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December 16, 2021
Project No. 20130228E001

Miles Sand and Gravel
P.O. Box 280
Mount Vernon, Washington 98273

Attention: Dan Cox

Subject: Response to Skagit County Geologic Hazard Requirement
Grip Road Mine Haul Road
Skagit County, Washington

Dear Mr. Cox:

The following letter provides our response to the geologic hazard requirements presented in a letter from Skagit County Planning and Development Services dated June 17, 2021 for the Grip Road Mine Project located in Skagit County, Washington (Figure 1). A site plan showing the subject area and identified geologic hazards is shown on Figure 2. Our letter follows the requirements for a site assessment set forth in Chapter 14.24 of the *Skagit County Code* (SCC). As stated in their letter, a geologic hazard assessment following Chapter 14.24 of the SCC is required by Skagit County (County) as a condition to use an existing haul road for the aggregate mine operation. The County letter indicates representatives from the County completed a "Critical Areas Site Visit" during which they identified the likely presence of wetlands and steep slopes within 300 feet of the proposed mine and haul road. A Critical Areas Reconnaissance Sketch was attached to the letter which shows the approximate locations of the identified wetland, stream, and "geo-hazard." This sketch is provided in Appendix A. This letter addresses the steep slope area identified in the County letter. For preparation of this letter, we were provided with an as-built plan set for the "Grip Road Gravel Mine Access Road," prepared by Semrau Engineering and Surveying, dated September 4, 2018.

Project and Site Description

Access to the proposed aggregate mine will follow an existing haul road that extends from approximately 0.7 miles east of the intersection of Grip Road and Prairie Road, generally northward towards the proposed mine area. We understand the existing haul road was previously used as a haul road for past logging activities in the area. The haul road is a gravel surface road with an approximate length of 2 miles.

The steepest portion of the haul road occurs just north of Swede Creek, approximately 0.4 miles north of Grip Road. A bridge currently provides access over the creek. On both sides of the bridge, the haul road extends up the adjacent slopes that flank Swede Creek. The area identified in the County letter as a "geo-hazard" is approximated in our Figure 2. Review of Light Detection and

Ranging (LIDAR)-derived contours show the slope north of the creek and near the bridge, has a vertical height ranging from 80 to 100 feet and a general inclination of 60 percent or flatter. Smaller localized areas of both slopes near the haul road have inclinations as steep as 80 percent likely resulting from original road construction.

We understand the proposed mine project will generally utilize the haul road as is and that no construction to alter or extend the road beyond its current limits is proposed. The exception will be where asphalt pavement will be placed along a roughly 500-foot-long stretch of the haul road that extends from Swede Creek to the hairpin turn at the top of the slope north of the creek.

Geologic Mapping

The geologic map of the site vicinity titled, *Geologic Map and Interpreted Geologic History of the Bow and Alger 7.5-minute Quadrangles, Western Skagit County, Washington*, by J.D. Dragovich et al. (1998) indicates that slopes adjacent to Swede Creek are comprised of Vashon lodgement till with glaciomarine drift mapped near the top of the slopes. No landslides are mapped in the vicinity of the haul road. Lodgement till was deposited at the base of an active continental glacier during the Vashon Stade of the Fraser Glaciation approximately 12,500 to 15,000 years ago. The till was compacted by the weight of about 3,000 feet of overlying ice and typically has high-strength and low-compressibility attributes. Glaciomarine drift sediments in this area were deposited during the Everson Interstade, following the Vashon Glaciation, when glacial ice began to retreat and was floated by marine waters. Glacial sediments were then introduced to the marine waters by the floating ice, and settled out. These sediments typically consist of primarily fine-grained glacial silt and clay, with occasional gravel dropstones which were carried to sea within floating ice.

LIDAR-Based Shaded Relief Map

LIDAR imagery is a remote sensing technology that can be used to generate a detailed expression of the ground surface topography, even in densely vegetated areas. For this reason, LIDAR-based topographic imagery can be helpful in distinguishing surface features (such as old landslide features) that may otherwise not be easily recognizable. We reviewed LIDAR-based shaded relief imagery, which we obtained from the *Washington State LIDAR Portal: North Puget Sound 2016*. The imagery shows that the slopes adjacent to Swede Creek were formed from the incision of the creek into the native sediments. The area of slope identified by the County as a geohazard, exhibits relatively planar features indicative of generally good overall stability. Our review of the LIDAR imagery did not find geomorphological evidence of past or on-going deep-seated slope failure, such as hummocky ground or back-rotated benches, large bowl-shaped features, or tension cracks.

