GEOHAZARD ASSESSMENT PROGRAM

NORTH CENTRAL REGION – ATHABASCA AREA

2016 INSPECTION

Site Number	**Location**	**Hwy** 55:10 and 813:02 Intersection	**km**
NC004-1	Athabasca		
Legal Description		**UTM Co-ordinates**	
21-066-22 W4M		12V E 6066180 N 353385	

	Date	**PF**	**CF**	**Total**
Previous Inspection:	Aug. 18, 2015	12	4	48
Current Inspection:	May 18, 2016	13	4	52
Road AADT:	9590		**Year:**	2015
Inspected By:	Tarek Abdelaziz, José Pineda (Thurber) Roger Skirrow, Arthur Kavulok, Ron Hiligas, Paula Campbell (TRANS)			
Report Attachments:	☑ Photographs ☑ Plans ☑ Maintenance Items			

Primary Site Issue:	Severe erosion of Hwy 55 highway side slopes and median ditches	
Dimensions:	Refer to attached drawings and notes below.	
Maintenance:	**May 2015:** TRANS placed some cold mix asphalt along the shoulder of the south sideslope of Hwy 55 and installed some Class 1M riprap over non-woven geotextile, a short section of coconut matting and some synthetic ditch barriers in the median ditch as shown on the attached drawing. TRANS placed an ACP patch on Hwy 55 to correct an area of settlement that had occurred over the former Tawatinaw River channel where the former bridge had once been. **September 2015:** TRANS lined the eroded south ditch of Hwy 55 with Class 1 M riprap between Gabion weirs G4 and G9, backfilled the two 900 mm holes near existing light standards, lined the existing swale between 50 Ave and the south ditch of Hwy 55 with Class 1 M riprap, installed additional synthetic ditch barriers in Hwy 55 south ditch, and repaired the damaged guardrail section along the northwest corner of Hwy 813 and Hwy 55.	
Observations:	**Description**	**Worsened?**
☐ Pavement Distress	N/A	☐
☐ Slope Movement	Not obvious	☐
☑ Erosion	Erosion between the widely spaced gabion weirs installed in the median ditches between Hwy 55 and 50 Ave. and Hwy 55 and Hwy 813, the south and north side slopes of Hwy 55., along the sideslope of the Hwy 813 tie-in to Hwy 55 and the northwest side slope of the intersection of Hwy 55 and 43 St., and along the north sideslope of Hwy 55 east of the new Tawatinaw River diversion bridge.	☑
☐ Seepage	None noted during visit	☐

☑ Bridge/Culvert Distress	Some fill settlement has occurred around the manhole/drop pipe that drains the median ditch to the storm sewer pipe.	☐
☑ Other	Slight damage in the sides of the Hwy 55 north ditch G14 and G17 wire baskets; a few rocks came out of the baskets	☐

Instrumentation (1PN):

The slope inclinometers installed at this site were either sheared off prior to construction or damaged during the construction of the intersection improvement project.

The only operational pneumatic piezometer (PN04-2) located in the south ditch of Hwy 55 indicates that the groundwater level at this location is about 3.4 m below existing ground surface.

Assessment:

The site condition appears to have deteriorated since the last site visit completed in 2015. This is evident from the additional erosion issues occurred within the highway side slopes and ditches between 2015 and 2016.

The severe erosion that has been occurring along the side slopes appears to be due to a combination of concentrated runoff flowing over bare slopes in sandy soils. Hwy. 55 and 813 have curved alignments at the areas of concern with super elevations that concentrate and directs runoff to the side slopes. The sideslopes are generally bare of vegetation, possibly due to salting of the hill sections of Hwy 55 and Hwy 813.

The sandy soil that is present in the sideslope and median ditch bottoms is highly susceptible to erosion when left in a bare, unprotected condition and exposed to concentrated runoff. Similar ground conditions have performed much better in other areas on site where runoff occurs as sheet flow rather than a concentrated flow.

The existing gabion type rock weirs installed in the bottom of the Hwy. 55/50 Ave. median ditch are spaced quite far apart (about 25 to 30 m). The ditch gradient is relatively steep (approximately 6 to 8 percent) and the existing weirs should have been placed at a closer spacing to prevent erosion from taking place. Otherwise, heavy armouring of the ditch bottom should have been provided between the widely spaced weirs. The erosion control blanket placed between the widely spaced weirs provided a temporary erosion control measure and a more robust permanent erosion control measure should have been considered to provide a long-term protection against erosion.

