ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)
2024 INSPECTION

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
PH024	11 km W. Cleardale	Clear River East Hill-(Old Site 8)	64:02	24.2-25.5
Legal Description		**UTM Co-ordinates (NAD 83)**		
NE27/SE34-84-11-W6		11 N 6244830 E 336445		

	Date	PF	CF	Total
Previous Inspection:	May 31, 2023	9	4	36 (Risk Eros. Scale)
Current Inspection:	May 8, 2024	9	4	36 (Risk Eros. Scale)
Road AADT:	560		**Year:**	2023
Inspected By:	Don Proudfoot, Nicole Wilder (Thurber). Rocky Wang, Robert Senior (TEC)			
Report Attachments	☒ Photographs ☒ Plans ☐ Maintenance Items			

Primary Site Issue:	Erosion of the highway south ditch and embankment shoulder (took place in 2013, 2018, 2019, and again in 2020). It was caused by water backup/release overtop of the undersized 1200 mm CSP culvert inlet which had also iced up and was unable to handle all of the flow northwards beneath the highway from the spring melt. Also, some gabion drop structure erosion along the north ditch channel.		
Dimensions:	South embankment/ditch/channel erosion ~900m long x <7m wide x <2m deep; North gabion erosion ~50m long x 20m wide x 5m deep.		
Date of any remediation:	1979 - North ditch gabion liner at select locations, channel shaping. 2008 - Slide excavation/subdrains/recompaction, erosion repair, drainage re-routing, 1200 CSP repair/extension, embankment fill and backslope flattening. 2020 - MC performed culvert maintenance, excavated out the south hwy embankment & loose ditch erosion material, and lined the south ditch/embankment with 6-80 gravel along the upper ~7% reach, Class 2 riprap along the middle ~9% reach, and left the lower reach unlined west of the 760 mm SWSP cross culvert.		
Maintenance:	August 2008 - Asphalt overlay. 2013, 2018 - Pitrun placed to infill major erosion locations along the south highway embankment immediately after the spring flow events. 2016 - WB lane ACP patch adjacent to Slope Inclinometer 08-1. 2017 (Fall) - Chip seal. 2019 – Excavated south ditch erosion and backfilled with pitrun covered by TRM.	**Worsened?**	
Observations:	**Description**	**Yes**	**No**
☒ Pavement Distress	A 3m long crack observed in the WB shoulder directly below the creeping north backslope area at the east end of the site. Some erosion and undermining of the south (eastbound) shoulder, with a few cracks and vertical drop off along the edge of paved shoulder (repaired most recently in 2020).	☐	☒
☒ Slope Movement	Along the toe (~10 m high) of the natural south valley slope near the 1200 CSP inlet area due to softening from saturation and rapid drawdown. Also, creep movement in	☒	☐

	the north backslope area at the east end of the site. Also, a 10m wide x 3m high slump in the south ditch backslope.		
☒ Erosion	The ditch along the south highway embankment became severely eroded from the spring, 2020 and 2019 flows, incising through the pitrun gravel placed in 2018 and 2019, which was carried down-gradient and deposited near the west end of the site (ditch/embankment were repaired in 2020). This erosion extended southwards into the bush due to the over-flow water along the south ditch. There was retrogressive slumping around two of the north ditch gabion drop structures (50 m long, across and upstream of the 760 mm dia. cross culvert outlet) that were completely destroyed from previous flood events. Below the outlet of the 760 mm dia. SWSP (where riprap was added in 2020), a gully has formed along the west edge of the riprap and joined the gully around the gabion drop structure. 1 m deep scour holes across the north ditch channel exist (1 about midway between the 760 mm dia. and 810 mm dia. culvert outlets, and another below the 760 mm outlet). Rilling outside the guardrail along the north highway embankment edge over a length of ~100 m, due to excess sanding gravel build-up (east half was graded in 2020, west half remains).	☒	☐
☒ Seepage	From former/existing subdrains in south ditch and Lookout slide.	☐	☒
☒Bridge/Culvert Distress	The 1200 mm dia. culvert outlet has a slight oval shape beneath the settled area located behind the outlet riprap. The 810 CSP cross-culvert that was ½ full of sediment was flushed/cleaned in 2020. The pitrun covered inlet and outlet areas of the 760 mm dia. SWSP cross-culvert were flushed/cleaned and the pitrun removed in 2020.	☐	☒
☐ Other		☐	☐

Instrumentation:

Inclinometer SI08-1, last read June 4, 2011 – No discernable movement since the fall of 2009.

