

**ALBERTA TRANSPORTATION AND
ECONOMIC CORRIDORS GRMP
NORTH CENTRAL (ATHABASCA AND FORT
McMURRAY DISTRICTS)
2025 SITE INSPECTION**



Site Number	Location	Name	Hwy	km
NC102 (previously known as NC24B and NC24D)	Adjacent to Hwy 41, N. of Junction Hwy 29 at km 8.8	Kehiwin Lake	41.23	8.7
Legal Description		UTM Co-ordinates (NAD 83)		
SW-31-58-6-W4M		12U N 507240	E 5989184	

	Date	PF	CF	Total
Previous Inspection:	May 18, 2023	6	3	18
Current Inspection:	May 15, 2025	6	3	18
Road WAADT:	1,400		Year:	2024
Inspected By:	José Pineda, Bruce Nestor (Thurber) Rishi Adhikari (TEC)			
Report Attachments:	☒ Photographs ☒ Plans ☐ Maintenance Items			

Primary Site Issue:	Pavement distress on the highway SBL to the south of the NC24B pile wall, creating a bump/twist near the south end of the guardrail.
Dimensions:	About 150 m long along the highway SBL.
Site History:	A landslide occurred at this location in 2010 and the landslide head scarp crack encroached into the highway southbound lane. The landslide was repaired in 2011 using a 112 m long cantilever cast-in-place concrete pile wall (NC24B pile wall), installed on the west side of the highway, approximately 3 m downslope of the guardrail location. Three slope inclinometers (SI11-1 to SI11-3) were installed in the pile wall to assess the effectiveness of the remedial measure. A dip developed on the highway SBL to the south of NC24B pile wall in May 2014. Geotechnical instruments, consisting of slope inclinometers and piezometers, were installed in 2015 to the south of the NC24B pile wall to monitor the landslide movement rates and determine soil and groundwater conditions. A cast-in-place concrete pile wall (i.e., NC24D pile wall) was constructed in the fall of 2016 to retain the landslide movement. NC24D pile wall is an extension to the original wall completed in 2011 (i.e., NC24B wall). Two slope inclinometers (SI16-1 and SI16-2) were installed in the NC24D pile wall to assess the effectiveness of the remedial measure.
Maintenance:	Crack sealing took place in fall 2014; ACP patch in 2015 to smoothen the bump within the south end of the dip; ACP patch was completed in October 2017. Based on information provided by Mr. Ralph Gilbertson, TEC's MCI for the site, during a phone call on May 15, 2025, it is understood that ACP overlay along this section of the highway is scheduled for the summer of 2025.

Observations:	Description	Worse?
☒ Pavement Distress	N/A	☐
☒ Slope Movement	10 to 150 mm wide reflective cracks with up to 30 mm drop on the highway surface above NC24B wall; 10 to 80 mm wide cracks with up to 20 mm drop above NC24D pile wall. A 0.4 m deep scarp crack, located about 3.4 m from guardrail exposing 4 piles from the NC24B Pile Wall near SI11-1.	☒
☐ Erosion		☐
☐ Seepage		☐
☐ Bridge/Culvert Distress		☐
☐ Other		☐

Instrumentation: (11 SIs, 8 PNs, 3SPs)

The total pile head deflection, since construction completion, in the NC24B and NC24D pile walls ranges from zero to 4 mm; no discernable movements in SI15-1 and SI10-1 (located in the east ditch of the highway); the rate of movement in SI15-2, SI10-3 (located downslope of the pile walls) is less than 0.5 mm/yr; SI15-4, located to the south of the NC24D pile wall, is moving at 0.5 mm per year.

Between the fall of 2024 and the spring of 2025, the variation in groundwater levels ranged from a decrease of 0.2 m to an increase of 0.2 m.

Assessment (Refer to attached Figure):

The NC24B and NC24D pile walls have been effective in stabilizing the landslide movements. The reflective landslide cracks appeared on the highway surface above both walls will continue to open and widen over time until the pile walls mobilize the full magnitudes of the landslide stabilizing forces.

The design of the NC24B pile wall accounted for partial loss of the downslope soil mass (i.e., up to 4 m). Hence, the integrity of the wall should not be impacted due to the exposure of the concrete piles unless the downslope mass drops by more than 4 m. However, the slump developed downslope of the wall may get bigger and deeper in the future, and the head scarp crack may potentially expose more piles. Future loss of the exposed soils between the spaced piles, if occurs for example due to repeated freeze/thaw cycles or saturation of soils after a heavy rainfall event, may eventually impact the integrity of the highway due to progressive loss of soils the wall and the highway.

Recommendations:

This site inspections can be discontinued or limited to one inspection visit during the next contract; however, consideration should be given to reading the instruments installed at this site on a yearly basis.

In general, open cracks on the highway surface above the pile walls should be sealed to reduce groundwater infiltration into the landslide masses.