The median ditch between Hwy. 813 and Hwy. 55 has a steep gradient near the top of the hill (inclined at approximately 9 percent); however, the closely spaced weirs, which are about 7 m apart, performed relatively well with little to no significant signs of erosion between the weirs below the ECB. Severe erosion was however noted between the 25 to 30 m apart weirs within the flatter gradient of the ditch (inclined at approximately 5 to 6 percent) near the bottom of the hill.

A few of the existing riprap channels in the south ditch of Hwy 55 are not well defined (i.e. appears to be flat) with no riprap along the ditch slopes and this could result in severe erosion developing near the edges of the riprap. The swale between 50 Ave and Hwy 55 south ditch was not provided with adequate thickness of Class 1 M riprap in addition to the presence of bare spots between the rocks. This deficiency could result in future erosion issues within the bottom and the sides of the swale.

The concentrated runoff occurring at the northwest corner of the intersection of Hwy 55 and Hwy 813 created 500 to 800 mm deep parallel erosion gullies down the side slope.

The damage occurred in the wire mesh of the G14 and G17 baskets could be attributed to localized settlement of fill below the affected baskets resulting is excessive stretching and failure of the wires.

It should be noted that additional erosion issues may have taken place between the widely spaced weirs installed in the southeast ditch of Hwy 813 and this will need to be assessed and addressed during the 2017 site inspection visit.

Recommendations:	**Estimated Cost**
Following are our recommendations and ballpark prices:	
1. It is recommended that a concrete curb and gutter be constructed along the south edge of Hwy. 55 over a distance of about 290 m to collect runoff from the roadway and direct it into ½ C.S.P. culvert downpipes draining into the base of the median ditch. Five downpipes, each of about 15 m in length, are recommended at the approximate locations shown on the attached drawing. A similar curb and gutter of about 10 m in length and downpipe of about 30 m in length, should also be installed down the sideslope in the northwest corner of the Hwy. 55 and Hwy. 813 intersection. The curb and gutter could be similar to those used in the vicinity of 50 Ave. consisting of a 600 mm wide section. The half culverts could be in the order of 500 mm in diameter and should be anchored to the slope.	$160,000 to $180,000
2. Prior to installing the curb and gutter and downpipes, all eroded sideslope areas should be repaired. The suggested repair consists of blading and track packing the slopes to fill the rills. In the case of the NW slope of the Hwy 813 and Hwy 55 intersection, where the gullies are worse, the gullies should be backfilled with well compacted crushed gravel. Imported topsoil should be spread over the graded slopes and track packed in the up and down-slope direction to texture the slope surface prior to seeding and covering the topsoil with medium flow soil covering. A salt tolerant mix will need to be used to promote the growth of the grass in a saline environment. An alternative option would be using at least 75 mm thick compost blanket with custom seed mix to provide a better growth medium and a longer term erosion control.	$70,000 to $85,000
3. The eroded sections of the Hwy.55 ditches should be graded smooth and thoroughly compacted and then covered with non-woven geotextile and Class 1M riprap. Some of the areas already addressed by TRANS in the south ditch have bare spots between the rocks or flat bottoms. Additional riprap should be placed in the bare spots to supplement existing riprap and care must be taken to extend the riprap armour in the existing and new channels at least a few meters up each sideslope so that runoff does not erode around the edges of the armour. This includes some rock to correct the settlement at the manhole/drop pipe at the downstream end of the Hwy 55 south ditch, the area between the CSP pipe and the manhole in the north ditch, and the area between the outlet of the culvert and the gabion basket weir G30 in the Hwy 55 north ditch.	$200,000 to $220,000
4. Bracing wires and ties should be used to close the gaps formed within the wire baskets in the Hwy 55 north ditch and prevent further loss of rocks. The repair should be completed as per the supplier/manufacturer's recommendations.	Maintenance Item

