PEACE REGION
(GRANDE PRAIRIE DISTRICT – SOUTH) GRMP
SITE INSPECTION FORM

SITE NUMBER AND NAME: **GP036 Rockfall 2.0 km South of McIntyre Mine**	HIGHWAY & KM: 40:36, 12.061	PREVIOUS INSPECTION DATE: June 10, 2024	INSPECTION DATE: **June 2, 2025**
LEGAL DESCRIPTION: NW 04-58-08-W6M	NAD 83 COORDINATES: UTM 11 Northing 5984469 Easting 359856	RISK ASSESSMENT: PF: 16 CF: 6 TOTAL: 96	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 760 (north) & 960 (south) (Reference No. 25592, 2024)		CONTRACT MAINTENANCE AREA (CMA): 504	

SUMMARY OF SITE INSTRUMENTATION:	INSPECTED BY:
There is no instrumentation at the GP036 site. LAST READING DATE: N/A	Chris Gräpel (KCB) Courtney Mulhall (KCB) Rocky Wang (TEC)

PRIMARY SITE ISSUE: Rockfall hazards from rock slope along/above west (southbound) side of Hwy 40:36. Talus deposits and rockfall particles from rock slope constrict west highway ditch and falling rocks are a traffic hazard. This site is located along the west valley slope of the Smoky River. In 2022, previous debris flow component of this site was separated into its own GRMP site (GP054).

APPROXIMATE DIMENSIONS: Rock slope is approximately 376 m long and 15 m to 50 m high above pavement surface with an approximate cut angle ranging from 50° to 70°. Highway ditch geometry ranges from 4 m to 11 m wide and 0.1 m to 1.0 m deep.

DATE OF ANY REMEDIAL ACTION: Around 2010 – Lock blocks placed adjacent to guardrail on west side of Hwy 40:36. Ongoing highway ditch cleaning and removal of rockfall particles from pavement surface.

ITEM	**CONDITION EXISTS**		**DESCRIPTION AND LOCATION**	**NOTICABLE CHANGE FROM LAST INSPECTION**	
	YES	NO		YES	NO
Pavement Distress		X	None from rock hazards observed at time of 2025 inspection (Photo 8).		X
Slope Movement	X		Rockfall particles and talus materials continues to accumulate at toe of slope and in west highway ditch.	X	
Erosion	X		Differential weathering, freeze thaw, ice jacking, and seepage eroding rock mass. Some erosion along crest of slope.	X	
Seepage	X		Seepage sometimes observed flowing from rock slope.		X
Culvert Distress	X		Culvert inlet on west side of highway partially blocked with rockfall particles. Some rockfall particles removed by TEC during 2025 inspection by hand.	X	

