercutting of the slope by Day Creek. Landslide LS-3 is likely a relict feature that has not been historically reactivated. A quantitative assessment of groundwater recharge suggests that the proposed forest practices could temporarily increase annual recharge to LS-1 by about 14 percent; however, the presence of low permeability glacial till within the harvest unit will greatly reduce the groundwater recharge to LS-1. Surface water within the GWRA is likely to flow directly to stream Ck 4A and on to Day Creek. in our opinion, this potentially small increase in annual recharge post-harvest will have a low likelihood of accelerating deep-seated slope movement as evidenced by the lack of response to historic clear-cut harvest.

(b) *The likelihood that sediment or debris would be delivered to any public resources, or in a manner that would threaten public safety:*

The proposed forest practices are unlikely to increase the delivery of sediment or debris to public resources or to threaten public safety because the features that were recognized by this evaluation as unstable or potentially unstable have been removed from the proposed harvest. It is the general belief, upon which are predicated the Forest Practices Rules, that avoidance of unstable landforms by appropriately buffering them from harvested areas is a strategy that will limit landslide occurrences to a frequency and magnitude within the range of natural processes (Forests and Fish Report, Appendix C). In our opinion, this standard has been met by the complete removal of unstable landforms that have clear delivery potential. As mentioned above, harvesting trees within the GWRA of deep-seated landslides LS-1 may temporarily increase the annual recharge to these features but is unlikely to accelerate or reactivate slope movement, or increase sediment delivery.

The proposed forest practices will not threaten public safety since the site has limited public use and is several miles from private residences and public infrastructure.

(c) *Any possible mitigations for the identified hazards and risks:*

Mitigation occurs through the careful engineering of this harvest unit, and the leaving of significant riparian buffers and additional trees in certain locations. In particular, the riparian buffer along Day Creek is located along the toe of landslide LS-1, which could be susceptible to increased sediment delivery.

LIMITATIONS

We have prepared this report for use by Merrill & Ring, Inc., agent for Grandy Lake Forest Associates, LLC., for the Elephant Hair Harvest Unit. We provided our services to evaluate potential impacts of proposed harvest and road rehabilitation activities on specific sites within the harvest unit. Our recommendations are intended to minimize adverse impacts on slope stability from forest practices. However, forest practices on slopes involve risk, only part of which can be mitigated through qualified engineering and harvest practices. Favorable performance of slopes in the near term does not imply a certainty of long-term performance, especially under conditions of adverse weather or seismic activity.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of engineering geology in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix A titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

REFERENCES

Keaton, J.R. and DeGraff, J.V., 1996, Surface observation and geologic mapping. IN: Turner, A.K., Schuster, R.L. (Eds.), Landslides - Investigation and Mitigation. National Academy Press; National Research Council Transportation Research Board Special Report 247, 36-75.

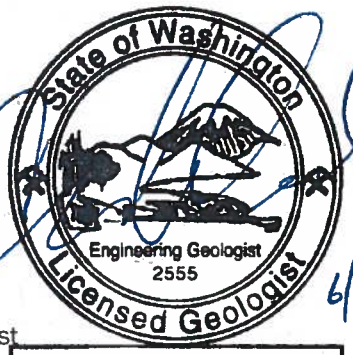
Noson, L.L., Qamor, A., and Thorsen, G.W., 1988, Washington State Earthquake Hazards: Washington State Division of Geology and Earth Resources, Information Circular 85, Olympia, Washington.

Whetten, J.T., Dethier, D.P., and Carroll, P.R., 1979, Geologic map of the Clear Lake NE quadrangle, Skagit County, Washington: U.S. Geological Survey, OF-79-1468. 1:24,000.

Washington State Division of Forest Land Management, 1983, State Soil Survey, Report for the Olympic Area: Olympia, Wash., Washington State Department of Natural Resources, Forest Land Management Division.

We appreciate the opportunity to provide services to Merrill & Ring. Please call if you have any questions concerning this report or if we can be of further assistance.

Sincerely,
GeoEngineers, Inc.



Andrew J. Caneday, LEG
Associate Engineering Geologist

CRG:AJC:leh

Attachments:
Figure 1. Vicinity Map
Figure 2. Harvest Unit Plan
Figure 3. Geology and Soils Map
Figure 4. Landslide Activity Map
Figure 5. 1953 Aerial Photograph
Figure 6. 1971 Aerial Photograph
Figure 7. 1998 Aerial Photograph
Figure 8. 2006 Aerial Photograph
Figure 9. 2019 Aerial Photograph
Appendix A. Report Limitations and Guidelines for Use

