

SITE NUMBER AND NAME: NC010 – Willow Bend Slide	HIGHWAY AND KM: 33:04, km 25.005	PREVIOUS INSPECTION: June 10, 2019	CURRENT INSPECTION: June 28, 2021
LEGAL DESCRIPTION: SE 28-57-03-W5	NAD83 COORDINATES: UTM11U 5981185N, 672306E		RISK ASSESSMENT: PF: 11 CF: 5 Total: 55
AVERAGE ANNUAL DAILY TRAFFIC (AADT): 1930 (Referenced from PMA)		CONTRACTOR MAINTENANCE AREA (CMA): 509	

SUMMARY OF INSTRUMENTATION: One slope inclinometer and five standpipe piezometers functional. LAST READING DATE: July 4, 2021	INSPECTED BY: Stantec: Leslie Cho and Owen Zhang AT: Bernard Ching and Rishi Adhikari
PRIMARY SITE ISSUE: Landslide affecting sidehill section of the highway.	
APPROXIMATE DIMENSIONS: About 70 m long.	
DATE OF ANY REMEDIAL ACTION: Chip sealed in 2010. Patched in 2013. Crack sealing and spray patch in 2016. Two patches in 2017. West side slope improvements in 2019 including a clay wedge to eliminate the sharp drop off.	

ITEM	CONDITIONS EXIST		DESCRIPTION AND LOCATION	NOTICEABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		Pavement cracks reflecting through patch. 5-10 mm dip on north and southbound lanes.		X
Slope Movement	X		Landslide scarp cracks reflecting through highway patch. Tilting fence posts at toe of west side slope. Backslope Slump		X
Erosion	X		Erosion at inlet and outlet of 900 mm diameter CSP culvert. Subsidence along the alignment of 900 mm diameter culvert about 15 m north of inlet.		X
Seepage		X			
Culvert Distress	X		900 mm diameter culvert inlet separated about 0.5 m in. No flow from same culvert outlet but can hear water flow. Localized slump above culvert outlet.		X

COMMENTS
<ul style="list-style-type: none"> • Site conditions generally unchanged from previous inspection in 2019 (Figure 1). • Pavement cracks have reflected through the previous patch in 2017 suggesting an active landslide (Photos 1 and 2). Pavement cracks appear similar to previous visit and may have temporarily slowed down since 2021 had relatively low precipitation. Additionally, no additional fill placement has occurred since 2019. • Pavement crack is approximately 0.5 m away from the shoulder line on the northbound lane (NBL). • SI97-3 does not show any movement suggesting the landslide scarp is located on the highway. Previous SI readings indicate the slip surface is about 7 m below the highway surface. • The NBL shoulder appears to be relatively steep and may constitute a safety hazard to motorists. • Water ponding was observed in a relatively large wheel rut at the base of the backslope slump #3 (Photo 3). • No changes to the backslope slumps #1-3 were observed due to thick vegetative cover. • Separation observed about 0.5 m into the inlet of the 900 mm diameter culvert, possibly due to erosion (Photo 4).

- Local slump observed above the 900 mm diameter culvert outlet, possibly due to saturation of the embankment fill at the location of the separation (Photo 5). Water could be heard flowing at the outlet with no flow coming out (Photo 6).
- The Consequence Factor was increased by 1 to 5 due to the potential loss of full roadway and significant detours required to reroute traffic.

RECOMMENDATIONS

- The local MCI should continue to monitor the highway condition for development of new cracks and progression of existing cracks.
- Crack sealing should be completed to reduce surface water infiltration into the landslide.
- A small amount of fill could be placed to reduce the steepness of the NBL shoulder. Sharp shoulder signs may also be placed to warn motorists.
- The 900 mm diameter culvert should be inspected via CCTV to check for separation below the highway. Separated sections of the culvert should be excavated and replaced. Repair of the slump at the outlet can also be completed concurrently for efficiency.
- It is understood that a pile wall design was prepared for tender by another consultant and is scheduled for implementation in 2022.
- Site inspections should be completed every 2 years with the next inspection in 2023.
- Instrumentation should be monitored annually in the spring.

PREPARED BY: Leslie Cho, M.Eng., P.Eng.**REVIEWED BY:** Carrie Murray, M.Eng., P.Eng.

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2021 Site Inspection Photos at NC010



Photo 1: Pavement cracks reflecting through 2017 patch. Looking south.



Photo 2: Pavement cracks reflecting through 2017 patch. Looking north.

2021 Site Inspection Photos at NC010



Photo 3: Ponding in wheel rut at toe of backslope slump #3. Looking north.



Photo 4: Separation at culvert inlet. Looking north.