COMMENTS
Site is partially downslope/east of the former McIntyre Mine (now CST Canada Coal Ltd.).
In 1998, gradeline improvements were made along this section of highway which resulted in some of the original rock slopes being excavated further with drill-and-blast methods while other sections were not.
Brow of rock slope is treed with a relatively thin layer of soil (Photos 3 and 9).
Bedrock structure consists of non-planar bedrock planes with some evidence of limited folding and faulting dipping generally to the south or southwest (dip estimated between 60° to 70°). The bedrock bedding planes have been distorted during mountain building and are not planar. The degree of non-planar distortion in bedding planes varies across the rock slope, dipping from 32° to 64° to near vertical at the top of the slope (Photos 3 and 9). The bedding layers in the bedrock vary in thickness from quite thin (tens of centimeters) to several meters thick. Some of the bedding layers in the bedrock mass are coal seams which appear to have been disrupted by faulting.
Rock mass consists of bedded and sheared sedimentary rocks, with coal seams which are weathering faster. Faster weathering of the coal results in the undermining of more competent rocks, which results in overhanging blocks and particles with little support that eventually fall, and the deposition of talus cones/slopes at the toe of the coal seams with occasional adjacent lateral rock block piles/cones (Photos 3 through 9). Cubical shaped rockfall particles appear to be rolling and bouncing down the talus cones bringing them closer to the highway (i.e., the talus cones act like chutes for rockfall particles). Whereas flat platy shaped rockfall particles appear to get hung up in the talus.
Several hanging rock blocks with some close to falling, including one potentially large rock block (Photos 3, 4, and 10). A bedrock discontinuity “plane” (distorted and non-planar) appears to underlie the large rock block (Photos 3 and 4). Along the north side of the large rock block is a layer of fractured rock and a coal seam which is weathering faster than the rest of the slope (Photo 3). The discontinuity between the undulating discontinuity and the large rock block appears to be dilated. Continued weathering of the coal seam could result in loss of confinement, resulting in overstressing the remainder of the attachments for the large rock block to the slope, causing a large rockfall event that would likely cover the section of highway below.
Mid-slope ledges and talus cones/slope could potentially bounce/launch/roll rockfall particles out onto the highway (Photo 9).
Previously fallen rockfall particles (up to 1.5 m x 1.0 m x 0.8 m) and talus materials continue to accumulate at the toe of the rock slope and in the west highway ditch (Photos 2, 3, and 6 through 10). Some rockfall particles on the east side of the highway, but they may have been cleaned off the highway (Photo 7). TEC has previously mentioned that some rock particles make it to the highway, and some are large enough to require a front-end loader to remove.
Relaxations of joints on the rock slope appear to have increased over the past two years. A few larger particles have fallen near the middle of the site (Photo 8) and some additional material appears to have fallen at the north end of site (Photo 10) since the 2024 inspection.
Possible fault structure located between rock slopes that is infilled with soil (Photos 1 and 2).
Decommissioned coal mine shaft entrance approximately midway up rock slope (Photo 9).
Ponded water is sometimes observed in the west highway ditch at the toe of the rock slope, which could be due to seepage and/or poor ditch drainage. During the 2025 inspection, the ditch channel was relatively dry.
A high-pressure natural-gas pipeline is located below the west highway ditch.
“Watch for fallen rock” signs on either side of site, located on the east shoulder before the site for northbound traffic and on the west shoulder before the site for southbound traffic. Also, no parking sign on the east side of the highway at the northern site limit (end of guardrail) for northbound traffic.
Swallows have been previously observed at the site. Construction would need to be outside the nesting period.

Maintenance/Repair/Monitoring Recommendations:

- Clean the west highway ditch regularly to maintain rockfall storage volume (i.e., keep ditch as wide and deep as possible to retain material within the ditch) and reduce the potential for material reaching the highway. This includes cleaning the culvert inlet which is typically partially blocked with rockfall particles (Photo 11). A buried gas line and fiber optics cable along the ditch limits the depth the ditch can be excavated or cleaned out. Estimated cost: approximately $25,000 to $40,000.
- Along the west highway shoulder, some of the concrete lock blocks are deteriorating and have been damaged by rock strikes, and a segment of the guardrail is deflected and has been pushed towards the southbound lane from rock strikes (Photo 12). Eventually, the lock blocks will eventually need to be replaced and the guardrail will need to be repaired.
- Complete a pipeline survey along the west highway ditch. A crossing agreement is needed between TEC and the pipeline owner to complete the survey with hydrovac excavation. It is noted that the crossing agreement limits the access of heavy equipment within 1.5 m of the pipeline along the ditch, which would be needed to clean the accumulated debris.
- Tender package for rockfall hazard mitigations:
    - KCB is preparing a tender package for rockfall hazard mitigations at four sites along Hwy 40:36 between km 8.395 and km 17.161, including this site. The mitigation actions for the site are based on a preliminary engineering report (PER) and technical memorandum submitted by KCB in August 2024 and April 2025, respectively and include:
        - A maintenance program that includes rock scaling of loose blocks and cleaning the highway ditch of accumulated debris every two years. Estimated cost: approximately $250,000.
        - A 90% rockfall catchment, extension of the existing concrete lock block barrier towards the south end of the site, and replacement of the existing concrete lock blocks that have deteriorated. Additionally, installation of fiber-reinforced shotcrete protection over fractured coal seams. Estimated cost: approximately $1.8 Million.
    - Environmental considerations for the proposed mitigation work included an Environmental Evaluation (EE) and Environmental Risk Assessment (ERA) submitted by KCB in May 2025 and June 2025, respectively.

