

<b>SITE NUMBER AND NAME:</b> NC010 – Willow Bend Slide	<b>HIGHWAY AND KM:</b> 33:04, km 25.005	<b>PREVIOUS INSPECTION:</b> September 16, 2022	<b>CURRENT INSPECTION:</b> May 31, 2023
<b>LEGAL DESCRIPTION:</b> SE 28-57-03-W5	<b>NAD83 COORDINATES:</b> UTM11U 5981185N, 672306E		<b>RISK ASSESSMENT:</b> PF: 13 CF: 6 Total: 78
<b>AVERAGE ANNUAL DAILY TRAFFIC (AADT):</b> 2780 (2022)		<b>CONTRACTOR MAINTENANCE AREA (CMA):</b> 509	

<b>SUMMARY OF INSTRUMENTATION:</b> One slope inclinometer and four standpipe piezometers functional.	<b>INSPECTED BY:</b> Stantec: Leslie Cho and Sonja Pharand TEC: Rocky Wang and Amy Driessen
<b>LAST READING DATE:</b> May 10, 2023	
<b>PRIMARY SITE ISSUE:</b> Landslide affecting sidehill section of the highway.	
<b>APPROXIMATE DIMENSIONS:</b> About 70 m long.	
<b>DATE OF ANY REMEDIAL ACTION:</b> 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. Patched in Spring 2022. Milled and repaved in Fall 2022 after significant cracking and vertical differences up to 40 mm were observed during a September call-out inspection.	

ITEM	CONDITIONS EXIST		DESCRIPTION AND LOCATION	NOTICEABLE CHANGE FROM LAST INSPECTION	
	YES	NO		YES	NO
Pavement Distress	X		No cracks have reflected through the new pavement patch placed Fall 2022.	X	
Slope Movement	X		Landslide scarp cracks were reflecting through previous highway patch. Tilting fence posts at toe of west side slope. Backslope slump near intersection with TWP Rd 574.		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 wet sediment present.		X

<b>COMMENTS</b>
<ul style="list-style-type: none"> <li>• Site conditions were generally unchanged since the 2019 site inspection (Figure 1) except that pavement has been recently patched with no cracks reflecting (Photos 1 and 2).</li> <li>• 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.</li> <li>• The NBL shoulder appears to be relatively steep and may constitute a safety hazard to motorists.</li> <li>• Water ponding was observed in a relatively large wheel rut at the base of the backslope slump #3.</li> <li>• Sedimentation was observed in the wheel tracks on the east side of the highway, south from backslope slump #3 (Photo 3).</li> <li>• No changes to the backslope slumps #2-3 were observed due to thick vegetative cover.</li> </ul>

- Slump #1 was measured to be 5.9 m wide and 7 m long, and was mostly bare of vegetation with exposed coal fragments at the surface.
- The beaver dam at the 900 mm diameter culvert inlet continues to dam water upstream of the culvert. The difference in water elevation was approximately 2.3 m.
- Standing water was observed at the culvert inlet.
- A separation was observed about 0.5 m into the inlet of the 900 mm diameter culvert. Further erosion has occurred on the east side of the inlet, creating a gap between the ground surface and the culvert (Photo 4).
- Subsidence of the ground along the 900 mm diameter culvert alignment between the inlet and the catch basin was observed (Photo 5).
- The catch basin cover north of the inlet of the 900 mm diameter culvert was observed to be in a state of disrepair. The metal is extremely weak and falling apart due to heavy rusting. This may present a hazard to anyone/ wildlife walking in the area. The depth from the top of the catch basin to the bottom of the culvert was measured to be approximately 2.4 m.
- No flow was observed at the culvert outlet; however, it is possible that water is still flowing through (or around) the culvert given the wet sediment observed inside the culvert outlet (Photo 6).
- The previously observed slump around the culvert outlet was not observed due to vegetation growth.
- Piezometric levels were observed to have dropped since the readings taken Fall 2022 during the call-out inspection.
- The Consequence Factor remains at 6 since the landslide could result in a full road closure. The Probability Factor remains at 13 since the hazard appears to be active with a high rate of movement considering the fast progression of cracks and vertical displacement after the Spring 2022 patch.


**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.
- Milling and paving may continue as a short-term solution until long-term repairs can be performed. For any planned milling, the highway should be overlaid such that the final elevation matches the existing elevation or lower (i.e., no net addition of loads).
- 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.
- A pile wall design was prepared for tender by another consultant and was scheduled for implementation in 2022. However, it's understood that the construction schedule changed. It is recommended that the pile wall be constructed as soon as practicable.
- Site inspections should be completed every 2 years with the next inspection in 2025.
- Instrumentation should be monitored annually in the spring.



NORTH CENTRAL REGION GRMP  
EDSON / STONY PLAIN  
SITE INSPECTION FORM



<b>PREPARED BY:</b> Sonja Pharand, P.Eng.	<b>PREPARED BY:</b> Leslie Cho, M.Eng., P.Eng.
	
