

SITE NUMBER AND NAME: GP008a Road Surface Slumping (N. of McIntyre Mine)		HIGHWAY & KM: 40:36, 16.070	PREVIOUS INSPECTION DATE: May 25, 2020	INSPECTION DATE: July 21, 2021
LEGAL DESCRIPTION: SE 15-58-08-W6M	NAD 83 COORDINATES: UTM Northing Easting 11 5986931 362757		RISK ASSESSMENT: Middle Slide PF: 8 CF: 4 TOTAL: 32 North Slide PF: 9 CF: 5 TOTAL: 45 Rockfall PF: 11 CF: 4 TOTAL: 44	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 900 (north) & 900 (south) (Reference No. 70000788)			CONTRACT MAINTENANCE AREA (CMA): 504	

SUMMARY OF SITE INSTRUMENTATION: Operational: Three SI's and two PN's installed in 2004 Inoperable: One PN installed in 2004 LAST READING DATE: PN-2A and PN-2B on June 28, 2021	INSPECTED BY: Chris Grapel James Lyons Roger Skirrow (AT) Rocky Wang (AT) Ed Szmata (AT) Max Shannon (AT) Dwayne Lowen (AT MCI) Renato Macciotta (KCB/ UofA)
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PRIMARY SITE ISSUE: 3 slope failures in a possible mine-waste fill below the highway: South Slide cuts diagonally across the highway; Middle Slide confined to east bound driving lane and shoulder. The North Slide encompasses both lanes. Rockfall hazards located at north and south end of site.
APPROXIMATE DIMENSIONS: South Slide approximately 60 m wide across highway, approximately 90 m long (south slide was being paved at time of inspection and measurements could not be verified). Middle Slide is approximately 15 m wide and North Slide approximately 140 m crossing both lanes. The fill appears to be approximately 30 m high and could be an old mine waste fill that predated highway construction to Grande Prairie. The embankment slope is approximately 3H:1V. The rockfall hazard is from a near-vertical sedimentary rock cut slope above the highway approximately 15 to 20 m high. Bedrock bedding planes are steeply to near vertical and sub-parallel
DATE OF ANY REMEDIAL ACTION: Paving underway at time of inspection, previous pavement patches

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Pavement cracks at each slide location (south slide, cuts diagonally across the highway); Middle slide affects north bound lane to centreline; North slide crosses both lanes. The south slide area was being paved at the time of inspection.		X
Slope Movement	X		Subtle changes in slope grading near bushes at northern slide could indicate a toe bulge		
Erosion		X			
Seepage		X			
Culvert Distress		X			