Assessment (Refer to Figures PH024-1-1, -2, & -3)**:**

A surge of meltwater occurred during spring thaw in 2013 along the channel leading to the south embankment near the east end of this site, at the entrance of the 1200 mm dia. CSP culvert that drains northwards beneath the highway. It was likely joined by highway ditch runoff meltwater further east, which also drains down along the south embankment and outlets in front of the 1200 mm inlet via the 900 mm dia. SWSP. The volume of water was greater than the culvert could handle (it is also likely that ice was also restricting the culvert), causing the water to back up overtop the inlet/headwall. It backed up high enough (10 to 12 m of head) that the water flowed westwards along the toe of the south embankment, then along the south highway ditch, and finally southwest away from the highway through the bush (it was documented to have subsided by the next morning). In addition to eroding soil, it eroded the erosion control soil covers, and some of the buried subdrain that was installed in the south ditch in 2008. This scenario was forecast as part of the 2007 design measures, prior to the 2008 construction, where the culvert was estimated to only handle a 1 in 5-year design flood peak, which would result in a build-up of water for events greater than 1 in 5 years. Similar occurrences took place during the spring flow events in 2018, again between April 1 to 3, 2019, and again in 2020. Ice build-up at the inlet of the CSP culvert was documented by the maintenance contractor LaPrairie as a cause of the 2019 event. There was no backed up overflow into the south ditch in 2022 to 2024 inclusive (LaPrairie cleared a bit

of snow/ice prior to spring break-up 2022). In 2024, ice was build up over the riprap leading to the 1200 CSP, and the outlet end of the 900 mm drop pipe was almost full of ice also (possibly blocked by valley ice/snow build-up).

The pitrun gravel that was used to fill 2018's erosion event was eroded and washed downslope, filling the south ditch near the west end, and water also ran overtop the highway and down the north embankment at one location. LaPrairie used a backhoe to dig part of the ditch out and swept the excess pitrun off the road. Similar south ditch erosion occurred in spring, 2020 after the 2019 installation of pitrun with TRM cover. As shown on Drawings PH024-1-2 and -3, the 2020 repairs involved grading the south embankment with 6-80 gravel, and installing a south ditch liner consisting of: 6-80 gravel over a 130 m upper channel length where the average gradient was ~7 percent; then installing Class 2 riprap along the center portion of this channel over a 110 m length extending up to the 760 mm SWSP culvert where the gradient was ~9 percent, as shown on Section D-D'; and then left the lower ditch bottom unlined west of the 760 SWSP (where a modest ditch block was constructed), as shown on Section C-C'. The 9 percent gradient is likely too steep, and flood surge flows too large, for the prior ditch liner repair attempts consisting only of 6-80 (pitrun) gravel. with the subsequent Class 2 riprap lining appears to be performing well to date.

The 810 mm diameter culvert had been half full of sediment for several years. This culvert appears to have been originally installed to bring water from the south ditch across to the north side of the highway for discharge via the 1.04 m dia. SWSP centreline pipe down into the dissipation pool on the south side of the highway. It appeared that this pipe had not been allowing flow to the north side either due to lack of maintenance or after it was purposely blocked. This culvert was cleaned out in 2020, and the inlet was formed with a riprap covered inlet bowl and a downstream ditch block that grades downwards to the south which would appear to let flood water overflow to the west through the bush if this culvert backs up flow.