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2025 Oct. 15
ID#153449

Courtney Mulhall, M.Sc., P.Eng.
Geotechnical Engineer

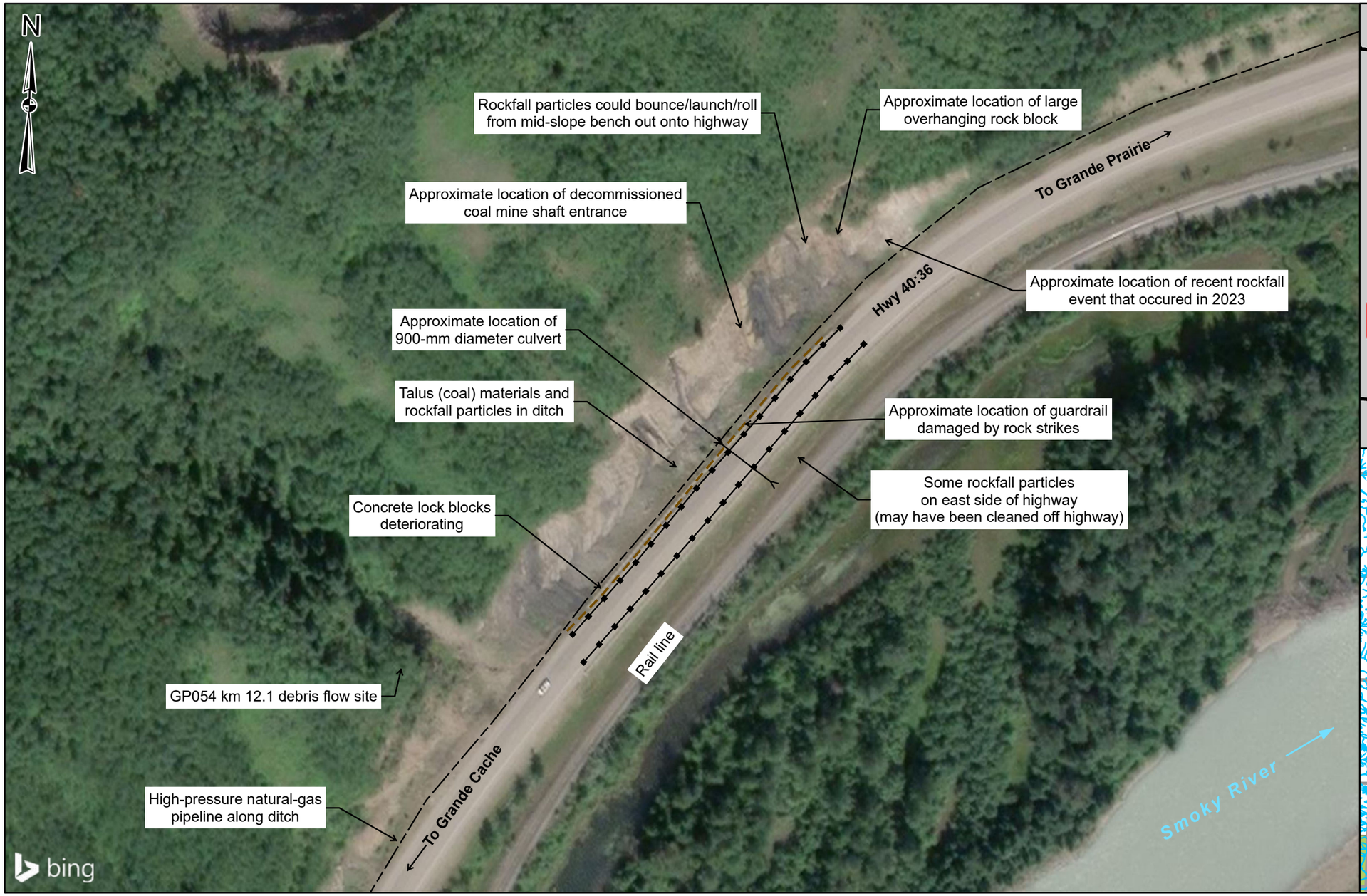
PERMIT TO PRACTICE
KLOHN CRIPPEN BERGER LTD.