<b>REVIEWED BY:</b> Xiteng Liu, M.Sc., P.Eng., PMP	<b>PERMIT TO PRACTICE</b>

2023 Inspection Photos at NC010



**Photo 1:** Pavement recently patched in Fall 2022. Looking north.



**Photo 2:** Pavement recently patched in Fall 2022. Looking south.



2023 Inspection Photos at NC010



**Photo 3:** Signs of flowing water and sedimentation in wheel tracks on east side of highway, south from backslope slump #3. Looking north.



**Photo 4:** Separation at culvert inlet. Looking southwest.



2023 Inspection Photos at NC010

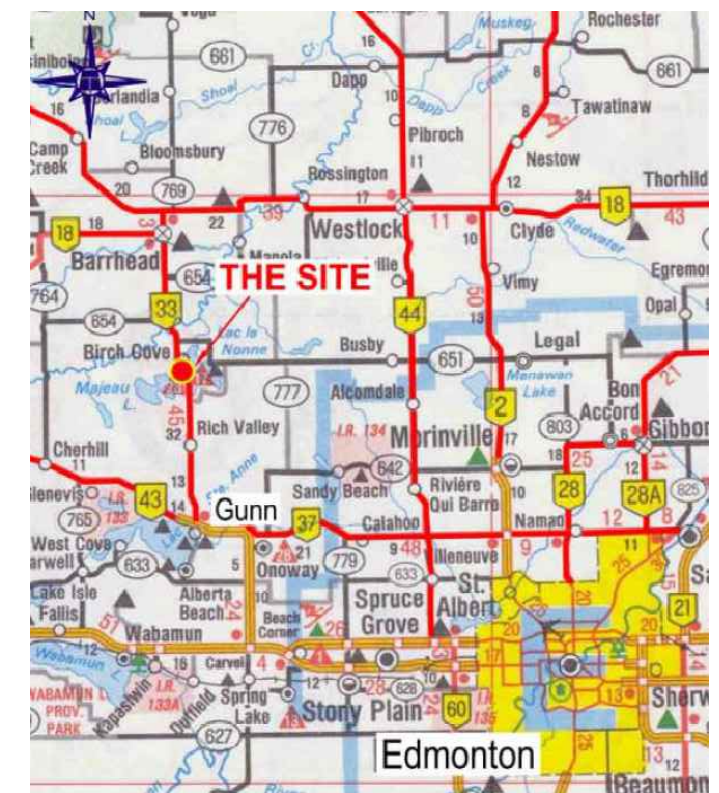
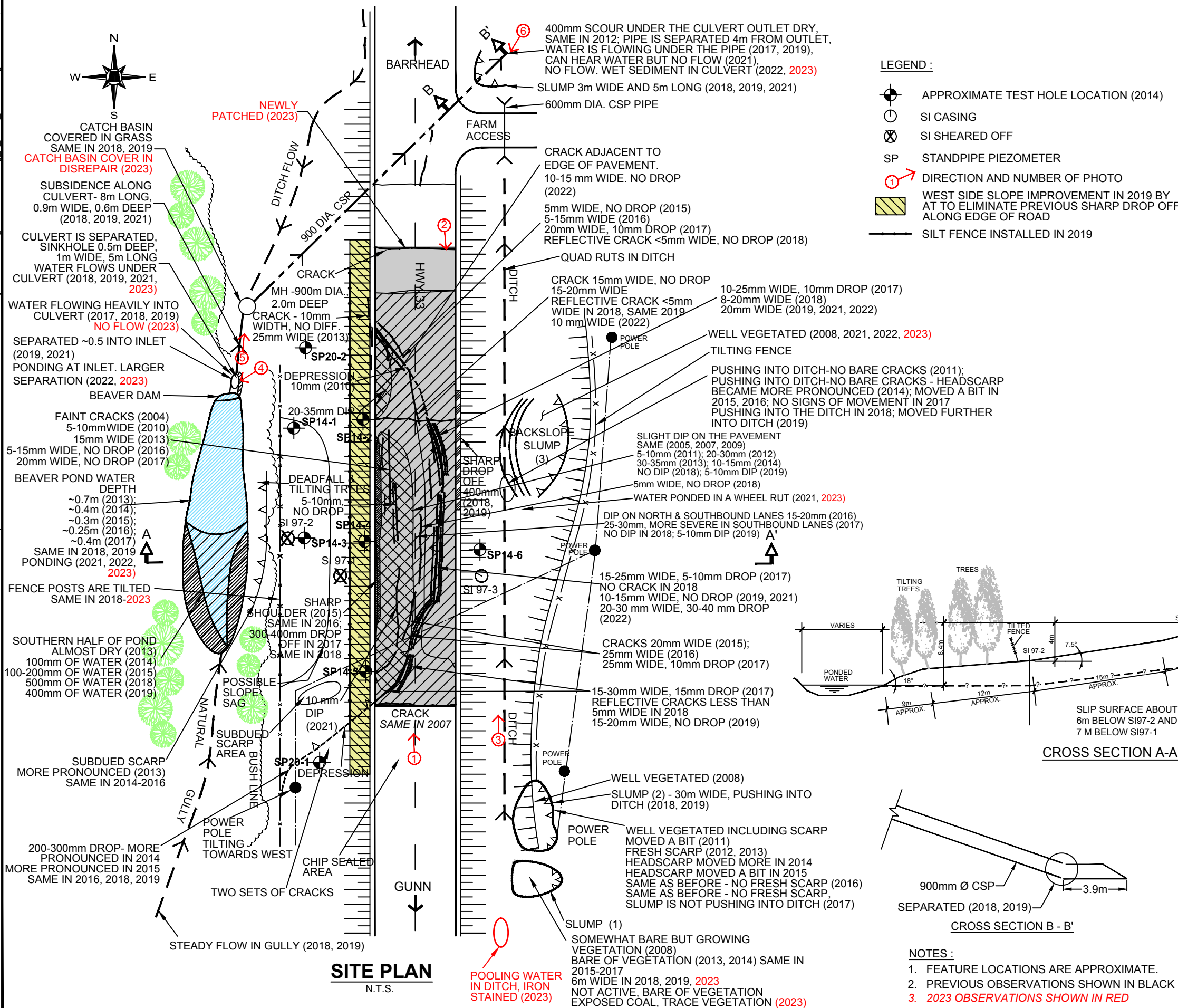