Visual Slope Reconnaissance

We completed a limited visual site slope reconnaissance on September 22, 2021. The slope adjacent to the haul road north of the Swede Creek bridge was the focus of our reconnaissance. During our reconnaissance we measured slope inclinations of 60 percent or less which is generally consistent with the LIDAR-based contours. We observed dense silty sand sediments along road cuts and in areas on the face of the slope. Penetration depths with a ½-inch-diameter T-Probe into these sediments were less than 2 inches, which is indicative of glacially consolidated sediments. The slope surfaces were generally uniform and covered with moderate to heavy vegetation consisting of sword fern, brush, and mature Douglas Fir, Western Big Leaf Maple, and smaller deciduous tree species. Most of the trees had straight trunks with some of the smaller trees exhibiting moderate “pistol-handle”-shaped trunk curvature, which can indicate shallow-seated soil creep is occurring. No apparent signs of deep-seated movement of the slope soils such as soil tension cracks, downset benches or scarps, or hummocky foreground were noted. No emergent groundwater seepage or drainage ravines were observed on the slopes.

Critical Areas Site Assessment

The SCC defines erosion and landslide hazards in Subsections 14.24.410(1) and 14.24.410(2) which are presented below.

Erosion Hazard

- (a) Areas with gradients greater than or equal to 30%.
- (b) Areas located within the following map units: No. 1 Andic Cryochrepts, Nos. 3 and 4 Andic Xerochrepts, No. 13 Birdsvie, Nos. 47 and 48 Dystric Xerochrepts, Nos. 50 and 51 Dystic Xerorthents, Nos. 63 and 65 Guemes, No. 69 Hoogdal, No. 90 Lithic Haploxerolls, No. 91 Marblemount, No. 99 Mundt and Nos. 150 and 151 Typic Croyorthods or mapped severe erosion hazard, as identified in the U.S. [Department](#) of Agriculture Natural Resources Conservation Service [Soil Survey of Skagit County](#) Area, WA (1989).
- (c) Coastal beaches or bluffs.
- (d) Areas designated in the [Department](#) of [Ecology](#), Coastal [Zone](#) Atlas, Washington, Volume Two Skagit [County](#) (1978) as U (Unstable), UB (Unstable Bluff), URS (Unstable Recent Slide), or UOS (Unstable Old Slide).
- (e) Areas susceptible to rapid stream incision and stream bank erosion.

Landslide Hazard

- (a) Areas designated in the [Department of Ecology](#), Coastal [Zone](#) Atlas, Washington, Volume Two, Skagit [County](#) (1978) as U (Unstable), UB (Unstable Bluff), URS (Unstable Recent Slide), or UOS (Unstable Old Slide).
- (b) Slopes having gradients of 15% or greater:
 - (i) That intersect geologic contacts with permeable sediments overlying low-permeability sediment or bedrock and springs or [groundwater](#) seepage are present;
or
 - (ii) That are parallel or subparallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials.
- (c) Slopes of 40% or steeper and with a vertical relief of 10 feet or more.
- (d) Areas of previous failure such as earth slumps, earthflows, mudflows, lahars, debris flows, rock slides, [landslides](#) or other failures as observed in the field or as indicated on maps or in technical reports published by the U.S. Geological Survey, the Geology and Earth Resources Division of the Washington [Department](#) of Natural Resources, or other documents authorized by government agencies.
- (e) Potentially unstable areas resulting from rapid stream incision, stream bank erosion, and undercutting by wave action.
- (f) Coastal bluffs.
- (g) Slopes with a gradient greater than 80% and subject to rock fall.
- (h) Areas that are at risk from snow avalanches.
- (i) Areas designated on the Skagit [County](#) Alluvial Fan Study Orthophoto Maps as [alluvial fans](#) or as identified by the [Administrative Official](#) during [site](#) inspection.
- (j) Areas located in a narrow canyon potentially subject to inundation by debris flows or catastrophic [flooding](#).

(k) Those areas delineated by the U.S. [Department](#) of Agriculture's Natural Resources Conservation Service [Soil Survey of Skagit County](#) as "severe" (Table 9) limitation for [building](#) development.