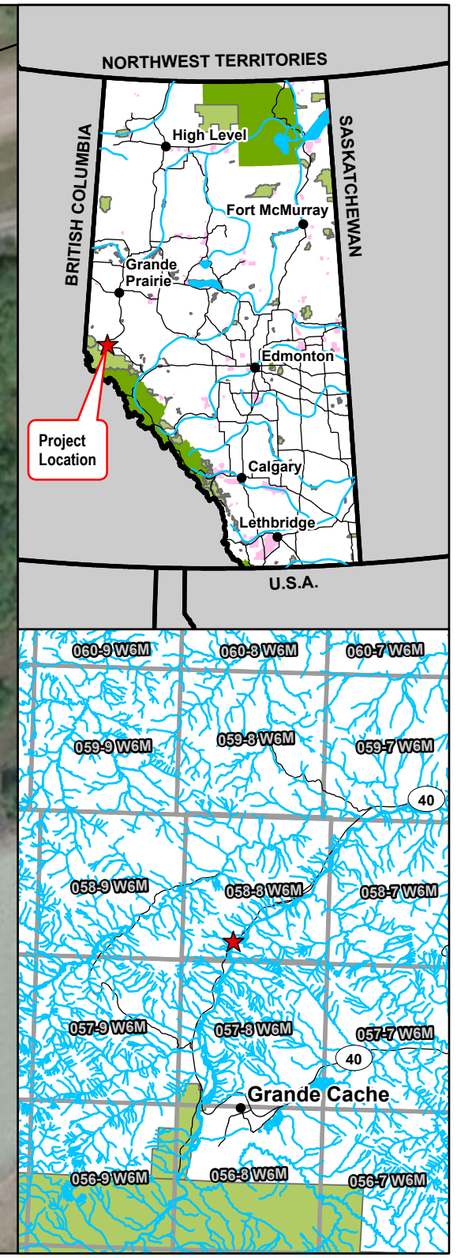
RM SIGNATURE: _____

RM APEGA ID #: 187607

DATE: 15 Oct. 2025

PERMIT NUMBER: P009196
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)





Legend

- Flow Direction
- Concrete Lock Block
- Guardrail
- Culvert
- Pipeline

0 50 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 11N
3. IMAGE SOURCE: 2025 MICROSOFT CORPORATION, 2025 MAXAR CNES, DISTRIBUTION AIRBUS DS

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: PEACE REGION (GRANDE PRAIRIE DISTRICT-SOUTH) GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
GP036 - Rockfall 2.0 km South of McIntyre Mine
Hwy 40:36, km 12.061

SCALE	PROJECT No.	FIG No.
1:1,500	A05116A01	1

File: Z:\AE\EDM\A05116A01 ABT Grande Prairie South GRMP\400 Drawings\GIS\MXD\2025\Section B\GIS2\AT_GPSouth_SectionB_250703.aprx Date: Time: Creator: : HManandyan

Inspection Photographs

Photo 1 **Rock slope along west side of Hwy 40:36, south of GP054 debris flow site. Photo taken June 2, 2025, facing southwest.**

Photo 2 **Rock slope along west side of Hwy 40:36, north of GP054 debris flow site. Note GP054 km 12.1 debris flow site on left. Photo taken June 2, 2025, facing northeast.**

Photo 3 **Rock slope along west side of Hwy 40:36. Note talus material mainly from coal seams in highway ditch, potential rock block on upper slope (circled in white, see photo below), and thin layer of soil at crest of slope. Photo taken June 2, 2025, facing northwest.**

Photo 4 **Potential rock block on upper slope shown in previous photo. Note dilated or open joints below rock block (indicated with white arrow), joints or shear planes to left and below rock block (circled in white), and rock and coal to right of rock block which is eroding. Photo taken June 2, 2025, facing northwest.**