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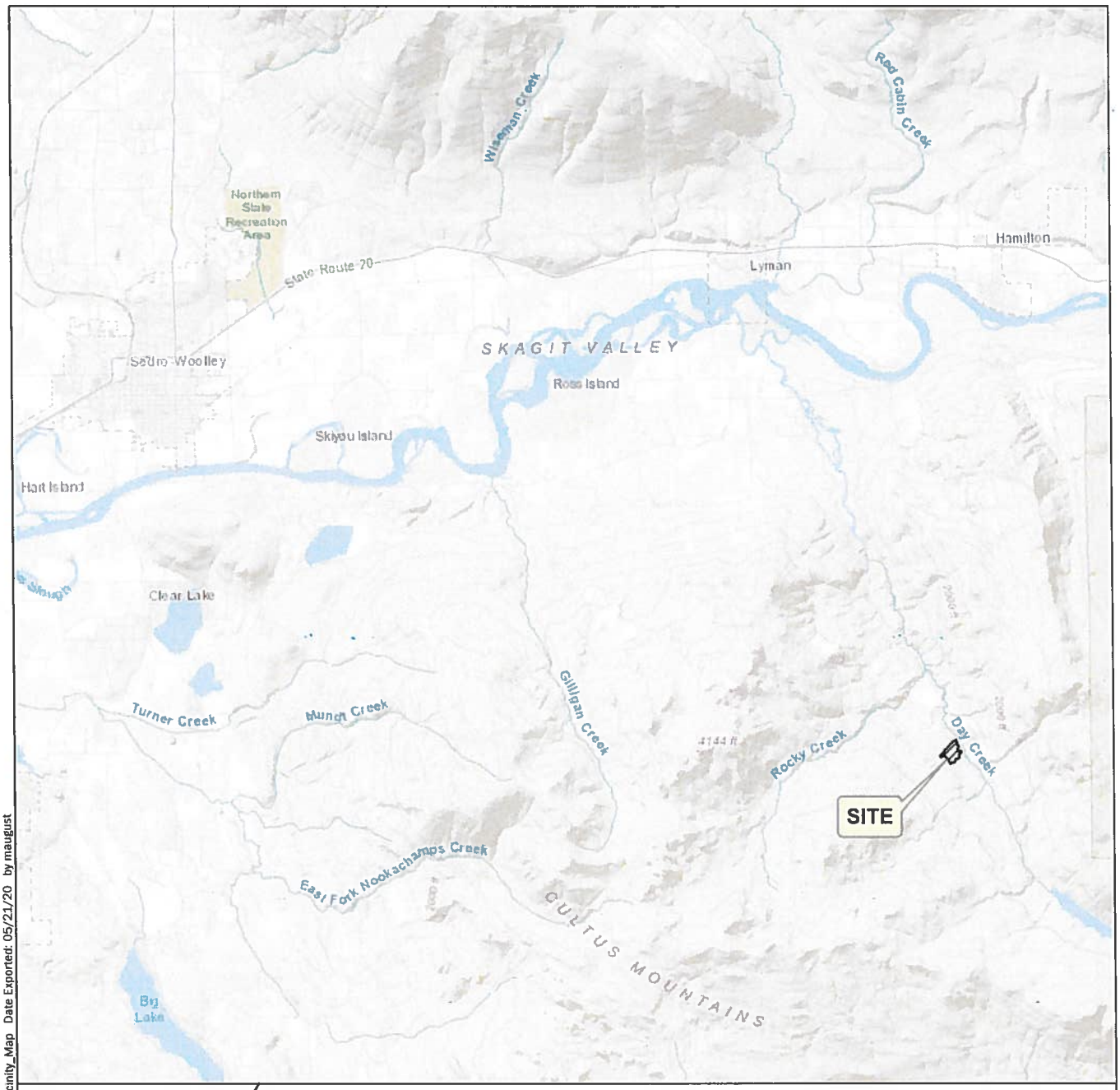