**Photo 5:** Subsidence along culvert alignment. Looking north.

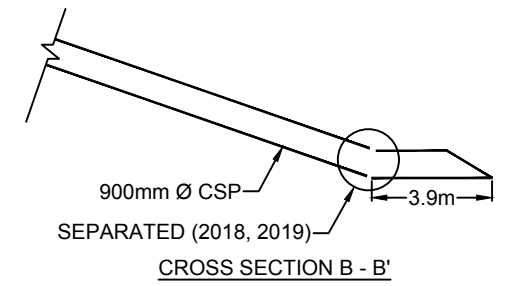
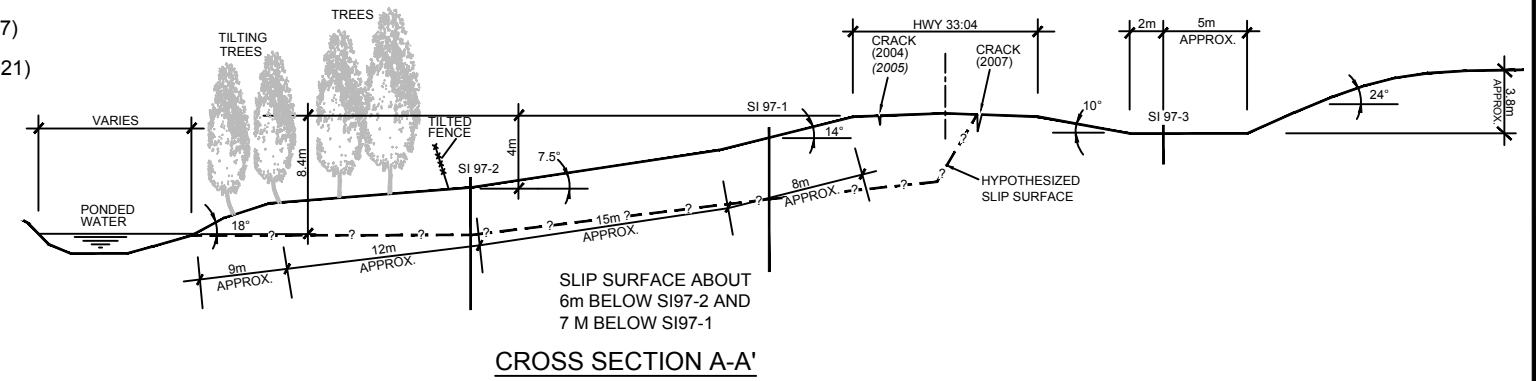


**Photo 6:** No flow at culvert outlet but wet sediment present. Looking southeast.





**SITE MAP**  
NOT TO SCALE



- NOTES:**
1. FEATURE LOCATIONS ARE APPROXIMATE.
  2. PREVIOUS OBSERVATIONS SHOWN IN BLACK
  3. 2023 OBSERVATIONS SHOWN IN RED

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**Stantec**

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

DRAWN	ML	CHECK	XL	APPROVE	LC
DATE	18 JULY 2023	SCALE	AS SHOWN	PROJECT #	123315222

**FIGURE - 1**