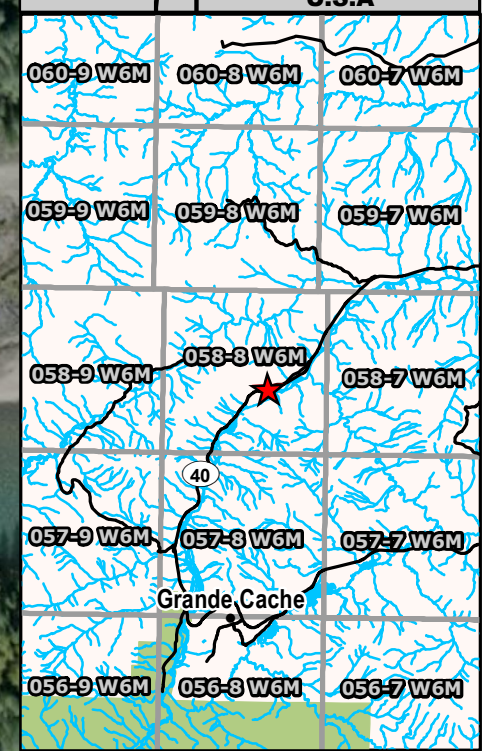
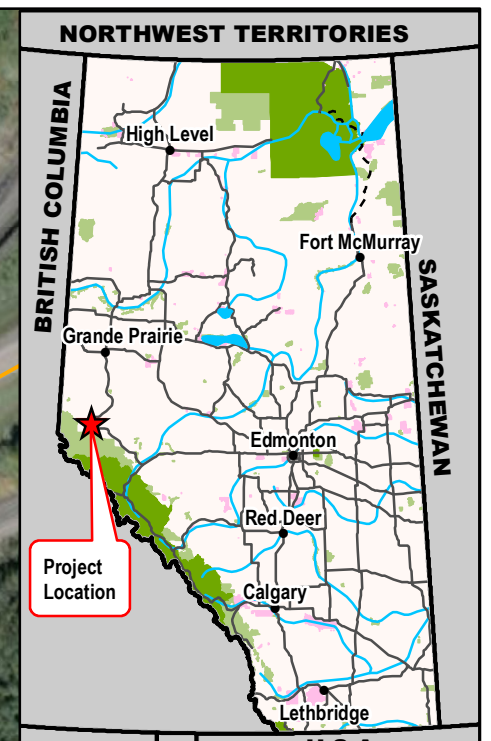
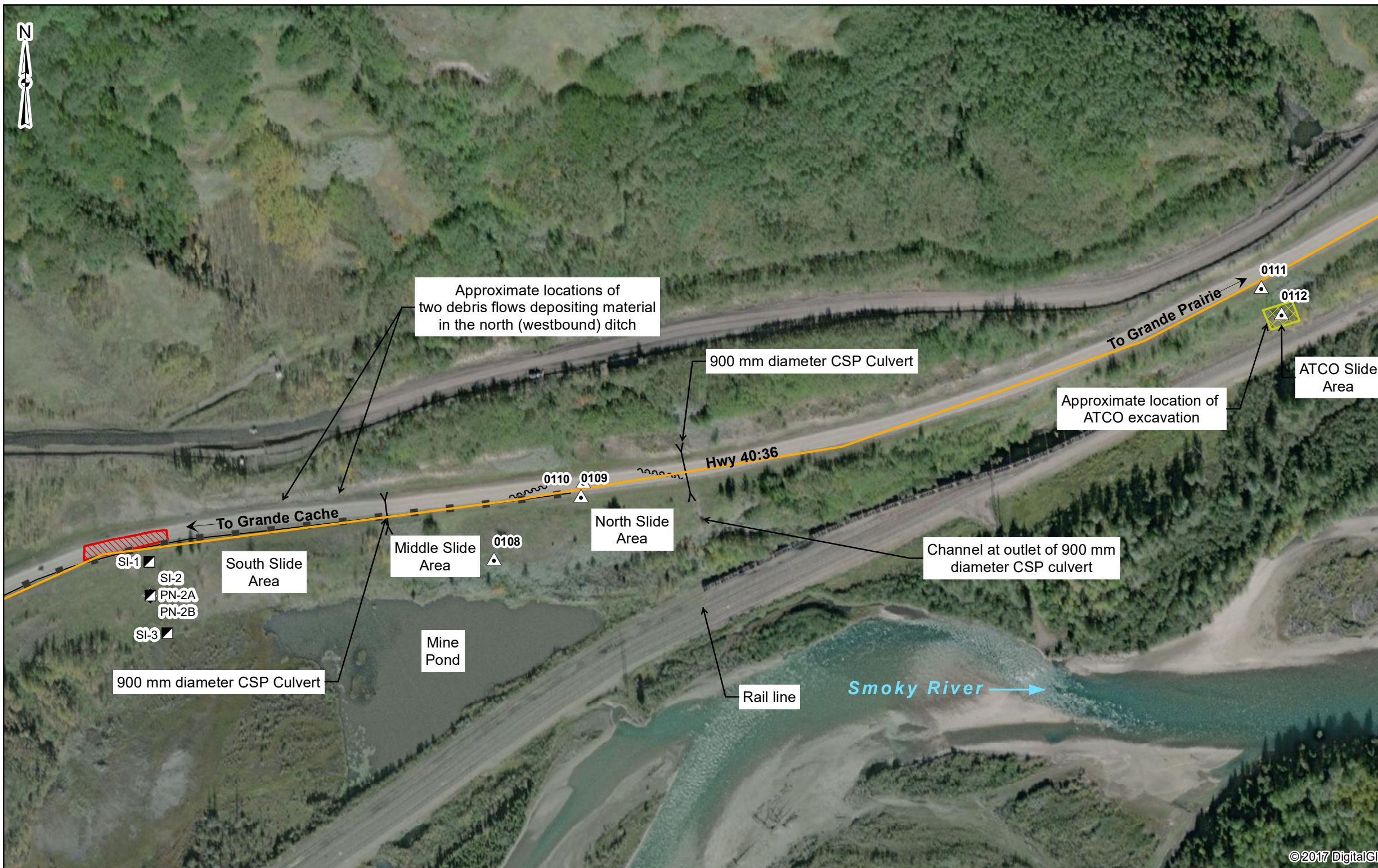
COMMENTS
- Pavement patching occurring in the north (westbound) lane during the 2021 site inspection at the South Slide location. South slide not visited. AT says that pavement cracks from the three slide zones usually reflect though pavement patches very quickly.
- Pavement cracking at Middle Slide is about 15 m wide. The width of the slide as indicated by pavement cracking doesn't appear to indicate a large failure that extends far down the slope. The surface of the slope below the Middle Slide appeared to be stable with the possibility of either a toe bulge 10 m downslope in bushes that could also be a remnant from poor slope grading.
- Material exposed on slope below Middle Slide appears to be mine waste material and could be from a former waste dump that predated highway construction. There is several meters distance between the guardrail and the crest of the slope which could also indicate a former mine waste structure as opposed to a highway embankment fill. Mine waste dumps are typically built in thick lifts with minimal compaction by end dumping with haul trucks. Settlements of the embankment could occur with time that might explain the movements, as would failures of the waste dump slopes that slide on thin sloping layers of segregated, of fine-grained waste dump materials that become preferential drainage paths
- North Slide pavement cracking does not appear to have changed since last inspection (based on AT recollections and previous photos). A possible toe roll/bulge was observed at WP 108 that could also have been poor grading.
- ATCO have constructed a temporary bench for powerline work on the embankment slope east of the North Slide (WP0112). The bench was constructed using a cut and sliver fill method, resulting in an oversteepened backslope and fill slope. The backslope of the bench is approximately 1H:1V, the cut-fill bench is about 6 m wide and 20 m long. The steep backslope has resulted in slope movements that have resulted in additional pavement cracking at the edge of pavement near the white line at the edge of the northbound lane. The stability of the slope below the bench is unknown, and it is immediately above the train tracks.
- AT reported that there has been more rockfall from the rock cut slope in recent years. Powerlines at crest of rock slope indicate mine site development that could be influencing the performance of the slope. KCB to check air photos for evidence of mining activity above slope and for history of road construction
- The brow of the rock slope has minimal to no overburden and the bedrock appears to be good quality rock. There is a mid-slope bench that has a talus slope/cone, which could potentially launch rocks out onto road
- Fragments from a fallen boulder in the ditch within 0.3 m of edge of pavement. The original particle looks like it was 0.3 x 0.3 x 0.3 m. AT says that some particles make it to the road and some are large enough to require a front-end loader to remove
- Ditch hasn't been cleaned in a while (about 8 years). Ditch should be cleaned to keep ditch as wide and as deep as possible so that rockfall particles are retained within the ditch. AT reported that there are no utilities below the ditch at this site
- AT requested a proposal for additional slope inclinometers in the South, Middle, and North Slides that extends through the potential mine waste dump into the foundation. Due to the potential for settlement of poorly compacted mine waste dump materials, AT requested that a research initiative with UofA be set up with the UofA-KCB-AT research project horizontal fibre-optic cable be placed in a trench behind the guardrail that extends across the potential waste dump fill. Fibre optic cables could be placed around the vertical slope inclinometers too. The proposal should include air photo review and background document review before any drilling is conducted.
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Senior Civil Engineer, Associate