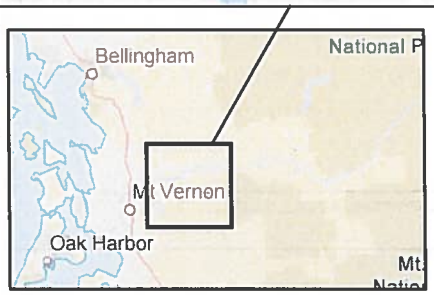

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Data Source: ESRI

Projection: NAD 1983 UTM Zone 10N

Vicinity Map

Elephant Hair Harvest Unit
Skagit County, Washington

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Figure 1

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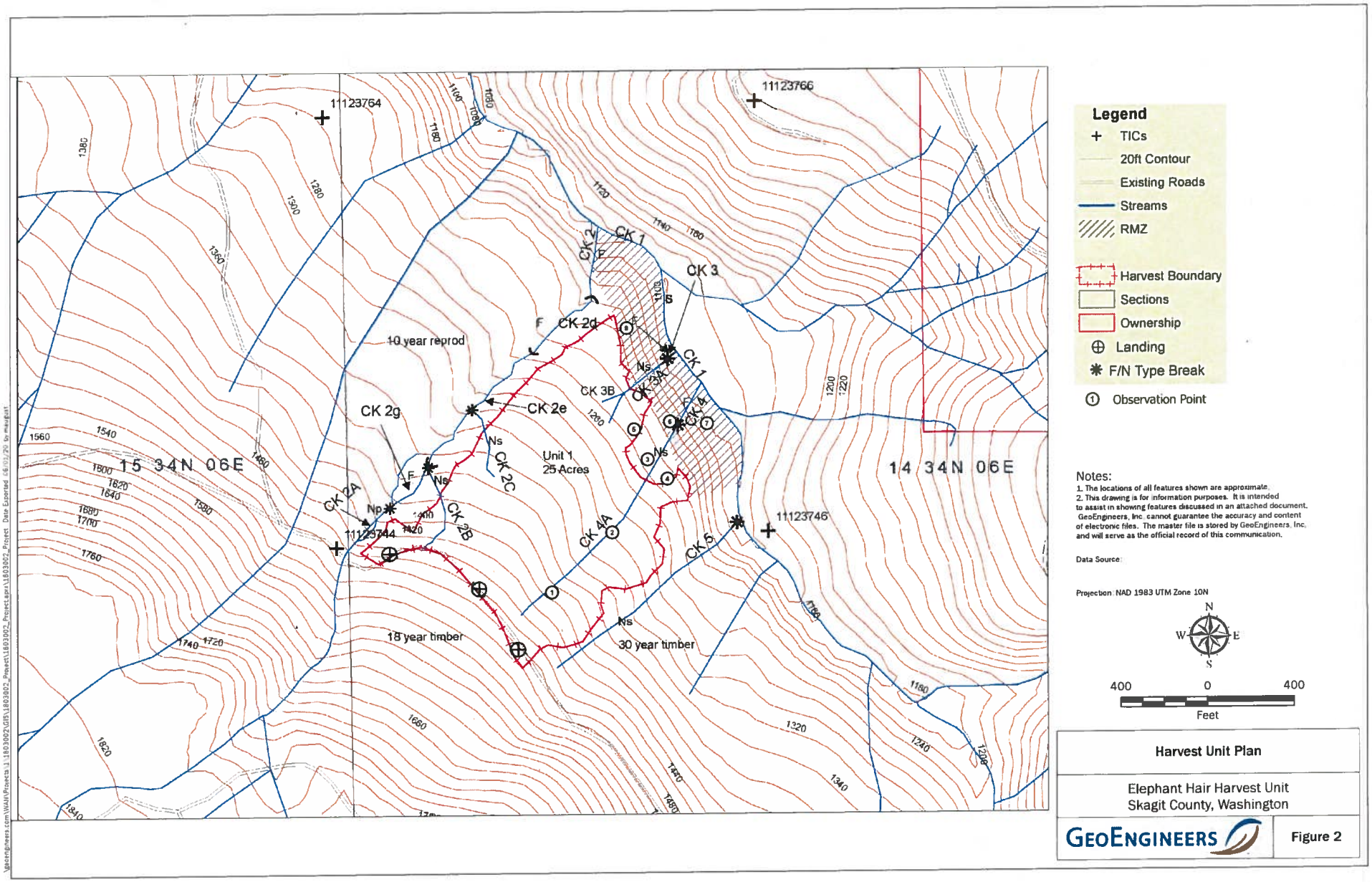