The local MCI should watch for the development of any new cracks on the highway lanes, particularly upslope of SI15-4 location (i.e., SI located outside the pile wall extent).

The slump area around the exposed four piles should be monitored and any cracks on the side slopes or the highway above this location should be sealed.

It is recommended that fill be brought to site to slightly grade/contour the slump area and cover the exposed four piles. The fill should be lightly compacted around the exposed piles.

Closure

It is a condition of this letter report that Thurber's performance of its professional services will be subject to the attached Statement for Use and Interpretation of Report.

José Pineda, M.Eng., P.Eng.
Associate | Senior Geotechnical Engineer

Bruce Nestor, M.Eng., P.Eng.
Geotechnical Engineer

STATEMENT FOR USE AND INTERPRETATION OF REPORT

1. STANDARD OF CARE

This Report has been prepared in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances at the same time and in the same or similar locality and in compliance with all applicable laws.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment, including this Statement For Use and Interpretation of Report, are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT, AS DESCRIBED ABOVE. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE OF THE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives, and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

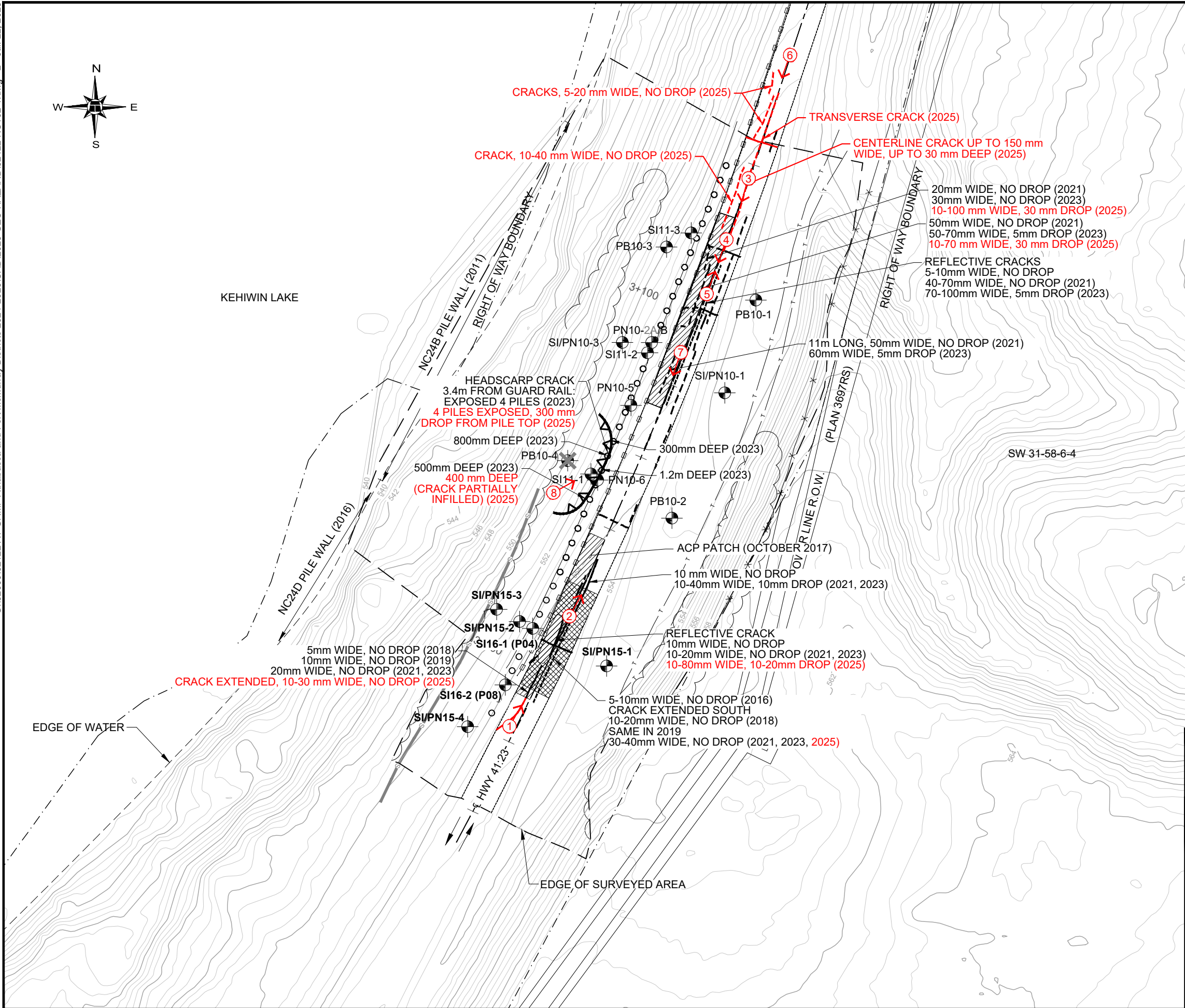
The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client for the development, design objectives, and/or purposes described to Thurber by the Client. **NO OTHER PARTY MAY USE OR RELY ON THE REPORT OR ANY PORTION THEREOF FOR OTHER THAN THE CLIENT'S BENEFIT IN CONNECTION WITH THE PURPOSES DESCRIBED IN THE REPORT.** Any use which a third party makes of the Report is the sole responsibility of such third party and is always subject to this Statement for Use and Interpretation of Report. Thurber accepts no liability or responsibility for damages suffered by any third party resulting from use of the Report for purposes outside the reasonable contemplation of Thurber at the time it was prepared or in any manner unintended by Thurber.