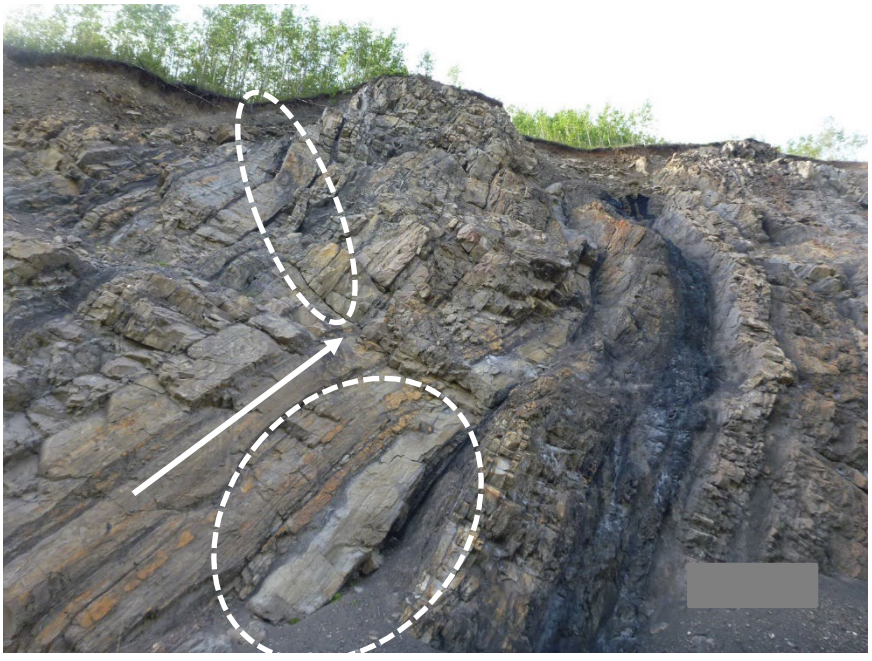


Photo 5 **Rock slope along west side of Hwy 40:36. Note loose rock block (circled in white) on slope. Photo taken June 2, 2025, facing northwest.**