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- Legend**
- ▲ GPS Waypoint (July 21, 2021)
 - ◆ Pneumatic Piezometer (PN)
 - ▣ Slope Inclinometer (SI)
 - GPS Track (July 21, 2021)
 - Guardrail
 - ~ Crack
 - Culvert
 - Flow Direction
 - ▨ Excavation Area
 - ▨ Asphalt Patch



NOTES:
 1. HORIZONTAL DATUM: NAD83
 2. GRID ZONE: UTM Zone 11N
 3. IMAGE SOURCE: ESRI Basemap

CLIENT

Alberta

Klohn Crippen Berger

PROJECT	GRANDE PRAIRIE SOUTH REGION GEOHAZARD RISK MANAGEMENT PROGRAM	
TITLE	Site Plan GP008A - Mine Pond Slides Hwy 40:36, km 16.070	
SCALE	PROJECT No.	FIG No.
1:3,500	A05116A01	1

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Photo 1 Talus cones along the rock slope east of the slide site. Note power poles above slope. Photo taken July 21, 2021 facing north.



Photo 2 Talus cones along the rock slope. Photo taken July 21, 2021 facing northwest.



Photo 3 Rock fall particles accumulating in the north (westbound) ditch at the base of the slope. Photo taken July 21, 2021 facing northeast.



Photo 4 The South Slide site viewed from the slope below the Middle Side site. Photo taken July 21, 2021 facing west.



Photo 5 Asphalt cracking at the North Slide approximately 100 m east of the debris flow site, extending from the edge of the asphalt to the centreline in the eastbound (south) lane. Photo taken July 21, 2021 facing northeast.



Photo 6 Asphalt cracking at the North Slide site approximately 150 m east of the debris flow site, extending from the edge of the eastbound lane to the edge of the westbound lane. Photo taken July 21, 2021 facing west.



Photo 7 **Outlet of the 900 mm diameter CSP culvert underlying Hwy 40. Photo taken July 21, 2021 facing north.**



Photo 8 **Riprap lined outlet channel for the 900 mm diameter CSP culvert. Photo taken July 21, 2021 facing south.**



Photo 9 Location of pavement cracking caused by ATCO temporary excavation 50 m to east of North Slide. Photo taken July 21, 2021 facing east. Red circle shows approximate location of pavement cracking in shoulder.