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LEGEND

- TEST HOLE LOCATIONS (2008)
- TEST HOLE LOCATIONS (2004)
- SLOPE INCLINOMETER
- CLASS 1M RIPRAP PLACED IN 2015
- GRASS COVERAGE IN DITCH BOTTOM
- BARE SLOPE - REQUIRES RILL REPAIR, TOPSOIL, SEED AND SOIL COVERING (APPROXIMATE)
- GABION BASKET WEIR
- EXISTING OVERHEAD LIGHT
- ABANDONED LIGHT FOUNDATION HOLE TO BE BACKFILLED
- PROPOSED CONCRETE CURB AND GUTTER
- PROPOSED HALF CULVERT
- PROPOSED CLASS 1M RIPRAP OVER NON-WOVEN GEOTEXTILE
- (1) DIRECTION AND NUMBER OF PHOTO
- G DENOTES GABION BASKET

N W E S

ATHABASCA RIVER

EDGE OF WATER

PROP R/W BDY

DIVERSION CHANNEL

HIGHWAY 813

HIGHWAY 55

DRAIN

4.0m GRAVEL PATHWAY

1.95m WIDE PAVED SIDEWALK

EXISTING ROTARY TRAIL

50 AVE.

43rd ST.

4th ST.

TH08-22, TH08-21, TH08-20, TH08-19, TH04-02, TH04-18, TH04-15, TH04-01, TH04-03, TH04-04, TH04-08, TH04-09, TH04-16, TH04-07, TH04-05, TH04-11, TH08-23, TH08-24, TH08-25, TH08-26, TH04-12, TH04-13, TH04-17

SI-31, SI-32, SI-33, SI-34, SI-24, SI-23, SI-22, SI-21, SI04-01, SI04-02, PZ04-1, SP04-1, SN04-2, SP04-2

1200mm Ø MH

1200mm Ø MH

2-300mm ø STORM WATER LINES

1600mm Ø CSP STORM PIPE

TAWATINAW RIVER

SEVERE EROSION GULLIES BELOW ECB TYPE C

SHALLOW EROSION GULLIES BELOW ECB TYPE C

SPILL CONTAINMENT DITCH BLOCK WITH 300mm CSP PIPE

EROSION AT OUTLET OF PIPES

SEVERE EROSION GULLIES (2015) SAME IN 2016

DAMAGED GUARDRAIL REPAIRED (SEP. 2015)

TWO EROSION RILLS THAT WERE BACKFILLED IN 2015

G5 TO G31 GABION BASKETS AT 7m SPACING

HOLE 0.9m ø x 0.6m DEEP (AUG. 2015) BACKFILLED IN SEP. 2015

COLD MIX ASPHALT WAS PLACED TO SLOW EROSION OF SIDESLOPE (AUG. 2015) SAME IN 2016

EXTEND RIPRAP ABOUT 2m INTO THE CHANNEL SIDE SLOPES

TRANSFORMER PEDESTAL

EROSION NEAR EDGE OF RIPRAP

END OF EXISTING CONCRETE CURB AND GUTTER OF 43 STREET

SCATTERED RIPRAP MIXED WITH DEBRIS- NEEDS TO BE REDONE

RIPRAP CHANNEL NEEDS TO BE SHAPED - EXTEND RIPRAP ABOUT 2m INTO CHANNEL SIDE SLOPES

HOLE 0.9m ø x 0.4m DEEP (AUG. 2015) BACKFILLED IN SEP. 2015

UNLINED SWALE EXTENDING FROM END OF CONCRETE GUTTER TO MEDIAN DITCH. (AUG. 2015) LINED WITH CLASS 1M RIPRAP OVER NON-WOVEN GEOTEXTILE. (SEP. 2015) -AREAS BARE OF RIPRAP IN SWALE; NEED ADDITIONAL RIPRAP.

NOTES:

1. HWY 55 SOUTH DITCH IS INCLINED AT 6~8%; HWY 55 NORTH DITCH IS INCLINED AT 5~9%.
2. ALBERTA TRANSPORTATION PLACED RIPRAP BETWEEN G4 AND G8 IN THE SOUTH DITCH IN SEP. 2015.
3. MAY 18, 2016 SITE OBSERVATIONS ARE MADE IN RED.