The backed-up water from the flood surges nearer the inlet of the 1200 mm dia. culvert saturated the native soil along the toe of the natural valley slope and combined with toe erosion from flowing water and a likely sudden drawdown scenario, caused toe slumping of the natural tree covered slope. This has gotten worse the last few years but is not currently affecting the functionality of the site, although some slide debris was observed beyond the toe of the slope in recent years.

On the north side of the highway, the 1200 mm dia. CSP flowing full was also likely combined with runoff from the area/slopes to the north, which caused damage to two of the steeper sloping gabion lined channel sections further west and created a scour hole in the channel further west of this. The channel was overgrown with willows which reduced the flow capacity causing water to flow around and erode the sides of the gabion structure, and is creating a wetland adjacent to the channel (Photo 13). Conversely, the willows at some locations may provide some protection against lateral bank erosion. In the 2013 event, there was also an erosion scour around the outlet of the 760 mm dia. SWSP in the north ditch, resulting from runoff originating from the south ditch flowing beneath the highway, which may have also contributed to the large erosion feature around the gabions immediately west (downslope) of this outlet. Both the inlet and outlet of this pipe were covered with pitrun in 2019, but this culvert was flushed/cleaned in 2020. A runoff gully has since formed beyond this culvert outlet and joined the gully that exists around the channel gabion.

In 2023 it was also indicated by TEC that it is planned to bore another cross-culvert across the hwy (between the existing 1200 mm CSP culvert inlet and the present gravel lined south ditch), and then line the remaining segment with riprap west of this up to the current Class 2 riprap liner, to help pass more spring flood surge flows from the south ditch over to the north side of the hwy. However, this had not been done yet as of the 2024 inspection.

Recommendations: **Cost**

Maintenance:

The highway side of the south ditch erosion was backfilled with pitrun gravel in 2013 (~400 m^3), in 2018, in 2019, and again in 2020 as emergency measures to re-establish the eroded/undermined highway embankment. Additional gravel should be placed as required against the edge of asphalt to buttress the pavement and maintain hazard-free traffic safety.

The 1200 mm dia. CSP inlet should be inspected and steamed each spring (if required) to remove ice build-up with a backhoe and establish unrestricted flow. We recommend that this late winter/early spring check and steaming be formally added to the maintenance contractor's annual maintenance work requirements (as was done in 2022, which may have prevented an overflow). **$5,000 annually**

Some of the rilling erosion near the north hwy embankment guardrail had been graded/smoothened. Repair the remaining rill erosion outside the north edge of the guardrail and along the edge of the eroded ACP north shoulder (Photo 10), by first grading the existing surface, then adding/track-packing/shaping with a few loads of gravel infill, and then covering with topsoil and TRM. **$5,000**

Grade/shape the downstream banks of the ditch blocks at the inlets of the 760mm SWSP and the 810mm CSP, and then add some Class 2 riprap over non-woven geotextile to induce more flow into these culverts. **$5,000**

The heavy willow growth in the areas where the gabion drop structures were eroded by high flows seem to be gradually reaching a level of equilibrium with the flows in the tributary channel by providing a natural liner against lateral erosion of the channel. A few more years of monitoring are recommended to assess whether further remedial measures are required at these locations.

Clean out future slide toe debris accumulations from in front of the 1200 culvert inlet area, and along the south ditch, if required.

The 75 m long erosion channel and scour bowl along the south edge of the overflow area where it approaches the south hwy ditch will likely become worse during the next culvert back-up and south ditch overflow scenario. This gully should be cleaned of loose debris, and backfilled with clay in thin lifts compacted to 95% of SPMDD.

Short Term:

The main 1200 mm dia. CSP should be inspected with a camera inserted along the pipe to see if it is restricted or damaged in any way, or if the joints are compromised, which could lead to water leaking out and creating erosion around the outside of the pipe. To prevent future icing of the culvert inlet, perhaps a permanent heat system consisting of heat wires inside small metal tubing attached to the inside of the culvert inlet over a 10 m length and powered by a solar cell mounted on a post with a battery backup could be employed. The post/assembly would have to be high enough to be above the flood level in order to be effective to ice build-up however.

