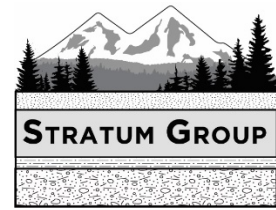


# Exhibit A-50: McShane haul road geological report



PO Box 2546, Bellingham, Washington 98227

June 10, 2022

Re: **Proposed Grip Mine Haul Road**  
Comments Regarding Potential Geology Hazards

I reviewed the Associated Earth Sciences (AES) Response to Skagit County Geologic Hazard Requirement dated December 16, 2021 and a letter regarding the proposed mine by the Skagit River System Cooperative (SRSC) dated April 30, 2021. I also reviewed the available geologic mapping in the area (Geologic Map of the Bow and Alger 7.5-minute Quadrangles, Western Skagit County Washington), reviewed lidar (light distance and ranging) bare earth imagery of the vicinity, review of historic aerial imagery and incorporated my own notes and observations I have made in the vicinity of the site and at locations with similar geologic conditions.

I have been a geologist and engineering geologist since 1983 and am licensed in the State of Washington as a geologist and engineering geologist. I currently work at Stratum Group where I routinely conduct geology hazard assessments. I have been working as a geologist in northwest Washington State since 1989 and am very familiar with the geology of the Samish Valley and continental glacial history of the area that are relevant to the slopes I in the Swede Creek drainage. I was on the project teams that completed literature reviews of deep-seated glacial landslides and deep-seated bedrock landslides for the Cooperative Monitoring, Evaluation and Research (CMER) Committee, the committee charged with advancing the science needed to support the adaptive management program associated with WAC 222. I have been the lead author of the of geology hazardous areas for local governments in Washington State. I have attached a copy of my CV.

Based on the geology assessment in the AES report, I cannot conclude that the proposed haul road that appears to have been constructed along a former logging road is not at risk from landslides or erosion. Furthermore I cannot conclude that the proposed haul road will not increase the risk of landslides or erosion based on the information provided in the AES report. The report does not provide an adequate discussion of the hazard and a number of slope issues on this site are never discussed or mentioned. The lack of analysis of several areas of the slope in the AES report is such that it is my opinion that no responsible geologist could reach the conclusion that the road is not at risk from landslides or does not pose a risk of increasing landslides or erosion.

My comments below are in regards to the Associated Earth Sciences report.

Comment #1 Regarding lidar bare earth review

The lidar bare earth review (last paragraph of page 2) is very limited and only addresses whether or not there are indications evidence of deep-seated slope movement at the immediate road area where the road crosses the slope. The brief review included this statement: *"The area of slope identified by the County as a geohazard, exhibits relatively planar features indicative of generally good overall stability."*

If a slope is planar, the slope is usually stable. No planar slopes can indicate that the slope is not stable or that there have been past landslides or areas of erosion. My own review of the lidar bare imagery is not remotely consistent with that statement that the slopes in this area are relatively planar. There are numerous non planar features in the vicinity including two non planar features that appear to be related to the road cut into the slope and one below the road which appears be related to erosion by Swede Creek that would undermine the slope the road is located on. There are areas of convergent topography including one area above the road that could be a potential landslide area.

Lidar bare earth imagery is a remarkable tool for identifying landforms prior to visiting a site. My own review of the lidar identified numerous non planar features (Figure 1) that should have been directly observed and evaluated and discussed as they all relate to the road stability.

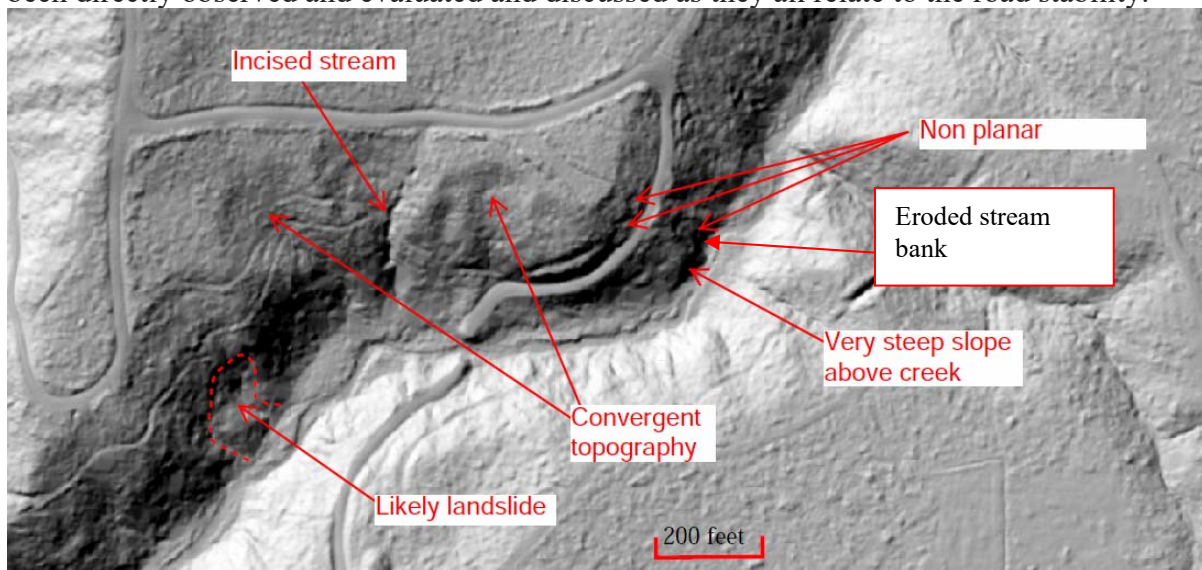


Figure 1. Lidar bare earth imagery of proposed access road and Swede Creek valley (2017 lidar via the Washington State Department of Natural Resources Lidar Portal). Note the lidar imagery predates the recent widening work on the proposed haul road.