2021 Site Inspection Photos at NC010

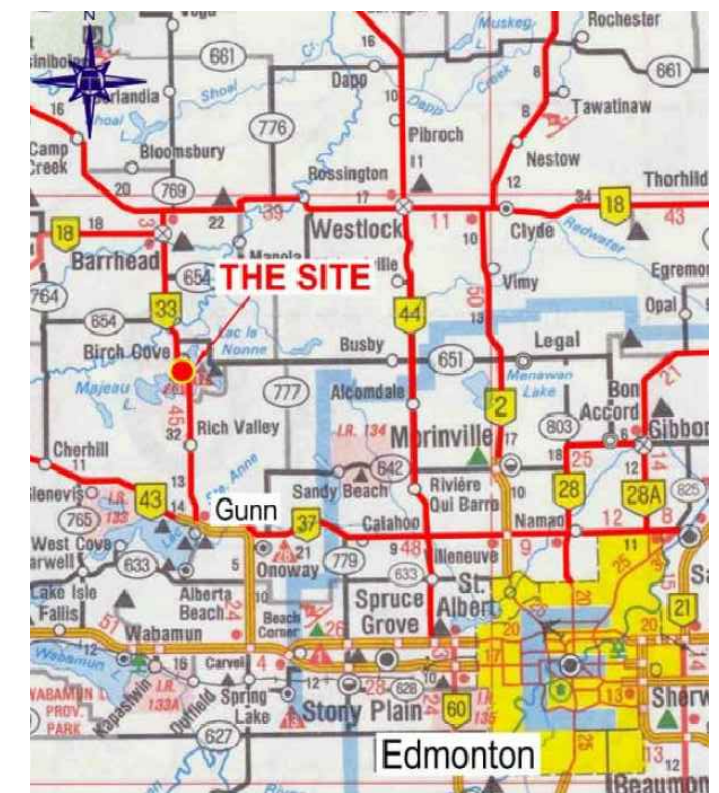
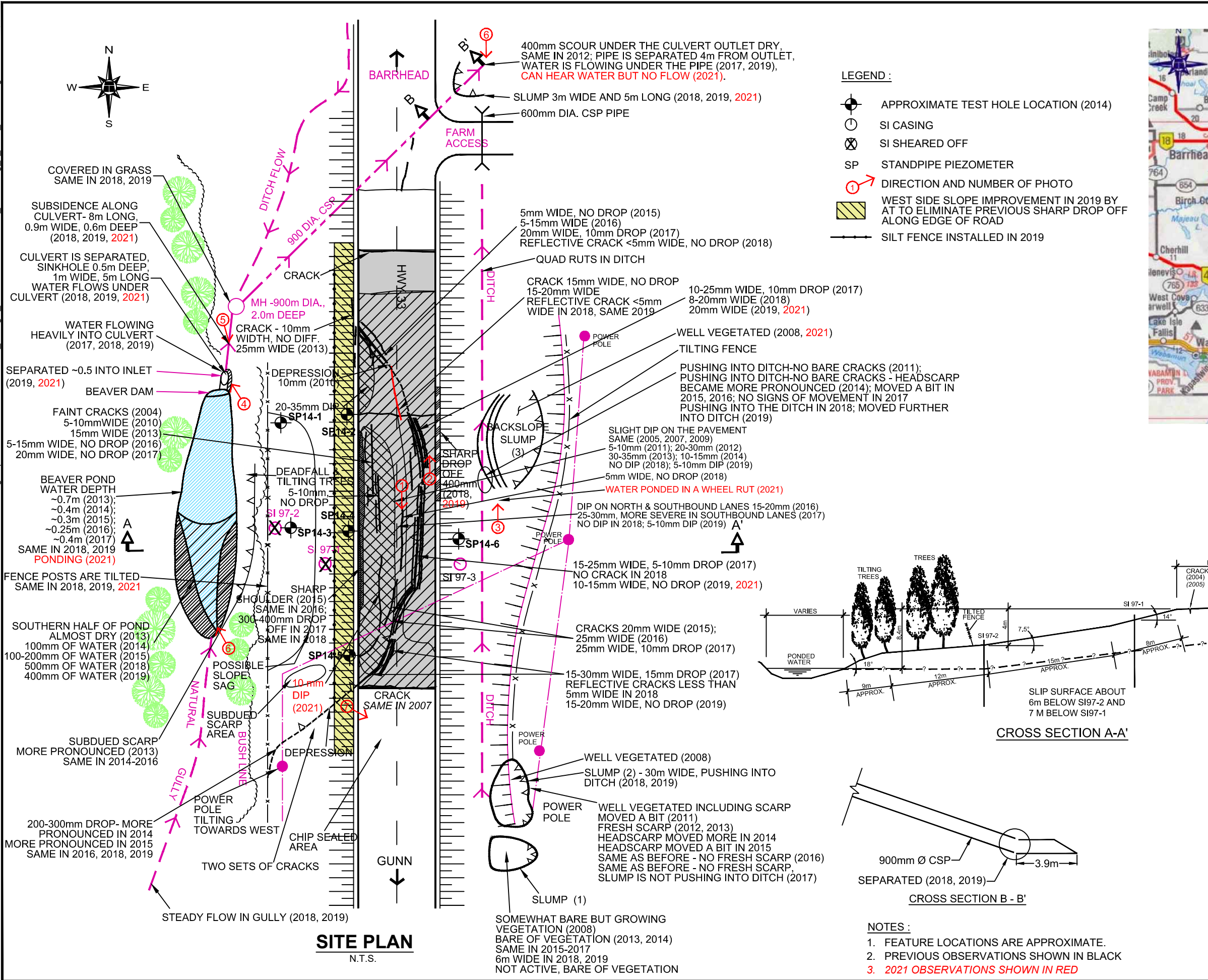


