SOUTHERN REGION GRMP
SITE INSPECTION FORM

SITE NUMBER AND NAME: **S040 Dorothy Sinkholes**	HIGHWAY & KM: 848:02, 11.507	PREVIOUS INSPECTION DATE: July 10, 2019	INSPECTION DATE: **May 31, 2022**
LEGAL DESCRIPTION: 06-04-27-17 W4M	NAD 83 COORDINATES: UTM 12 Northing 5681315 Easting 406434	RISK ASSESSMENT: PF: 8 CF: 4 TOTAL: 32	
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 60 (north) & 180 (south) (Reference No. 116220 & 114210)		CONTRACT MAINTENANCE AREA (CMA): 21	

SUMMARY OF SITE INSTRUMENTATION: There is no instrumentation at this site. LAST READING DATE: N/A	INSPECTED BY: Chris Gräpel (KCB) James Lyons (KCB) Rocky Wang (AT)
PRIMARY SITE ISSUE: Voids/sinkholes forming in dispersive soils and/or bedrock beneath and near the highway surface.	
APPROXIMATE DIMENSIONS: An approximate 500 m long section of the highway is being impacted.	
DATE OF ANY REMEDIAL ACTION: Ongoing – sinkholes close to the highway are backfilled with gravel containing fines; no recent repairs.	

ITEM	**CONDITION EXISTS**		**DESCRIPTION AND LOCATION**	**NOTICABLE CHANGE FROM LAST INSPECTION**	
	YES	NO		YES	NO
Road Surface Distress		X	No sinkholes observed on or near road surface. Gravel surfaced road recently graded.		X
Slope Movement		X	N/A – none observed		X
Erosion	X		Ongoing erosion of dispersive soils creating voids and gullies	X	
Seepage		X	Groundwater seepage		X
Culvert Distress		X	A joint at the CSP culvert outlet is separated		X

COMMENTS

Previous assessments have identified natural groundwater seepage and surface water flow as triggers for void/sinkhole formation. Voids previously observed near the highway are in areas of concentrated drainage (e.g., ditches, and rills and gullies on natural slopes). It is suspected that the ditch does not have the capacity for regularly rainfall events and there have been flows across the highway surface during rainfall events (i.e., heavy, or prolonged rainfall events).

During the 2017 inspection, a sinkhole approximately 1 m in diameter and 1 m deep opened near the middle of the highway after KCB and AT drove over the site (north of WP 512). The area has been repaired by Alberta Transportation (AT) but there may be other soil voids forming beneath the highway surface at the site. A second sinkhole was observed 2 m away from the culvert inlet that is partially undermining the south shoulder of the highway (WP 512).

During the 2018 inspection, a 0.15 m diameter 0.10 m deep sinkhole was observed near the north shoulder of the highway (WP 693). AT marked the location with a survey stake and flagging to warn motorists. A long, shallow sinkhole was discovered along the south shoulder (WP 694) approximately 100 m east of WP 693.

An Unmanned Aerial Vehicle (UAV) flight of the site was completed during the 2022 inspection to take aerial videos/photos (Photo 1 and 2).

An erosion feature was observed in the area inside the hairpin turn.

During the 2022 inspection the back slope was inspected but no sinkholes were observed. No sinkholes were observed along or near the highway surface. However, a large new sinkhole was observed approximately 30 m from the north edge of the highway on the inside of the hairpin curve (Photo 3) (WP 164).

The highway surface was recently graded before the 2022 inspection (Photo 4).

Maintenance/Repair/Monitoring Recommendations:

- Install signage (e.g., speed reduction and hazard markers) to warn motorists of hazard (e.g., potential washouts and collapse features); improve drainage (e.g., increase ditch drainage capacity) to reduce infiltration into underlying dispersive soils and erosion of steep natural slopes; backfill sinkholes and voids as needed; conduct a geotechnical site investigation that includes:
  - conducting a detailed topographic survey of the area (e.g., a LiDAR survey or an unmanned aerial vehicle [UAV] photogrammetry survey), so previous, current and future locations of sinkholes and voids can be plotted relative to the survey data to assess if they correspond to areas with concentrated drainage.
- A risk assessment guideline for dispersive soil sites should be developed.
- The site should be inspection every two-years as part of the Southern Region GRMP Section B inspections.