The features indicated in Figure are all non planar features that were not recognized, discussed or analyzed in the AES report. These features are all potential landslide or erosion hazard areas that should be evaluated in more detail.

### Comment #2 Regarding Visual Slope Reconnaissance

AES provides one paragraph regarding their visual slope reconnaissance. None of the features that are shown on the Figure 1 lidar are discussed or assessed. Each of the features indicated in Figure 1 and their relevance to the assessing the slope area of the proposed haul road are discussed below.

Swede Creek and stream processes along Swede Creek are never discussed. This is a significant omission in that the slopes in question are the result of Swede Creek having eroded a deep narrow steep sided valley. Lidar imagery clearly shows an active stream channel and active stream movement and evidence of recent erosion. There is a likely landslide associated with the creek a short distance down stream and what appears to be a steep stream cut slope below the proposed haul road (indicated on Figure 1) that is not mentioned or discussed. The lidar imagery shows what appears to be slope slump (a non planar feature) just above the steep stream cut slope. Further erosion at this location will undermine the slope the proposed haul road crosses. Stream erosion of the slope below the haul road is never mentioned or discussed in the report.

The convergent topography below the east-west section of the road above the slope was not addressed. These slopes are clearly not planar. What are these features? What geomorphic processes formed these features and how active are those processes? Could the road above impact the processes? Do the processes on these slopes pose a long term risk to the road?

The incised stream channel below the east-west road above the slope is never mentioned or discussed. The lidar image clearly shows this stream is a sharp feature suggesting recent active erosion. Does the road impact water flow to this feature? Does increased erosion from road drainage potentially impact the public resources down slope in Swede Creek?

### Comment #3 Stability of glacial marine drift

On page 6 AES makes the following statement: “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.”

The statement that the glacially consolidated sediments are high-strength is generally accurate. However, the upper slopes are mapped as being underlain by glacial marine sediments. Glacial marine sediments were never consolidated by glacial ice. Glacial marine sediments frequently contain desiccation fractures and due to these fractures are not high strength sediments. It has been my experience that fractures in the glacial marine drift can weaken over time leading to landslides. The convergent slope areas noted in Figure 1 that are less steep slope areas and I suspect are old slides within the glacial marine drift. The proposed haul road cuts through the upper slope in an area that has been mapped as glacial marine drift.

#### Comment # 4 Stormwater Mitigation

AES lists mitigation for the road (page 7) indicating that the road has impacted the stability of the slope and has the potential to further impact the stability of the slope.

In particular AES recommends “Clean out material that has sloughed into the swale that could potentially block surface water” and “Avoid concentrated surface water discharge onto the steep slopes.”

It is clear from the recommendations that the slope should be considered a landslide and erosion hazard area. The consequences of failure to keep the swale cleared was never discussed and the details of how the swale will be constructed is not described or the frequency of sloughing into the swale.

Typically avoidance of geology hazard areas is the initial approach that should be taken under critical areas. This road was originally built as a logging road. Old logging roads are typically ‘put to bed’ when not in use so that drainage problems do not develop. Reusing this road for a new purpose across a landslide and erosion area should require a more detailed plan to address drainage than the very general recommendations made.

No mention of changes to road drainage are made regarding the incised stream below the east-west section of the road (Figure1) as this incised stream was never observed or discussed in the report.

#### Comment #5 Regarding identified sidecast cracks and cut slope slumps


SRSC noted a crack in the road sidecast and also noted slumps into the ditch. Cracks in the side cast are indicative of soil movement within the side cast and could result in a landslide down into Swede Creek. The slumps into the ditch observed by SRSC indicate that the cut slope is not

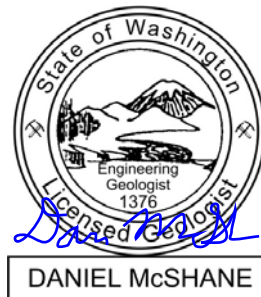
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Proposed Haul Road Comments

stable and is subject to slope failures that will at the least impact the drainage along the road and potentially the impact the road. Neither of these observations made by SRSC were ever mentioned or addressed in the AES report.

Stratum Group appreciates the opportunity to comment on this proposal. Should you have any questions regarding please contact our office at (360) 714-9409.

Sincerely yours,  
**Stratum Group**

  
Dan McShane, L.E.G., M.Sc.  
Licensed Engineering Geologist



*Dan McShane* 6-10-22