Harvest Unit Plan

Elephant Hair Harvest Unit
Skagit County, Washington

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Figure 2

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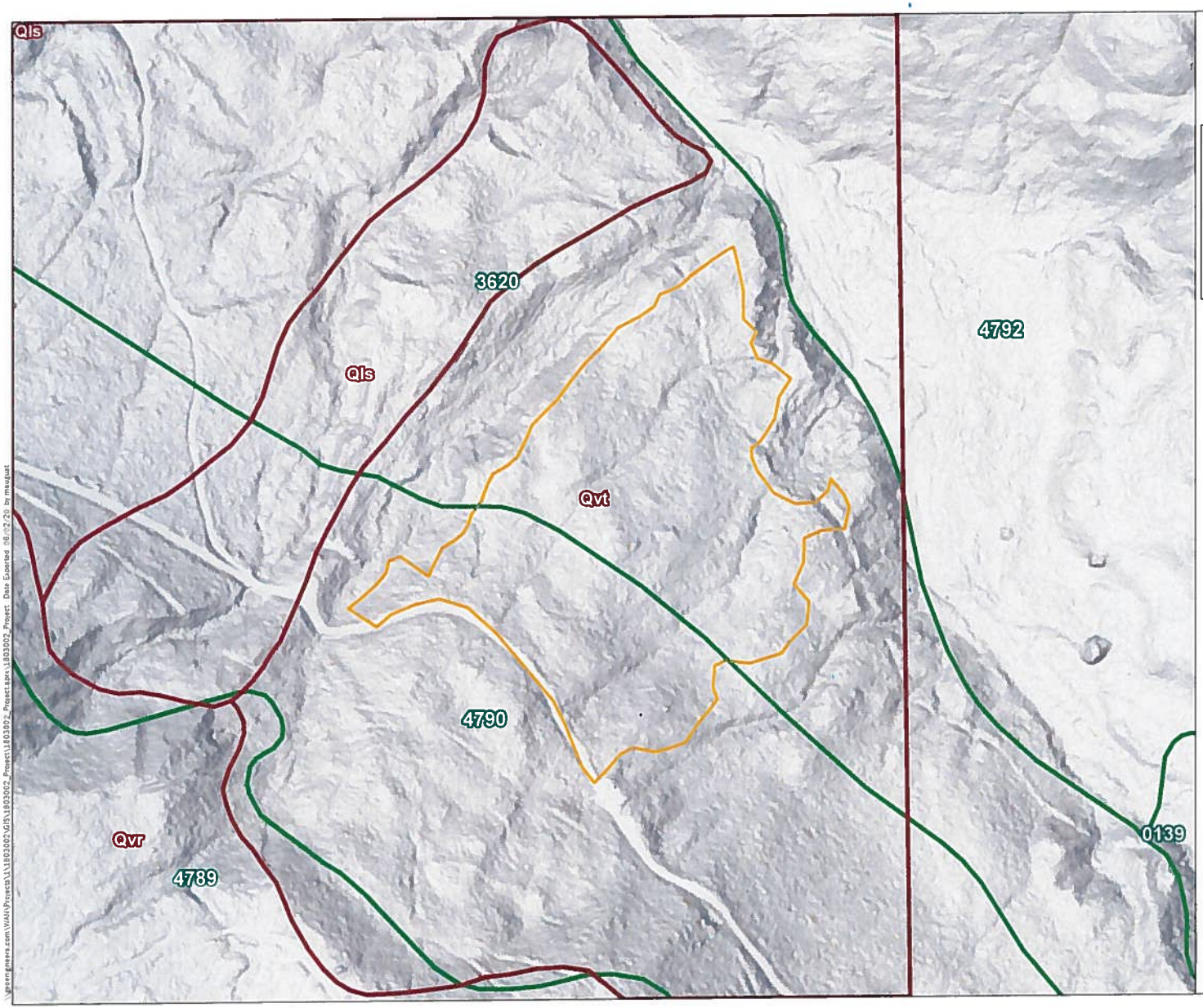

Legend

- Harvest Unit Boundary
- WADNR Geologic Unit
- WADNR Soils Unit

Geologic Unit
Qls - Quaternary mass-wasting deposits
Qvr - Vashon recessional outwash
Qvt - Vashon glacial till

Soils Unit
0139-ANDIC XEROCHREPTS V.GRAVELLY SILT LOAM 40-65% Slopes
3620 -JUG V.GRAVELLY SANDY LOAM 0-30% Slopes
4789-MONTBORNE V.GRAVELLY LOAM 3-30% Slopes
4790-MONTBORNE V.GRAVELLY LOAM 30-65% Slopes
4792-MONTBORNE-RINKER-COMPLEXV.GRAVELLY LOAM 30-65% Slopes