The slope area identified in the County letter as a "geo-hazard," and surrounding slope areas meet the criteria of erosion hazard and landslide hazard areas. Specifically, subsection (a) for erosion hazard area and subsections (c) and (e) for landslide hazard area. Figure 2 shows the extent of the geologic hazard areas in this location. Due to the presence of potential geologic hazard areas, the County is requiring a geologic hazard site assessment per subsection 14.24.080(4) of the SCC. The site assessment requirements which are listed below, require an assessment of impacts to critical areas from the proposed development. The project does not propose any new development, structures, grading, mining, stripping, etc. outside of the limits of the existing haul road. The project will add asphalt surfacing to an approximate 500-foot length of haul road starting near the Swede Creek bridge and extending to the north. A recent ruling by the Skagit County Hearing Examiner states:

"Development," as defined by SCC 14.04.020, does not include site disturbance for internal logging roads. The Code's language in context refers to disturbance contemplated by building a logging road. The activity contemplated here is about using a logging road for a completely different purpose. It is a form of site disturbance. Therefore, the haul road use for the gravel mine does not fall outside the definition of "development." Moreover, the new use of the road is subject to critical areas review because it presents a potential to disturb the soil, water or existing vegetation along its route. Evaluating a project for that potential is the whole point of requiring critical areas review.

Therefore, our geologic hazard site assessment will be based on assessing the impacts resulting from the change in use of the haul road to a route used for aggregate mine trucking and the proposed asphalt surfacing. The requirements of a site assessment are presented below in italics, followed by our response.

(i) [Project](#) description that includes a detailed narrative describing the [project](#), its relationship to the [critical area](#) and its potential [impact](#) to the [critical area](#); and

A project description and narrative including nearby critical areas and potential impacts are included in the "Project and Site Description" section of this letter.

(ii) A copy of the [site plan](#) for the [project](#) proposal including a map to scale depicting [critical areas](#), buffers, the [development proposal](#), and any areas to be cleared; and

Figure 2 attached to this letter provides a site plan showing the geologic hazard critical area. Note the development area consists of an existing haul road. The project does not propose any new grading, structures, clearing, stripping, or mining outside of the limits of the existing haul road. New asphalt surfacing will be added to a roughly 500-foot-long portion of the existing haul road starting at the Swede Creek bridge and extending north.

(iii) Identification and characterization of all critical areas and buffers adjacent to the proposed project area; and

Figure 2 identifies the critical area adjacent to the haul road.

(iv) An assessment of the probable cumulative impacts to critical areas resulting from development of the site and the proposed development; and

As previously stated, no alteration to the landslide hazard and erosion hazard areas, or within 300 feet of these areas, through grading, stripping, or other construction activities are proposed. The proposed “development” consists of using an existing haul road to transport aggregate from the proposed gravel mine to Grip Road. This same haul road was used in the past to transport harvested logs from the surrounding area. Based on our site observations, the portion of the haul road in the vicinity of the geologic hazard areas generally appears to have performed well during past logging operation and is generally in good condition. We saw no significant indicators of road instability, or instability to the adjacent slopes. Based on our field observations, the mapped presence of high-strength glacially consolidated sediments at the steep slopes, and the lack of moderate- to deep-seated instability indicators it is our opinion that the use of the road for mining operation will not increase the risk of landsliding or erosion at or near the identified geologic hazard areas.

(v) A description of the proposed stormwater management plan for the development and consideration of impacts to drainage alterations; and

New asphalt surfacing is proposed on the existing haul road between Swede Creek and extending approximately 500 feet north. No stripping or logging in the vicinity of the geologic hazard areas is proposed. No grading or alteration of the slopes in the vicinity of the geologic hazard areas will occur. Surface water that is generated on the asphalt- or gravel-surfaced sections of the road in the vicinity of the geologic hazard area will

sheet flow to an existing roadside swale. The swales run along the toe of the adjacent slope on the in-board side of the haul road and down toward Swede Creek. Check dams are located in the swales to reduce surface water velocity. The system of roadside swales will avoid concentrated discharge onto the steeply sloping areas.

(vi) A description of efforts made to apply mitigation sequencing pursuant to Subsection (6)(b) of this Section; and

SCC subsection 14.24.080(5) provides General Mitigation Requirements including the mitigation sequencing. 14.24.080(5)(a) states:

All proposed alterations to critical areas or associated buffers shall require mitigation sufficient to provide for and maintain the functions and values of the critical area or to prevent risk from a critical areas hazard and shall give adequate consideration to the reasonable and economically viable use of the property.