$100,000

As a minimum, the ~330 m long segment of the currently unlined south ditch bottom extending west of the riprap lined segment up to the 810 CSP culvert, should be topsoiled, seeded, and covered with TRM. **$15,000**

The erosion gully between the outlet of the recently opened 760 mm diameter SWSP and north channel (Photo 14) should be repaired by grading a trapezoidal channel and lining it with Class 1 riprap over non-woven geotextile.

Ballpark Cost $25,000

Medium Term:

Future erosion along the toe of the south highway embankment and ditch is still a potential threat to the highway and although some repairs were performed in 2020, supplementary repairs might still be needed. A Class 2 riprap south ditch bottom segment ~110 m long was installed in 2020, but a hard armour liner (such as riprap or gabion mattress) should extend over the entire ditch that has a ~9 % gradient (to the 810 CSP inlet at the west end) and may also need to be extended further east over the present 130 m long ~7% gravelled ditch segment (also installed in 2020).

Ballpark Cost $400,000

The 150 m length of the south ditch away from the highway in the bush near the west end, should also be repaired. Even if the now cleaned and flushed 810 mm and 760 mm diameter centreline culverts (and a proposed new centerline bore, discussed below) take some flow to the north and then through the 1.04

SWSP beneath the hwy, there may still be some flow extending down the south bank through this eroded area. A more durable fix for this section would be to **a)** infill the eroded areas with clay compacted in thin lifts using a sheepsfoot compactor, grading the surface and then covering it with gabion mattress all the way down to the stilling pool.

Ballpark Cost $200,000

Or alternatively,

b) A cheaper stop gap approach for the 150 m length away from the highway would be to fill the eroded areas with Class 1 riprap placed over non-woven geotextile in the upper slope area and construct a riprap lined drop structure on the lower 20^0 slope above the 1040 mm SWSP outlet (1.9 m headscarp area) to dissipate flows upslope of the stilling basin.

Ballpark Cost $100,000

Long Term

As mentioned in the assessment section of this report, TEC is planning to bore another cross-culvert across the hwy (somewhere between the existing 1200 mm CSP culvert inlet and the present gravel lined south ditch), and then line the remaining segment with riprap west of this up to the current Class 2 riprap liner, to help pass more spring flood surge flows from the south ditch over to the north side of the hwy (assumed 200 m long x <10 m deep). If this longer term repair is completed it would replace some of the medium term work.

Ballpark Cost $750,000

CLOSURE

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

Don Proudfoot, P.Eng.
Principal | Senior Geotechnical Engineer

PROFESSIONAL ENGINEER ALBERTA
BARRY MEAYS
ID 68826

September 24, 2024

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE:
RM APEGA ID #: 51674
DATE: September 26, 2024
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Barry Meays, P.Eng.
Senior Geotechnical Engineer

THURBER

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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 in order to confirm and document that the site conditions do not materially differ from those interpreted 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.

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1.3m DROP OFF AT HEADSCARP

FAILED GABION; VERY THICK WILLOW AND POPLAR GROWTH, TREES TILTED AND BASKETS DISTURBED. BOTTOM QUARTER HAS SPLIT OPEN, ERODING DOWN CENTER AND OUTSIDE OF MATS

17

WILLOWS GROWING IN CHANNEL

16

SUBDRAIN OUTLET OF LOOKOUT SLIDE

~7.3:1

760mm Ø SWSP CULVERT OUTLET, RIPRAP ADDED BELOW OUTLET. NOW FLOW HAS ERODED A GULLY THAT CONNECTS TO THE EROSION GULLY AROUND THE FAILED DROP STRUCTURE