September 27 2022
I.D. # 58463

Chris Gräpel, M.Eng., P.Eng.
Senior Civil Engineer, Associate

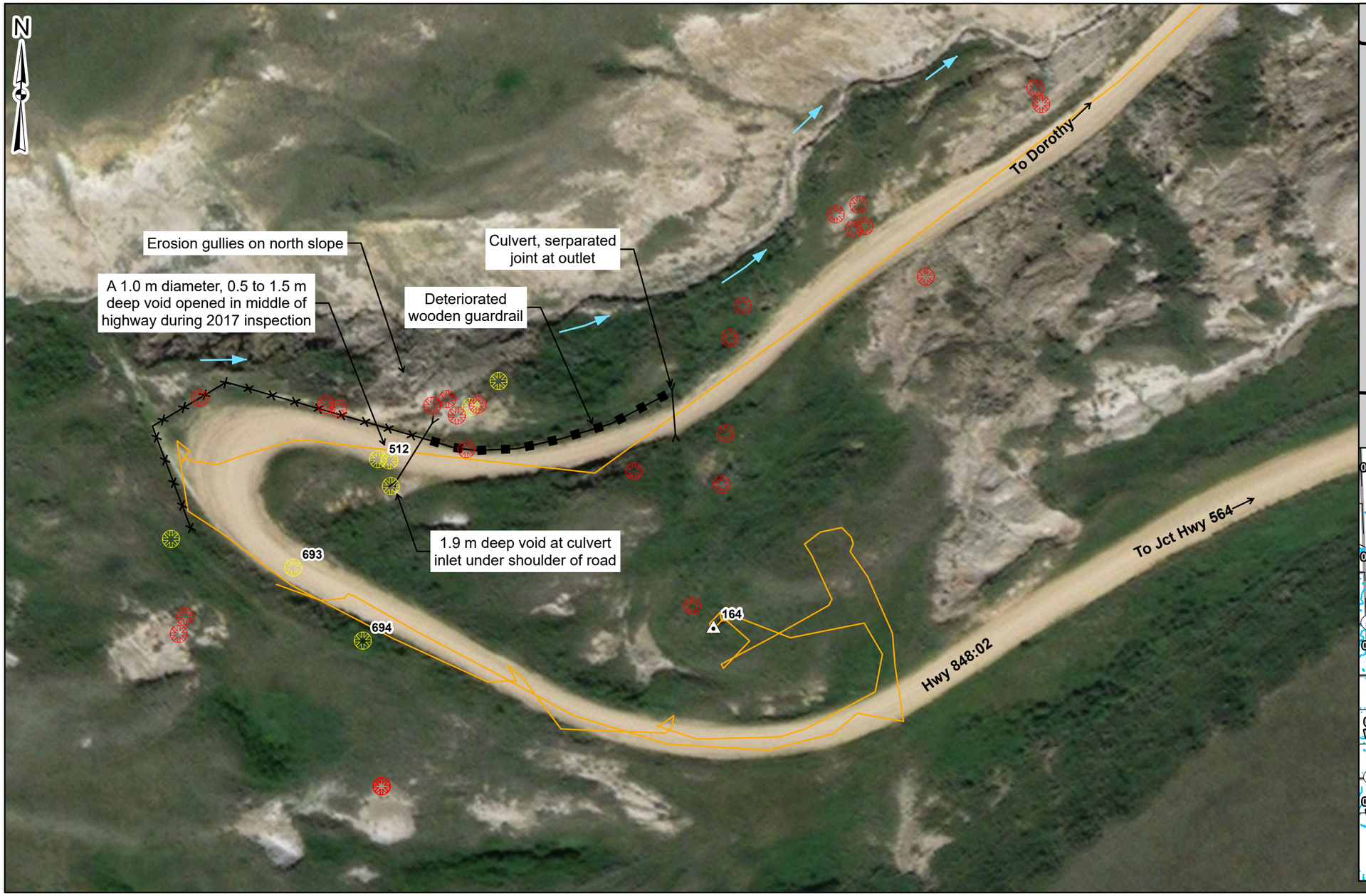
PERMIT TO PRACTICE
KLOHN CRIPPEN BERGER LTD.