0 20 40 60 80 m

SCALE 1:1500

BASE PLAN FROM THURBER DWG 17-308-379-6

Alberta Transportation

NORTH CENTRAL REGION (ATHABASCA AREA)
2016 GEOHAZARD ASSESSMENT (MAY 18, 2016)

NC004-1: HWY 55 / 813 INTERSECTION
SITE PLAN SHOWING SITE FEATURES

DWG No. NC004-1

DRAWN BY	ML
DESIGNED BY	JGP
APPROVED BY	TSA
SCALE	1:1500
DATE	JULY 2016
FILE No.	13357

THURBER ENGINEERING LTD.

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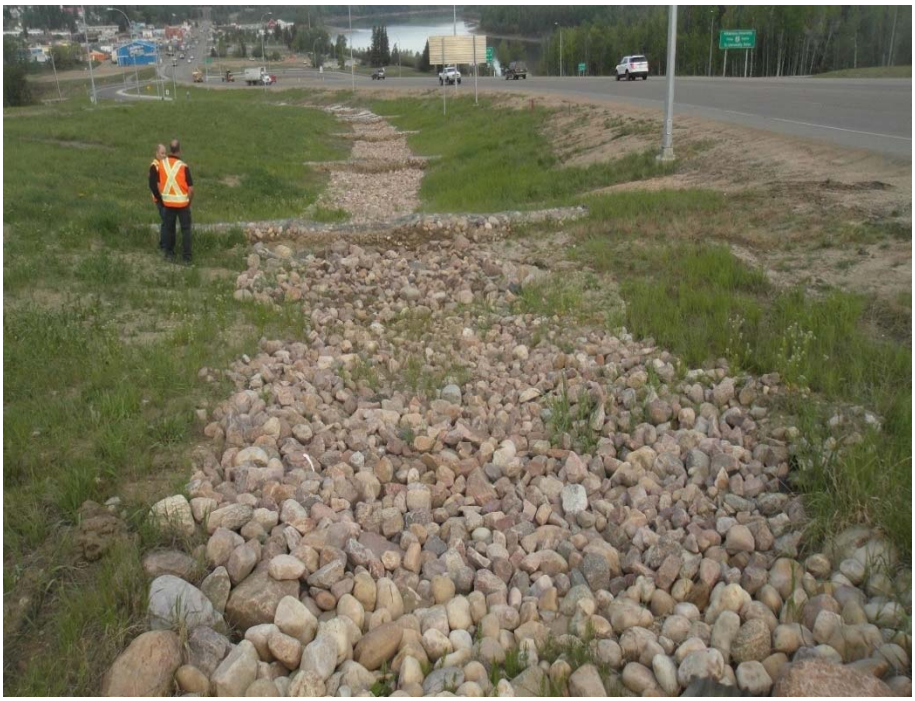
	**Photo 1.** Looking northwest at the southwest corner of Hwy 55 and 43rd intersection.
	**Photo 2.** Hwy 55 South Ditch: Looking west at an existing riprap channel to the east of G1. Note the erosion developed near the northwest corner of the channel; channel needs to be reshaped and riprap should be extended at least 2 m along the side slopes of the ditch