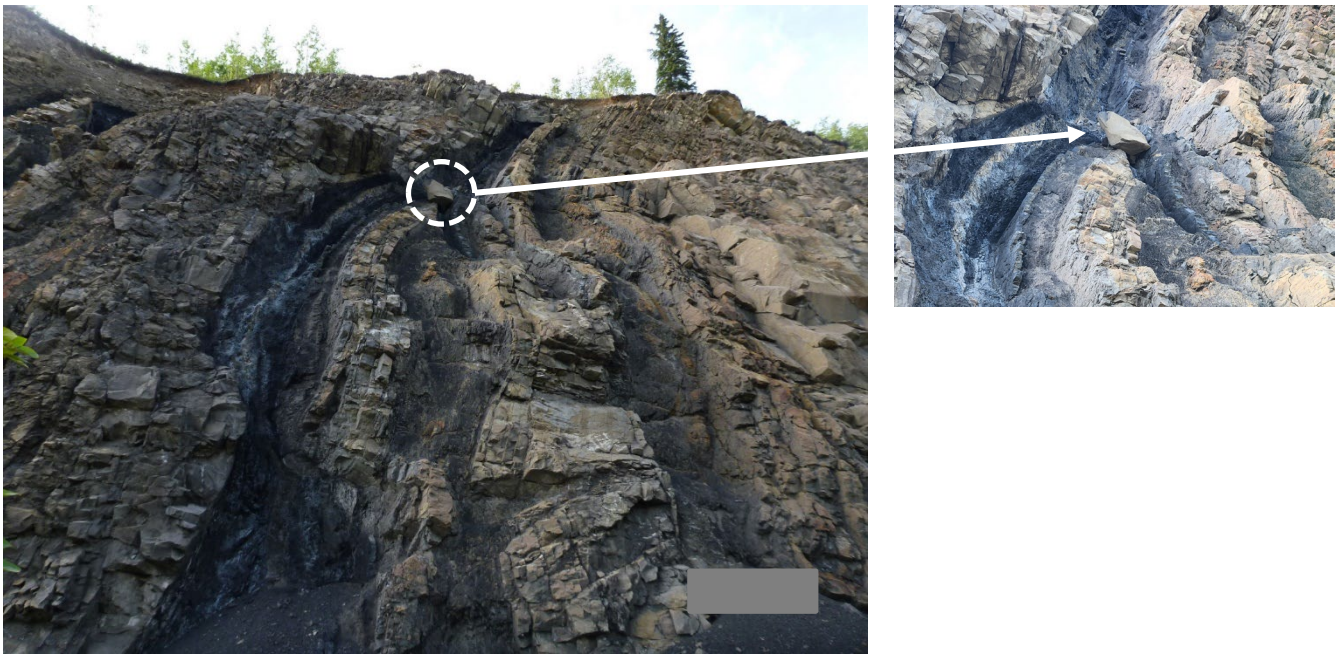


Photo 6 **Rockfall particle leaning against guardrail along west shoulder of Hwy 40:36. Photo taken June 2, 2025, facing northeast.**

Photo 7 **Rockfall particles in ditch on west side of Hwy 40:36. Note two large rock particles (circled in white) that fell between 2023 and 2024 inspections. Photo taken June 2, 2025, facing northeast.**

Photo 8 **Rockfall particles in ditch on west side of Hwy 40:36. Additional particles appears to have fallen since 2024 inspection. Photo taken June 2, 2025, facing southwest.**

Photo 9 **Rock slope along west side of Hwy 40:36. Note near-vertical bedding orientation of bedrock, talus material mainly from coal seams in highway ditch, bench which could launch rockfall particles from mid slope, and decommissioned coal mine shaft entrance (circled in white). Photo taken June 2, 2025, facing north.**

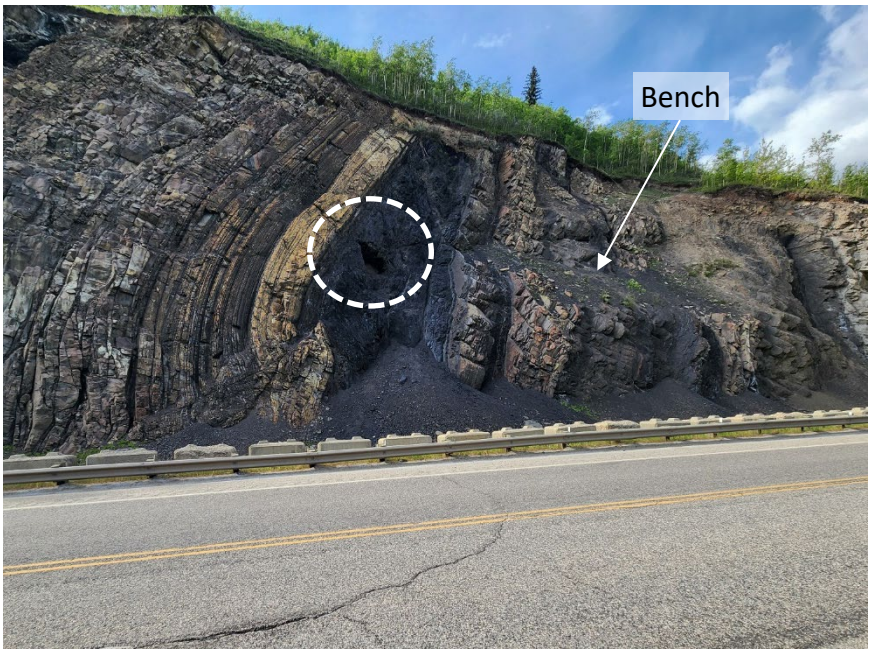


Photo 10 **Rock slope along west side of Hwy 40:36 near north end of site. Note hanging rock block (circled in white) and rockfall that occurred between 2023 and 2024 inspections (circled in black). Additional material appears to have fallen since 2024 inspection. Photo taken June 2, 2025, facing north.**

Photo 11 **Culvert inlet (circled in white) in ditch on west side of Hwy 40:36 partially blocked with rocks. Photo taken June 2, 2025.**

Photo 12 **Pavement surface of Hwy 40:36. Note lock blocks are deteriorating and segment of guardrail deflected and pushed towards southbound lane from rock strikes. Photos taken June 2, 2025, facing northeast and southwest, respectively.**