No alteration to the geologic hazard critical areas is proposed. The project is avoiding potential impacts to the geologic hazard areas associated with construction of a new road, by utilizing an existing haul road. No new grading, clearing, or stripping within the critical areas is proposed. Maintenance of surface drainage and erosion control Best Management Practices (BMPs) will be implemented through the life of the project.

(vii) A proposed mitigation plan including land use restrictions and landowner management, maintenance and monitoring responsibilities; and

Mitigation for using the existing haul road near the geologic hazard areas for mining operation shall include:

1. No clearing of vegetation within the geologic hazard areas.
2. Maintain roadside swales and check dams. Clean out material that has sloughed into the swale that could potentially block surface water. Avoid concentrated surface water discharge onto the steep slopes.
3. Do not place uncontrolled fill, strippings, or other debris over the top of steep slopes.

(viii) Regulatory analysis including a discussion of any Federal, State, Tribal, and/or local requirements, including but not limited to the Shoreline Management Master Program, or special management recommendations which have been developed for species and/or habitats located on the site.

Not applicable to Geotech.

(ix) If necessary, designate a maintenance corridor to provide an area for construction and maintenance of buildings and other structures. The standard width of the maintenance corridor shall be 15 feet. This distance may be modified with approval of the Administrative Official. The following may be allowed within the maintenance corridor area:

Not applicable to Geotech.

Conclusion

The proposed gravel mine will utilize the existing haul road to transport aggregate from the mine to Grip Road and will propose asphalt surfacing for a portion of the haul road north of Swede Creek. This section of haul road is located near a geologic hazard area which includes landslide and erosion hazards. No alteration through grading, stripping, or mining to the geologic hazard areas is proposed. The change in use of the existing gravel-surfaced road from a logging haul road to an aggregate mine haul road is considered by the County a form of site disturbance, and therefore is subject to the County's critical areas review. From a geotechnical standpoint, the haul road will have a similar function and will be subject to similar truck loads compared to its past use. Review of the geologic mapping indicates the steep slope areas have a core of dense glacially consolidated sediments, which is consistent with our on-site observations. No evidence of significant slope instability, road instability, past deep-seated landsliding, or groundwater seepage, was observed on the steep slopes near the haul road or on the haul road itself. This is also consistent with review of LIDAR imagery of the site. Given these factors, it is our opinion that the impact to the identified geologic hazards near the haul road caused by the change in haul road usage based on truck type can be avoided. This conclusion is predicated on the project following the mitigation recommendations provided above.

Please do not hesitate to contact us if you have any questions or concerns.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Kirkland, Washington