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Geology and Soils Map

Elephant Hair Harvest Unit
Skagit County, Washington

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Figure 3

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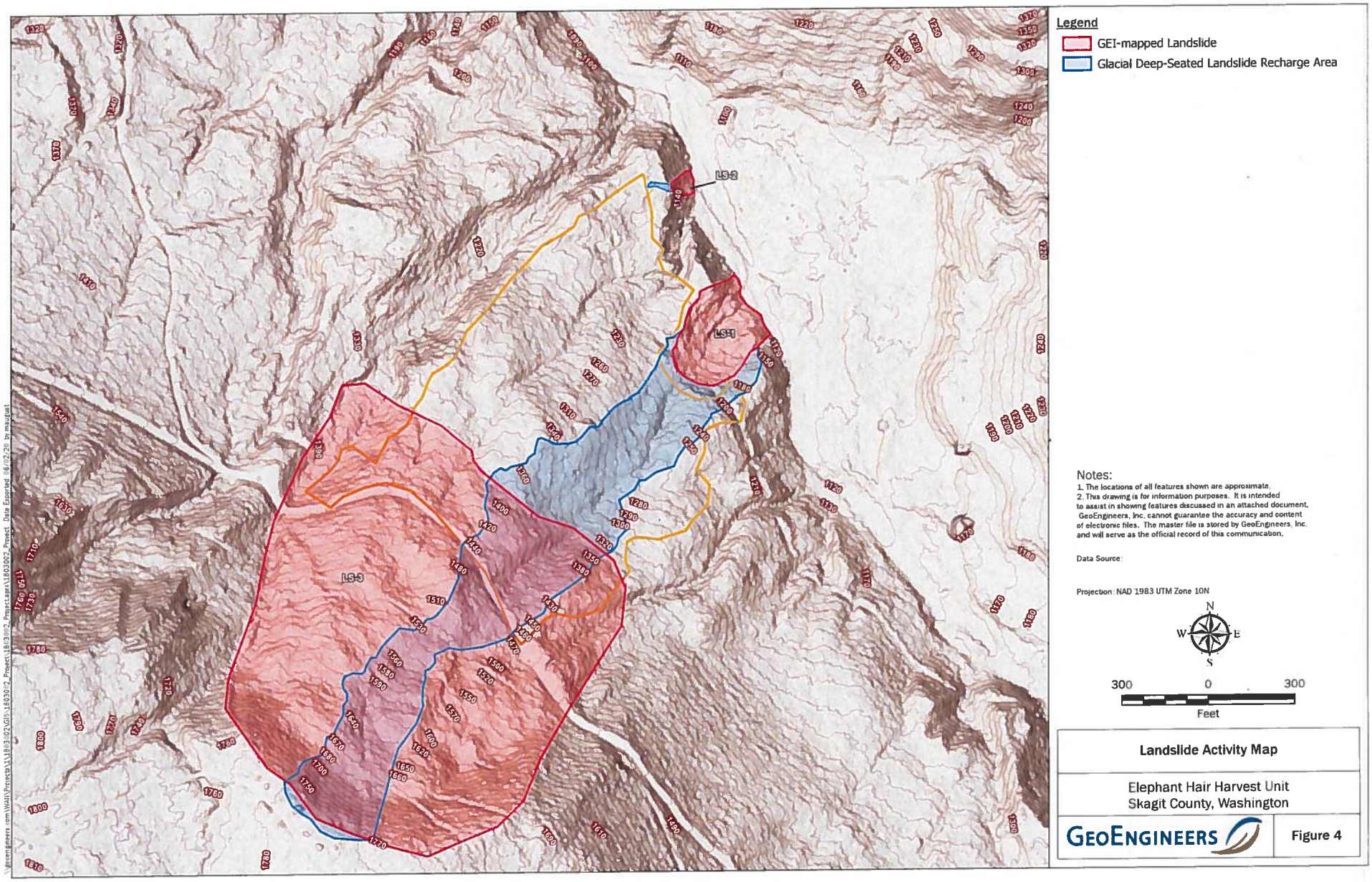
LS-1
LS-2
LS-3
Legend
GEI-mapped Landslide
Glacial Deep-Seated Landslide Recharge Area
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Landslide Activity Map
Elephant Hair Harvest Unit
Skagit County, Washington
GeoEngineers
Figure 4

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Harvest Unit Boundary

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1953 Aerial Photograph

Elephant Hair Harvest Unit
Skagit County, Washington

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Figure 5

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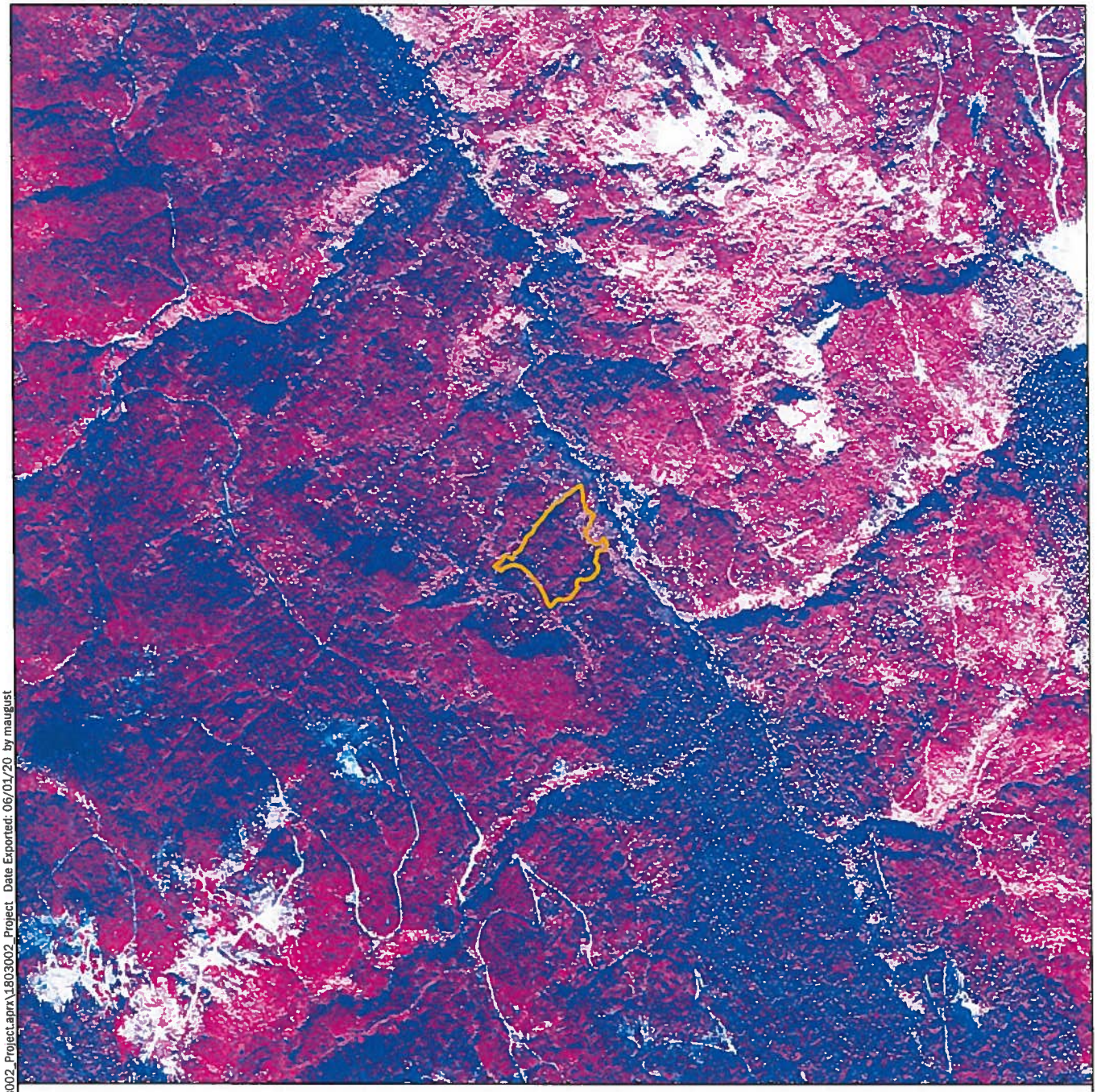

