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| SITE NUMBER AND NAME: NC052 – Pembina River Bridge | HIGHWAY AND KM: 621:02, km 16.420 | PREVIOUS INSPECTION: June 15, 2022 | CURRENT INSPECTION: June 2, 2023 |
| LEGAL DESCRIPTION: SE 01-50-09-W5 | NAD83 COORDINATES: UTM11U 5905008N, 621749E | | RISK ASSESSMENT: PF: 10 CF: 10 Total: 100 |
| AVERAGE ANNUAL DAILY TRAFFIC (AADT): 1,040 (2022) | | CONTRACTOR MAINTENANCE AREA (CMA): 509 | |

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| SUMMARY OF INSTRUMENTATION: Three slope inclinometers (SI), two pneumatic piezometers, one vibrating wire piezometer and one standpipe piezometer functioning. | INSPECTED BY: Stantec: Leslie Cho and Sonja Pharand TEC: Rocky Wang, Amy Driessen and Pramaya Kannel |
| LAST READING DATE: May 19, 2023 | |
| PRIMARY SITE ISSUE: Slope instability at east abutment. Artesian pressures at west abutments. Shallow groundwater table at east abutment. Bridge (BF74969) rotating with crushed bearing plates. | |
| APPROXIMATE DIMENSIONS: 40 m wide by 60 m long. | |
| DATE OF ANY REMEDIAL ACTION: Winter 2014/2015 – Dewatering of east abutment using sub-horizontal drains. Fall 2020 – Riprap placed on slope south of east abutment to about halfway down slope. Summer/Fall 2022 – Pavement patches at the location of the potholes near the east and west abutments. | |


| ITEM | CONDITIONS EXIST | | DESCRIPTION AND LOCATION | NOTICEABLE CHANGE FROM LAST INSPECTION | |
|-------------------------|------------------|----|--|--|----|
| | YES | NO | | YES | NO |
| Pavement Distress | X | | Transverse crack near SI13-01. | | X |
| Slope Movement | X | | Ground crack at toe of east abutment south of riprap channel. | | X |
| Erosion | X | | Downslope of riprap south of east abutment. | | X |
| Seepage | X | | Artesian flow from SI-1 on west abutment and SI14-01 in the river near the east bank. | | X |
| Bridge/Culvert Distress | X | | Top of east pier rotating to the east. East abutment pushing into bridge deck. Through cracks in both abutment seats. Separation of guardrails at all four corners of bridge deck. | | X |

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| COMMENTS |
| <ul style="list-style-type: none"> • Bridge rotation appears unchanged since 2021. The separation of the guardrails along the bridge deck have remained relatively unchanged with 30 mm, 70 mm, 45 mm, and 20 mm of separation at the NE, SE, NW, and SW corners, respectively (Photos 1 to 4). The NW corner saw a reduction of 5 mm in the separation. • The expansion joint at the east abutment has a gap 35 mm wide in the westbound lane where the rubber has fallen below the bridge deck (Photo 5). • The three tiltmeters installed at the bridge are all non-operational. • Spring 2023 SI readings show signs of creeping a rate of less than 1 mm/year in SI-1. SI-2 previously showed signs of creeping from Spring 2014 to Spring 2022 whereafter cumulative displacements returned to 2014 levels. • Piezometric levels at the site have been relatively stable since installing the horizontal drains. |

- Concrete cracks at both east and west abutment seats appear unchanged. A 20 mm gap was written onto the crack at the west abutment at an unknown date. This same gap was measured to be 20 mm by Stantec since 2016. (Photos 6 and 8)
- The girders were in contact with the abutment backwall at the east abutment. The bearing plates appear to be crushed at both abutments. (Photo 7)
- The locks on the drainage galleries have been cut and will be replaced by Stantec during the Fall instrument reading cycle. In the westernmost drainage gallery, 7 of the 20 drains were flowing and in the easternmost gallery, 9 of the 32 drains were flowing. Significant build-up of minerals was observed in the subdrains.
- Minor flow of water was also observed at the gabion outfall.
- The ground crack south of the riprap channel near S114-01 appeared unchanged at about 7 m long with vertical difference up to about 0.4 m high (Photo 9).
- No apparent change was observed in the riprap channel and erosion south of the bridge at the east abutment slope (Photo 10).
- Potholes are present adjacent to the west abutment patch and east of the east patch (Photos 11 and 12).
- A new transverse pavement crack across both lanes exists on an older patched section of the west abutment (Photo 11).
- The nearest detour route to cross the Pembina River appears to be at Range Road 91 and Township Road 491A, approximately a 12-minute drive south of the site. This detour would require the use of gravel roads and would not be suitable for all types of traffic.

RECOMMENDATIONS

- The bridge should be inspected by a bridge engineer.
- Batteries should be replaced for the remaining tiltmeters to collect regular readings. Otherwise, regular survey of the bridge should be conducted to monitor its rate of rotation/movement.
- The riprap channel south of the bridge should be extended downslope to the river or revegetated for increased erosion protection.
- Pavement cracks should be sealed and potholes should be filled to reduce surface water infiltration into the slope.
- The subdrains should be cleaned/ flushed out to reduce mineral build-up and improve performance.
- Site inspections should continue annually.
- Instrumentation readings should continue semi-annually.

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| PREPARED BY: Sonja Pharand, P.Eng. | PREPARED BY: Leslie Cho, M.Eng., P.Eng. |
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| REVIEWED BY: Xiteng Liu, M.Sc., P.Eng., PMP | PERMIT TO PRACTICE |
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2023 Site Inspection Photos at NC052



Photo 1: Guardrail separation at southeast corner of bridge. Looking south.



Photo 2: Guardrail separation at northeast corner of bridge. Looking north.

2023 Site Inspection Photos at NC052



Photo 3: Guardrail separation at northwest corner of bridge. Looking north.



Photo 4: Guardrail separation at southwest corner of bridge. Looking south.

2023 Site Inspection Photos at NC052



Photo 5: Gap at expansion joint with rubber falling out. Looking north.



Photo 6: Cracking of east abutment. Looking northeast.

2023 Site Inspection Photos at NC052



Photo 7: Girders in contact with east abutment. Movement of bearing plate. Looking south.



Photo 8: 20 mm crack at west abutment. Looking west.

2023 Site Inspection Photos at NC052



Photo 9: Riprap lined channel north of east abutment. Ground cracks near SI14-01. Looking northeast.



Photo 10: Riprap placed south of bridge along previous erosion channel. Looking southeast.

2023 Site Inspection Photos at NC052



Photo 11: Pavement surface at west abutment. Looking southeast.



Photo 12: Pavement surface at east abutment. Looking west.