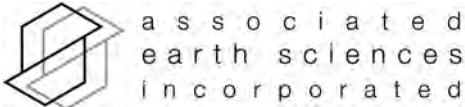
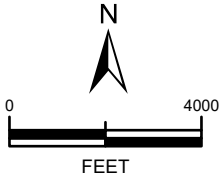
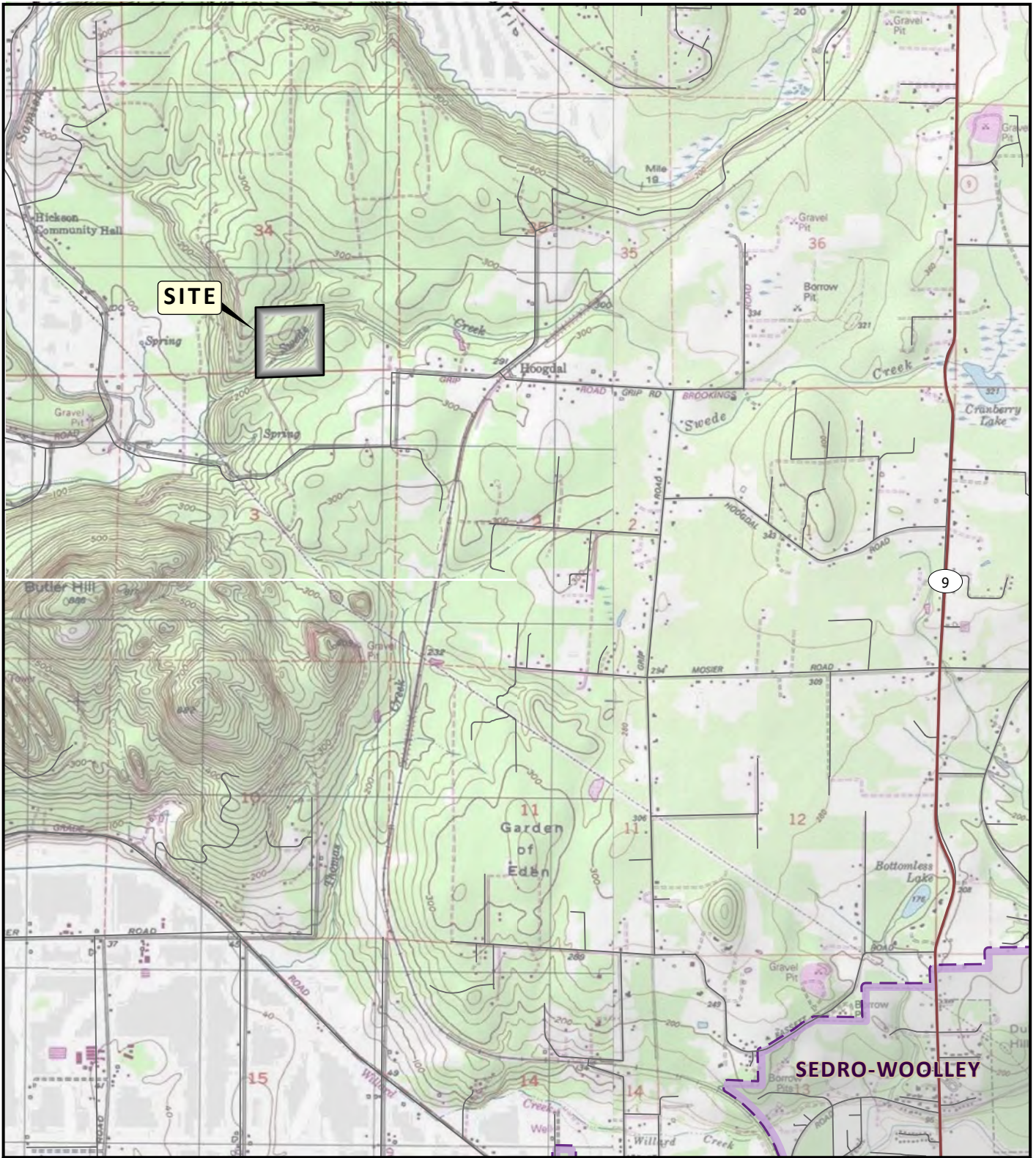
Matthew A. Miller, P.E.
Principal Engineer



Anthony W. Romanick, P.E.
Senior Engineer

Attachments: Figure 1: Project Vicinity
 Figure 2: Geologic Hazard Area
 Appendix A: Skagit County Critical Areas Reconnaissance Sketch

