Section A
File Review

1 PROJECT SETTING

1.1 Site Location

The Exshaw site is located on Highway 1A (Hwy 1A:02) between Canmore and Exshaw and consists of two rock through-cuts with the potential for rockfall onto the highway. The site was identified as a geohazard site for monitoring based on anecdotal evidence of rockfalls from Volker Stevin (VS) highway maintenance workers.

In accordance with Alberta Transportation (AT) convention, each geohazard site is assigned a distance, in km along the relevant highway control section. The two through-cut locations are summarized in Table 1 below:

Table 1 Identification of Hwy 1A:02 Geohazard Sites

Geohazard	Location (km)	Latitude	Longitude	ATS	NTS Mapsheet
Rock Cut Slope (Site A)	12.52 to 12.34	51.064779	-115.186521	NW SEC 22 TWP 24 RGE 9 M5	82O03
Rock Cut Slope (Site B)	12.26 to 11.91	51.066749	-115.191075	NE SEC 21 TWP 24 RGE 9 M5	82O03

1.2 Site Description

At the site, Hwy 1A:02 is a paved two-lane highway, orientated southeast to northwest. In the through-cut locations, rock cut faces are present north and south of the highway. North of the highway, bedding planes and joint orientations dip towards the highway, and south of the highway, the cut slopes are lower and bedding planes generally dip away from the highway. The road shoulder includes shallow catchment ditches, estimated as 3 m to 7 m wide.

The two rock-cuts are summarized as:

- Rock slope A (located southeast of Site B) estimated to be approximately 300 m in length, with cut faces up to 15 m high.
- Rock slope B estimated to be approximately 350 m in length with cut faces up to 12 m high.

Based on the AT Maps data portal, the highway surface elevation for Site A is reported as between El. 1304 m (southeast end) and El. 1310 m (northwest end). At Site B, the highway surface elevation is reported as between El. 1309 m (southeast end) and El. 1315 m (northwest end).

1.3 Topography

Topographic data was not available for the site. Slope heights were estimated at the time of the site walkover.

1.4 Site Geology, Hydrogeology, and Geomorphic Setting

The geological map for Exshaw (GSC, 1970a) was reviewed to evaluate potential bedrock conditions at the site. The available information suggests that the rock cuts are within Paleozoic middle to upper Exshaw and Banff Formation: dark grey, finely crystalline, thin-bedded limestone; dark brownish grey shale and calcareous shale; brown argillaceous siltstone, argillaceous and cherty skeletal calcarenitic limestone; and argillaceous dolomite. Dip angles of between 34^{o} and 47^{o} were reported in bedrock north of the highway, dipping to the west and southwest. Thrust faulting was hypothesized in bedrock to the east (within 1 km) and west (within 300 m) of the rock cuts.

Field observations supported the estimated geological conditions. Bedrock at the site was evaluated as sedimentary, possibly limestone or siltstone. Cut slopes were observed to be slightly weathered and blocky, with visible bedding planes dipping towards the highway (on the north side of the cut) at angles of approximately 40^{o}.

The rock mass was observed to contain multiple bedding plane separations and perpendicular joints, with the potential for block falls, wedge failures, and sliding failures. Several loose and unstable blocks were observed during the walkover. Joints were observed to be open to very wide, clean and fresh. No evidence of seepage was observed from the rock slope.

Erosion of the near-surface soil mass at the brow of the slope was noted to be releasing gravel, cobbles, and boulders down the cut face, particularly at Site B.

2 HISTORICAL INFORMATION

2.1 Description of Past Site Problems

The available information indicates that the following geotechnical issues are present at the site:

- Surface runoff erosion of the soil mantle overlying bedrock; and
- Rockfall with particle sizes that have the potential to reach the highway and cause vehicle damage and/or injury to road users due to bouncing on hard bedrock surfaces and shallow catchment ditches.

Table 2 provides a brief chronological background of the site history, based on the available information. There was no information which suggests that site conditions have been previously documented by AT.

Table 2 Chronological History of Site

Date	Description
Early 2000s	Rock slope scaling program carried out along the Highway 1A corridor as part of maintenance contract. No documentation is available relating to the scaling program and the extent of work completed at the subject site is unknown.
May 2019	Rockfall from the cut face into the catchment ditch and onto the highway reported by Volker Stevin highway maintenance team.
May 7, 2019	Site walkover completed as part of the 2019 geohazard risk management plan (GRMP) annual tour.

2.2 Previous Site Investigations

Based on the available information, there have been no previous ground investigations at the site.

2.3 Repair Work and Mitigative Measures Implemented

Based on the available information at the time of reporting, there have been no previous repair works or mitigation measures carried out at the site, apart from routine road maintenance and periodic clearing of rockfall from the ditches and road surface (as required).

2.4 Monitoring Overview

There are no instruments at the site; therefore, comments and recommendations are based on visual observations.

REFERENCES

GSC, 1970a: Geological Survey of Canada, 1970. “A Series Map 1265A, Geology of Canmore (east half), West of Fifth Meridian”. Geological map published in 1:50,000 scale in 1970. Downloaded from Natural Resources Canada Geoscience Publications GEOSCAN portal in July 2019.

AT Maps, 2019: Government of Alberta, Alberta Transportation extranet interface portal. AT Maps web mapping solution (https://extranet.inftra.gov.ab.ca/inftra_portal.html#). Accessed October 2019.