Photo 5: Subsidence along culvert. Looking south.

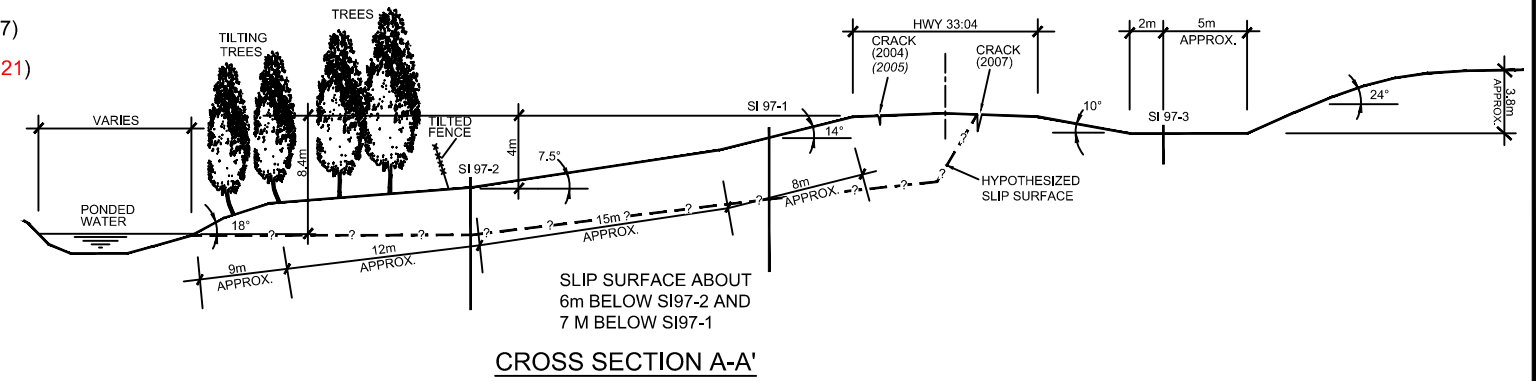


Photo 6: No flow at culvert outlet but can hear flowing water. Looking south.

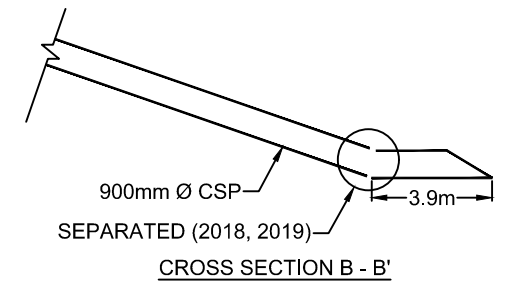
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SITE MAP
NOT TO SCALE



CROSS SECTION A-A'



CROSS SECTION B-B'

- NOTES:**
1. FEATURE LOCATIONS ARE APPROXIMATE.
 2. PREVIOUS OBSERVATIONS SHOWN IN BLACK
 3. **2021 OBSERVATIONS SHOWN IN RED**

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ALBERTA TRANSPORTATION
GEOHAZARD MONITORING PROGRAM
NC010-1: HWY 33:04 WILLOW BEND (km 25)
SITE FEATURES PLAN AND CROSS - SECTION A-A'

DRAWN	ML	CHECK	CM	APPROVE	LC
DATE	02 SEPT 2021	SCALE	AS SHOWN	PROJECT #	123315222

FIGURE - 1