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VICINITY MAP

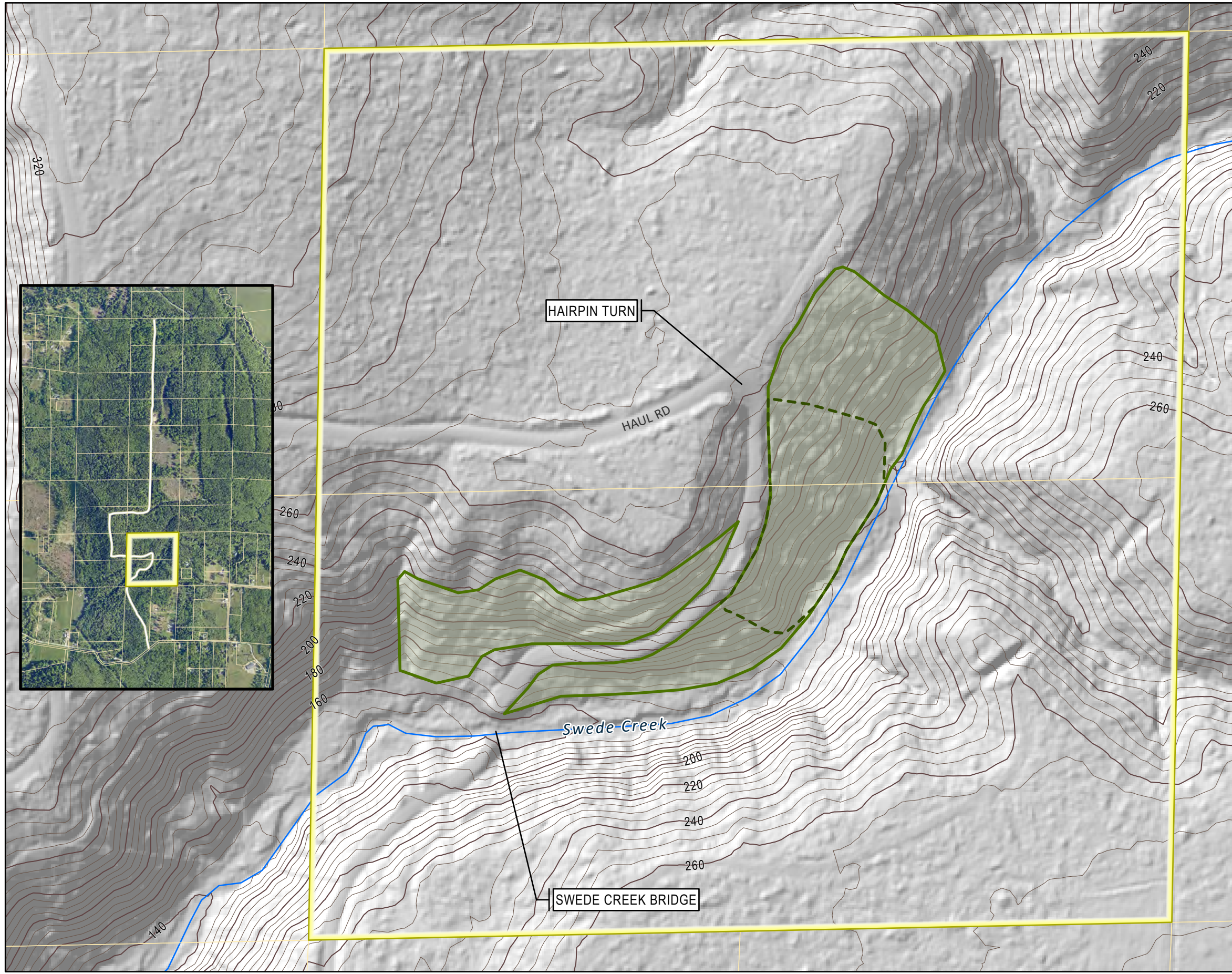
GRIP ROAD MINE
SKAGIT COUNTY, WASHINGTON

DATA SOURCES / REFERENCES:
 USGS: 7.5' SERIES TOPOGRAPHIC MAPS, ESRI//CUBED/NATIONAL GEOGRAPHIC SOCIETY 2013
 SKAGIT CO: STREETS, CITY LIMITS, PARCELS, 7/20
 LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION

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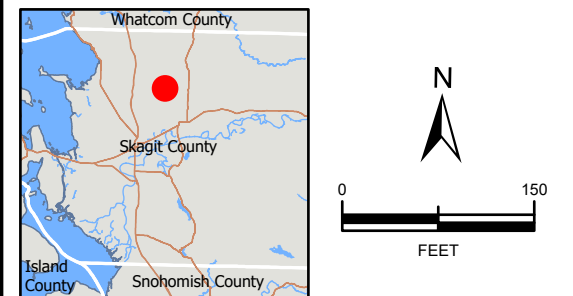
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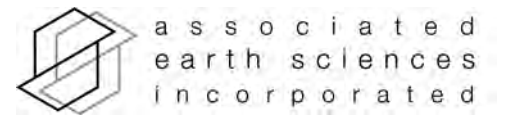
- LEGEND**
- SITE
 - APPROXIMATE EXTENT OF GEOHAZARD AREA AS IDENTIFIED BY SKAGIT CO.
 - LANDSLIDE AND EROSION HAZARD AREA
 - PARCEL
 - CONTOUR 20 FT
 - CONTOUR 5 FT

DATA SOURCES / REFERENCES:
 WA STATE LIDAR PORTAL: NORTH PUGET SOUND 2016
 ACQUIRED MARCH - SEPT 2016, GRID CELL SIZE IS 3'
 CONTOURS FROM LIDAR
 SKAGIT CO.: PARCELS, ROADS 7/20

LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE



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GEOLOGIC HAZARD AREAS

GRIP ROAD MINE
 SKAGIT COUNTY, WASHINGTON

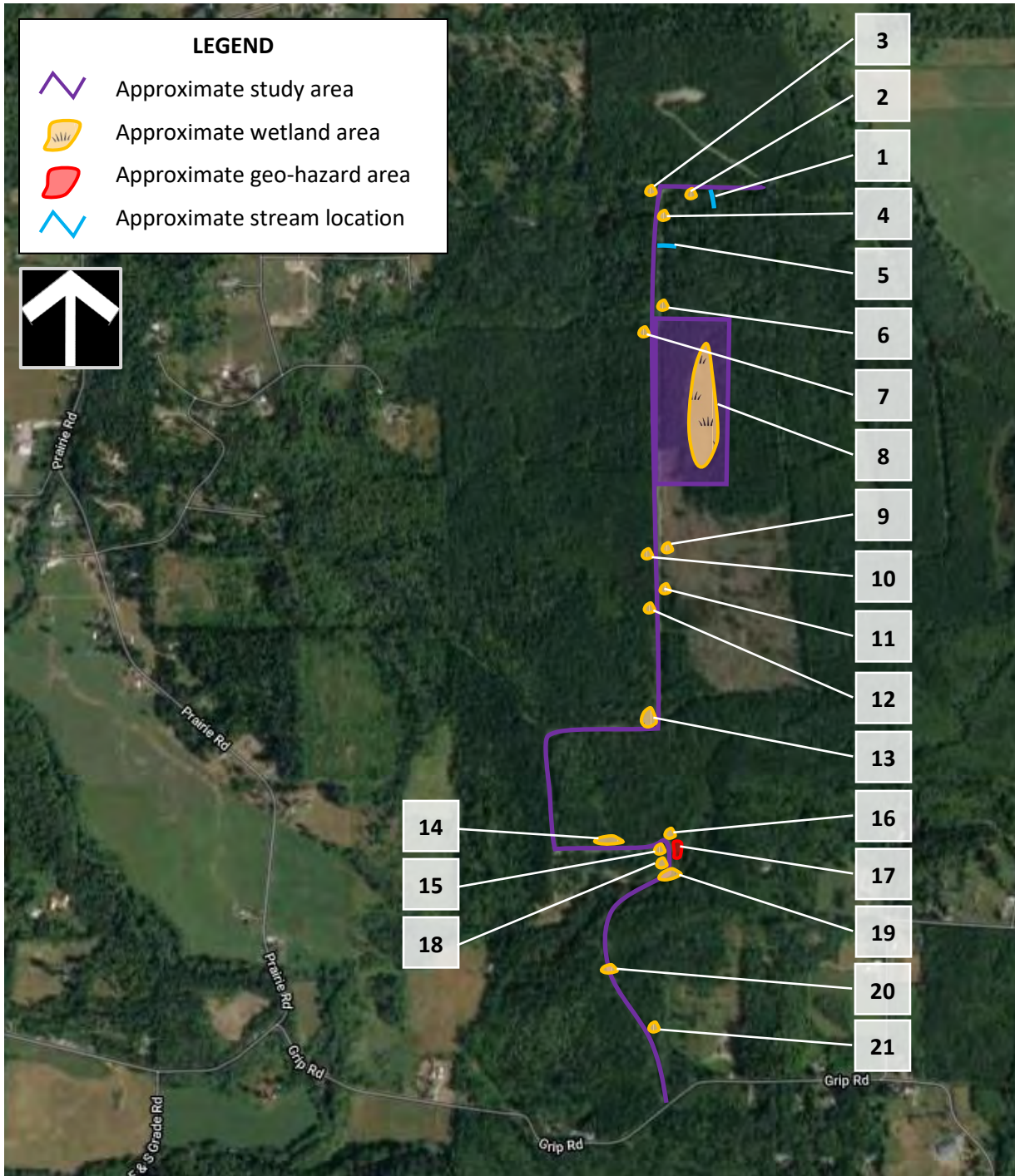
APPENDIX A

Skagit County Critical Areas Reconnaissance Sketch

Critical Areas Reconnaissance Sketch

Location: Skagit County, WA
 Parcel Number: P35704 (road frontage)
 Site Visit Date: June 4, 2021

Prepared for: Hal Hart, Michael Cerbone
 TWC Ref. No.: 210231.4



Note: Field sketch only. Features depicted are approximate and not to scale. Portions of the site located outside of the approximate study area have not been screened for critical areas; additional regulated features may be present.