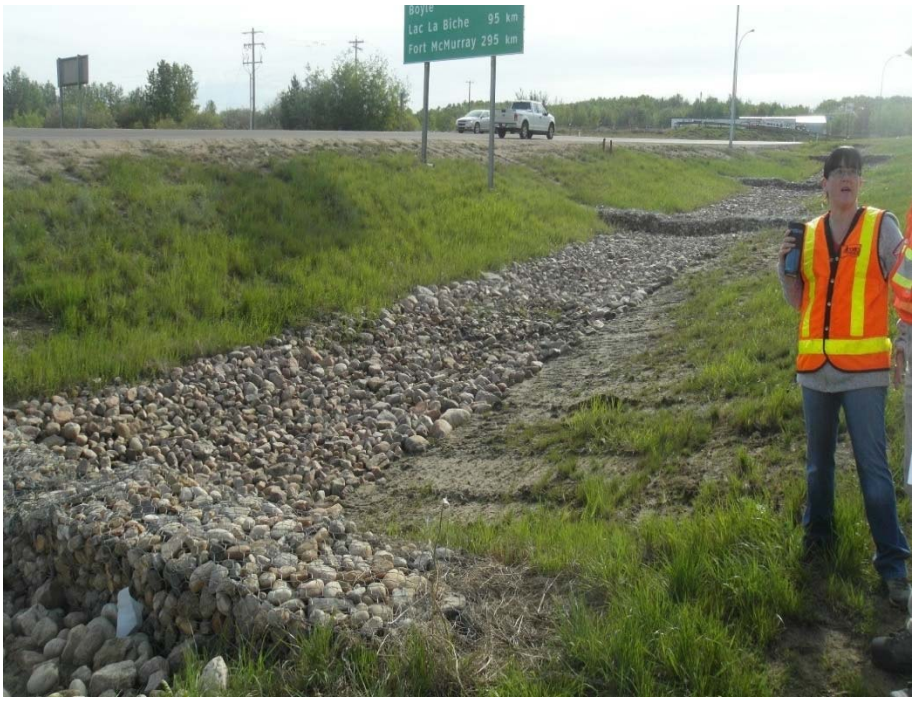
	**Photo 3.** Hwy 55 South Ditch: Looking west at the west end of an existing riprap channel located between G2 and G3. Bare side slope to the south of the channel; the channel needs to be reshaped and riprap should be extended at least 2 m along the side slopes of the ditch
	**Photo 4.** Hwy 55 South Ditch: Looking east at an existing riprap channel located between G3 and G4. Note the existence of bare vegetation to the south of the channel; channel needs to be reshaped and riprap should be extended at least 2 m along the side slopes of the ditch

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	**Photo 5.** Hwy 55 South Ditch: Looking west at new riprap placed by AT between G4 and G5. Riprap should be extended at least 2 m along the side slopes of the ditch
	**Photo 6.** Hwy 55 South Ditch: Looking north at scattered riprap immediately to the west of G4 and erosion rills on the highway side slope; the ditch bottom should be reshaped and additional riprap should be placed at this location

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	**Photo 7.** Looking northwest at the existing Class 1 M Riprap lined swale extending from the end of the concrete curb and gutter along the north edge of 50 Avenue to the south ditch of Hwy 55; note the presence of bare ground around the swale and areas bare or riprap within the swale.
	**Photo 8.** Looking southeast at G10 and the outlets of the storm water pipes; note the absence of vegetation in this area and signs of erosion at the outlets of the pipes

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	**Photo 9.** Hwy 55 south ditch: looking west at the ditch between G10 and G11; the ditch bottom is bare of vegetation and signs of erosion were noted in this area
	**Photo 10.** Hwy 55 south ditch: looking west at shallow erosion gully between G 12 and the spill containment ditch block

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	**Photo 11.** Looking east at a bare sandy slope on the south side slope of Hwy 55
	**Photo 12.** Highway 55 south ditch: Bare ground between the spill block and the Manhole; additional riprap is required at this location

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	**Photo 13.** Looking west at the northwest corner of the intersection of Hwy 55 and 813. Existing guardrail was repaired by AT in September 2015; vegetation appears to be scarce in this area
	**Photo 14.** Looking south at deep erosion gullies developed within northwest side slopes of the bridge east approach fill

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	**Photo 15.** Highway 55 north ditch: Looking east at bare ground surface and signs of erosion at the NE corner of the intersection of Hwy 813 and Hwy 55
	**Photo 16.** Hwy 55 North Ditch: Looking north at outlet of the Spill containment ditch block CSP pipe; note the presence of erosion rills and bare vegetation in the slopes; additional riprap should be placed between the CSP pipe and the manhole

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Photo 17.
Hwy 55 North Ditch: Erosion gully between G2 and G3

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Photo 18.
Hwy 55 North Ditch: Erosion gully between G3 and G4

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Photo 19.
Hwy 55 North Ditch: Erosion gully between G4 and G5

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Photo 20.
Hwy 55 North Ditch: G14 damaged wire mesh

Photo 21.
Hwy 55 North Ditch: looking west from the west side slope of 43 Street. Bare ground surface between west side slope of 43 St and G31 and between G30 and G31; sediment accumulated in the ditch behind the gabion baskets; ditch bottom should be cleaned of the built up sediment and riprap should be placed in these areas to reduce future erosion issues.