50m LONG x 5m DEEP x 20m WIDE EROSION WASHED OUT GABION DROP STRUCTURES COMPLETELY DESTROYED BY SPRING, 2018 RUNOFF
LARGE 1.5m DEEP EROSION SCOUR HOLE & WATER FALL GOT MUCHWORSE- NEEDS EROSION PROTECTION. SIGNIFICANT HEAD EROSION AND ENLARGEMENTS OF EROSION GULLY FLANKS (SAME - STRUCTURE FAILED)

14

15

EROSION

RIPRAP

E'

A

E

A'

EQUIPMENT RUTS; WETLAND DEVELOPING, SEDIMENT ACCUMULATED IN ORIGINAL CHANNEL & DIVERTING WATER INTO THIS AREA

SCOUR HOLE & CLUMPS OF WILLOWS OBSTRUCTING THE GABIONS;

SOUTH DITCH CHANNEL (~9%) LINED WITH CLASS 2 RIPRAP (SAME IN 2024)

SOUTH DITCH CH
LINED WITH 6-
SLIGHT EROSIO

UNLINED DITCH WEST OF 760m (SAME IN 2024)

SOME TEARING OF GABION BASKETS & SHOVING OF ROCKS (BUT HAS CREATED SMALL STEPS IN GABION MAT THAT DISSIPATES FLOW ENERGY) (SAME)

3

760mm CULVERT CLEANED OUT BY MAINTENANCE CONTRACTOR AND DITCH BLOCK ADDED ALONG WEST SIDE IN 2020

2

810mm Ø CSP OUTLET IN GOOD SHAPE, (TRACE OF FLOW THROUGH CULVERT DURING 2024 INSPECTION)

PONDED WATER

12

13

CHANNEL GRASSED OVER

1.04m Ø SWSP INLET (IN GOOD SHAPE WITH A BIT OF SCOUR)

11

SOME EROSION

HIGHWAY 64:02

FENCE

DITCH BLOCK

12m WIDE x 3m HIGH SLUMP ON SOUTH DITCH SIDESLOPE (SAME)

810mm CULVERT CLEANED OUT BY MAINTENANCE CONTRACTOR IN 2020

1

DITCH BLOCK ON WESTSIDE RIPRAPPED, & GRADED TO ALLOW OVER FLOW ON SOUTH END (IN GOOD SHAPE IN 2024)

B

SLUMP EROSION 1.2m DEEP x <10m WIDE x12m LONG (SCARP 6.7m FROM GUARDRAIL). (UNCHANGED 2024) GRASSED OVER

CULVERT GROUT PIPE

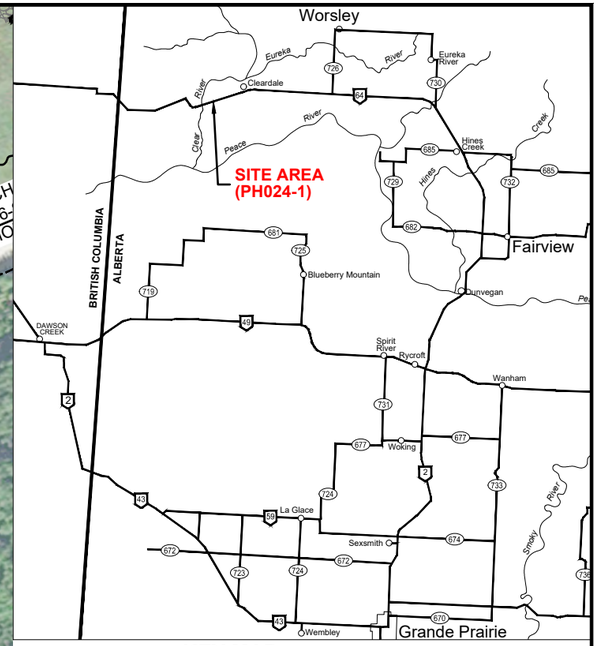
SCOUR BOWLS

RIP RAP SETTLING POND

B'

1.04m Ø SWSP OUTLET, WITH EROSION ON CROWN

SLUMP



KEY MAP - SCALE 1:1,500,000

LEGEND :