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Harvest Unit Boundary

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1971 Aerial Photograph

Elephant Hair Harvest Unit
Skagit County, Washington

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Figure 6

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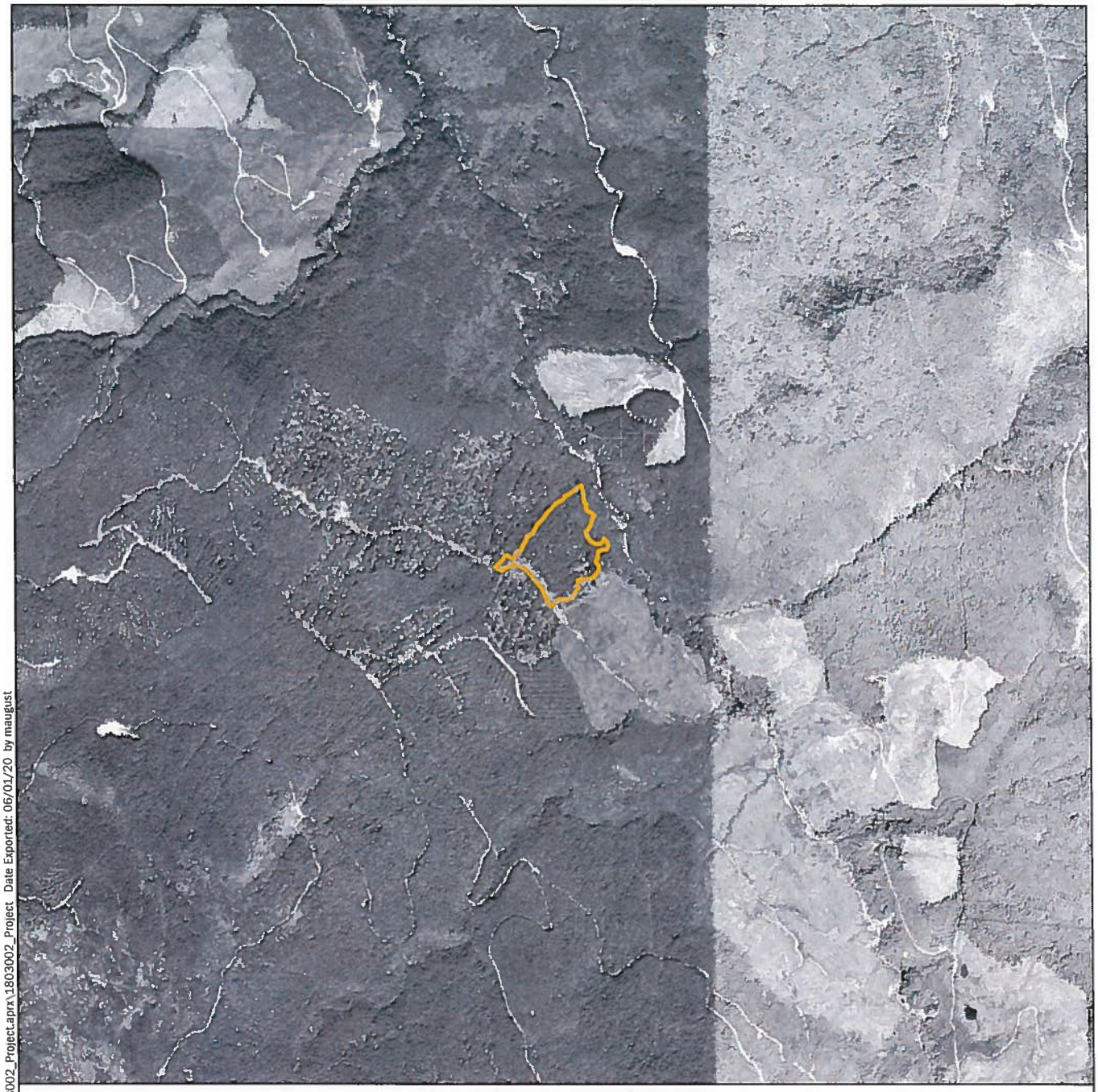