5. INTERPRETATION OF THE REPORT

- a) **Nature and Exactness of Soil and Contaminant Description:** Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors is inherently judgement-based. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other parties making use of such documents or records with or without our express written consent need to be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other parties. Some conditions are subject to change over time and those making use of the Report need to be aware of this possibility and understand that the Report only presents the interpreted conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client must disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) **Reliance on Provided Information:** The evaluation and conclusions contained in the Report have been prepared based on conditions in evidence at the time of site inspections and based on information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report resulting from misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other parties providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) **Design Services:** The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber is recommended to be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design need to be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) **Construction Services:** During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions to confirm and document that the site conditions do not materially differ from those conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or other parties who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes, but is not limited to, decisions made to develop, purchase, or sell land, unless such decisions expressly form part of the stated purpose of the Report as described in Paragraph 3.

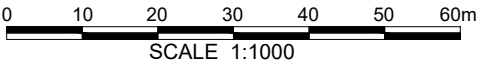


LEGEND

- km 8.8 PILE WALL
- FENCE LINE
- BUSH LINE
- ACTIVE SLIDE CRACKS ON HIGHWAY
- INACTIVE SLIDE CRACKS ON HIGHWAY
- TEST HOLE LOCATION
- SI SLOPE INCLINOMETER
- PN PNEUMATIC PIEZOMETER
- PB POORBOY / STANDPIPE
- DAMAGED/BLOCKED INSTRUMENT
- 550 GROUND SURFACE CONTOUR
- P OVERHEAD POWER LINE (APPROXIMATE)
- T TELUS LINE (APPROXIMATE)
- S SILT FENCE
- GUARD RAIL
- HIGHWAY DIP AREA
- ACP PATCH
- (P04) PILE NUMBER
- PHOTOGRAPH NUMBER, AND APPROXIMATE DIRECTION AND LOCATION

NOTES:

- MAY 15, 2025 OBSERVATIONS SHOWN IN RED
- CONTOUR INTERVAL IS 0.5m.
- CONTOURS INSIDE SURVEYED AREA WERE SURVEYED BY WSP. ELEVATION CONTOURS OUTSIDE SURVEYED AREA WERE DERIVED FROM LIDAR DATA.
- NC24D PILE WALL IS AN EXTENSION TO THE ORIGINAL NC24B PILE WALL CONSTRUCTED IN 2011.



NORTH CENTRAL REGION
(ATHABASCA AND FORT McMURRAY DISTRICTS)
2025 GEOHAZARD ASSESSMENT

NC102: HWY 41:23 KEHIWIN LAKE (km8.8)
SITE PLAN SHOWING FEATURES AND
INSTRUMENT LOCATIONS

DWG NO. 32122-NC102-1

DRAWN BY	ML
DESIGNED BY	JGP / BWN
APPROVED BY	TSA
SCALE	1:1000
DATE	JULY 2025
FILE No.	32122





Photo 1. Looking north at the 2017 ACP patch placed on the highway surface at the NC102 pile wall location; no visible dip on highway surface.



Photo 2. Looking north at reflective cracks in the highway surface at the NC102 pile wall location. Cracks are 10-80 mm wide, with a 10-20 mm drop.



Photo 3. Looking south at reflective cracks through north 2017 ACP patch.



Photo 4. Looking south at reflective cracks in north ACP patch. Reflective crack in middle of southbound lane is 10-70 mm wide with a 30 mm drop.



Photo 5. Looking north at reflective cracks near north end of NC102 pile wall. Reflective crack in middle of southbound lane is up to 100 mm wide with 30 mm drop. Centerline crack is up to 150 mm wide with a 30 mm drop.



Photo 6. Looking south at 5 to 20 mm wide reflective cracks with no drop on the southbound lane, up to 150 mm wide and 30 mm deep along centerline.



Photo 7. Looking south at 60 to 100 mm wide reflective cracks with up to 5 mm drop.



Photo 8. Looking at the tops of exposed concrete piles. The cracks in front of the piles are 300 mm deep.