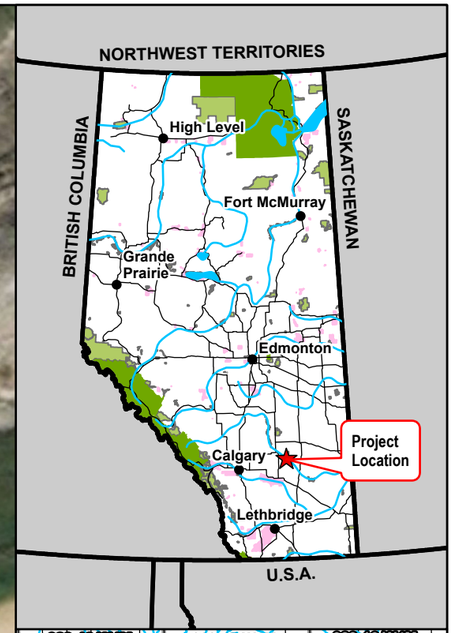
RM SIGNATURE: _____

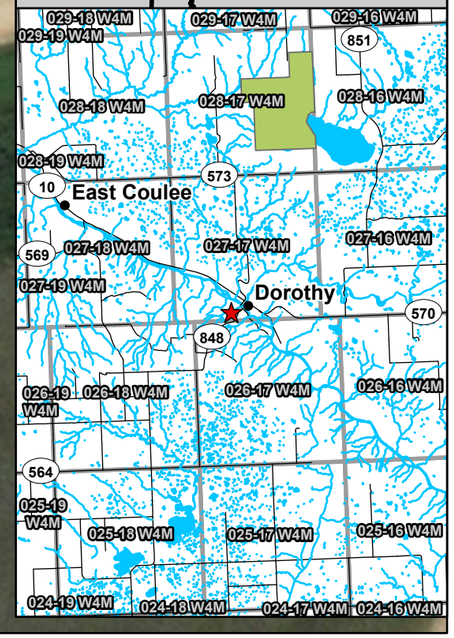
RM APEGA ID #: 187607

DATE: 28 Sep. 2022

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







Legend

- GPS Waypoint (May 31, 2022)
- Sinkholes (AMEC 2016)
- Sinkholes (KCB, 2016, 2017, 2018)
- GPS Track (May 31, 2022)
- Flow Direction
- Guardrail
- Fence
- Culvert

0 — 100 Metres

NOTES:
1. HORIZONTAL DATUM: NAD83
2. GRID ZONE: UTM ZONE 12N
3. IMAGE SOURCE: MICROSOFT CORPORATION 2022 MAXAR CNES, DISTRIBUTION AIRBUS DS
4. APPOXIMATE LOCATIONS OF PREVIOUSLY IDENTIFIED SINKHOLES DERIVED FROM AMEC 2016, FIGURE 1

CLIENT: Alberta

Klohn Crippen Berger

PROJECT: SOUTHERN REGION GEOHAZARD RISK MANAGEMENT PROGRAM

TITLE: Site Plan
S040 - Dorothy Sinkholes
Hwy 848:02, km 11.507

SCALE	PROJECT No.	FIG No.
1:1,250	A05116A03	1

File: Z:\AE\EDM\A05116A02 ABT Central Region GRMP400 Drawings\GIS\MXD\2022\S040_220613.aprx Date: Time: Creator: : aharrison

Inspection Photographs

Photo 1 **An aerial photo of the S040 Dorothy Sinkholes site. The erosion on the ditch slope, approximate location of the culvert inlet, and a large new sinkhole (WP 164) are indicated by a red arrow, square, and circle, respectively. The highway was graded shortly before the 2022 inspection. Photo taken May 31, 2022, facing east.**

Photo 2 **Aerial photo of the north side of the highway at the S040 Dorothy Sinkholes site. There is ongoing erosion of the north slope and the erosion has exposed bedrock at the toe of the slope/ditch bottom. Photo taken May 31, 2022, facing southeast.**

Photo 3 **Sinkhole observed on the inside of the hairpin curve (location shown in Photo 1) north of the highway (WP 164). Photo taken May 31, 2022, facing north.**

Photo 4 **The highway was graded shortly before the 2022 site inspection. Photo taken May 31, 2022, facing east.**