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Harvest Unit Boundary

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1998 Aerial Photograph

Elephant Hair Harvest Unit
Skagit County, Washington

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Figure 7

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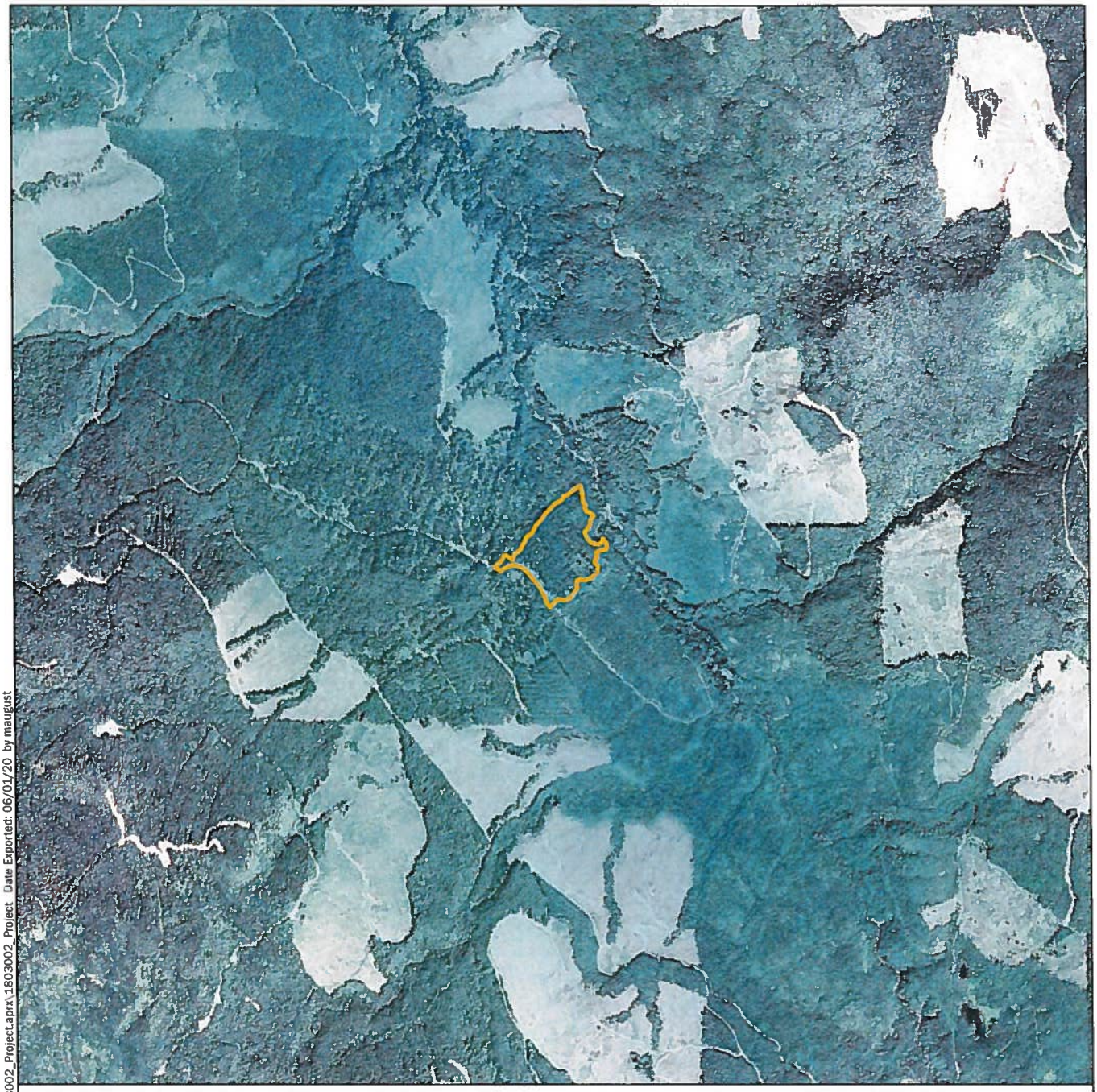

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Legend

Harvest Unit Boundary

2,000 0 2,000

Feet

N W E S

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

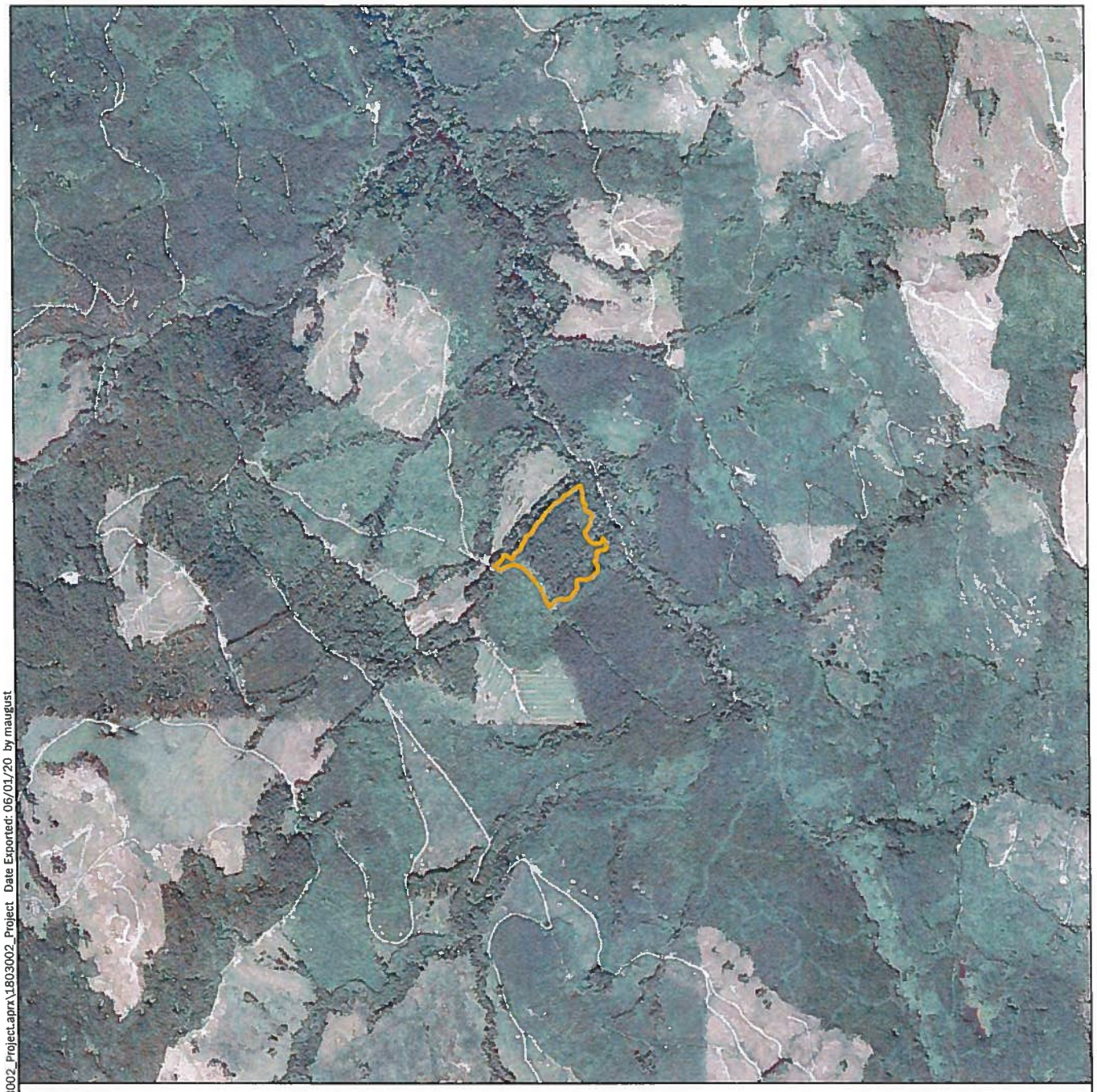
Projection: NAD 1983 UTM Zone 10N

2006 Aerial Photograph

Elephant Hair Harvest Unit
Skagit County, Washington

GeoEngineers

Figure 8



Legend

Harvest Unit Boundary

2,000 0 2,000

Feet

N W E S

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

Projection: NAD 1983 UTM Zone 10N

2019 Aerial Photograph

Elephant Hair Harvest Unit
Skagit County, Washington

GeoEngineers

Figure 9

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APPENDIX A
Report Limitations and Guidelines for Use

APPENDIX A
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This attachment provides information to help you manage your risks with respect to the use of this report.

Geotechnical Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for use by Merrill and Ring, Inc., agent for Grandy Lake Forest Associates, LLC. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. No one except Merrill & Ring should rely on this report without first conferring with GeoEngineers. This report should not be applied for any purpose or project except the one originally contemplated.

A Geotechnical Engineering or Geologic Report is Based on A Unique Set of Project-Specific Factors

This report has been prepared for the Elephant Hair Harvest Unit in Skagit County, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- Not prepared for you.
- Not prepared for your project.
- Not prepared for the specific site explored.
- Completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- Elevation, configuration, location, or orientation of the proposed harvest unit.
- Project ownership.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

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[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

Subsurface Conditions Can Change

This geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by man-made events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

Most Geotechnical and Geologic Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on surficial observations and widely spaced exposures within roadcuts and stream channels at the site. GeoEngineers reviewed field data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

Geotechnical, Geologic and Environmental Reports Should Not Be Interchanged

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations, e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.