- PHOTO & DIRECTION
- SLOPE INCLINOMETERS
- SLIDE SCARP
- EROSION RILL

NOTE:

1. MAY 8, 2024 OBSERVATIONS SHOWN IN RED

0 25 50 75 100 125 150m

SCALE 1:2500

SATELLITE IMAGE FROM ESRI WORLD IMAGERY (DOWNLOADED 2019-06-17)

Alberta

PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)
PH024: HWY 64:02 CLEAR RIVER EAST HILL SLIDE

PH024 INSPECTION

FIGURE PH024-1

DRAWN BY	ML
DESIGNED BY	BDM
APPROVED BY	DWP
SCALE	1:2500
DATE	MAY 8, 2024
FILE No.	32123

THURBER ENGINEERING LTD.

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N
W
E
S

30mm TO 60mm DEEP RUTTING IN EASTBOUND LANE

~3.9:1
~4:1
~4.6:1
~4.2:1
~4.6:1
~4.5:1
~4.8:1
~4.4:1
~4.5:1
~4.6:1
~6.7:1
~6.7:1
~5.4:1
~5.5:1
~6.8:1
~6.7:1
~5.6:1
~7.3:1
~5.5:1

0.23m GABION DITCH LINERS (GOOD SHAPE)

2.2m HIGH SCARP (STILL VISIBLE FROM HIGHWAY)

SCARP CRACK - 0.8 TO 0.4m HIGH SCARP

CRACK AND SUBSIDENCE EXTENDS 17m BACK FROM THE TOP CROWN EDGE OF CULVERT, AND IS 6m WIDE (OVERGROWN WITH VEGETATION)

CULVERT PIPE SLIGHTLY OVAL SHAPED (SAME)

PERMANENT RECP (TRM)

TREE LINE

EROSION RILLING STILL EXISTING 0.5m WIDE X 0.4m DEEP

HIGHWAY 64:02

900mm SWSP INV. 590.667 (GOOD SHAPE)

3m LONG CRACK IN (SAME) WESTBOUND SHOULDER

OUTLET AREA LINED WITH 0.5m GABIONS SURROUNDED BY RIPRAP GABION MATRESS WIRE TORN OVER 3m LONG (SAME)

SMALL SINK HOLE AT 14m FROM END OF CULVERT

AS-BUILT TIE IN 1200mm CSP INVERT 541.75m

AS-BUILT TIE IN 1200mm CSP INVERT 642.495m

CHANNEL LINED WITH 0.3m GABION MATTRESS

RIPRAP

CRACKS IN PAVEMENT (10m LONG NORTH & 20m LONG SOUTH)

RILLS (SAME)

EAST END OF GUARDRAIL

900 Ø SWSP OUTLET INV ELEV 556.088 m

900mm DROP PIPE GABION OUTLET STRUCTURE (ALMOST FULL OF ICE)

WILLOWS GROWING IN CHANNEL

SLIGHT EROSION ALONGSIDE EAST EDGE OF CULVERT HEADWALL (SAME)

SOME SLOUGHING ALONG NORTH SIDE OF RIPRAP

1200 CSP INLET INV. 554.107 AT HEADWALL

CLASS 2 RIPRAP APRON (UNDER ICE)

FILTERSOXX

SI08-1

~DITCH GRADE BREAK POINT

1200 CSP OUTLET INV. 540.564

1m Ø SINKHOLE (~0.3m DEEP)

ACP PATCH IN WESTBOUND LANE (2017)

AS-BUILT TIE IN 1200mm CSP INVERT 552.1m

SLIGHT EROSION ALONGSIDE WEST EDGE OF LOWER GABION BASKET (SAME)

SUBDRAIN OUTLET OF LOOKOUT SLIDE

6%

SOUTH DITCH CHANNEL(~7%) LINED WITH 6-80 GRAVEL SLIGHT EROSION (SAME IN 2024)

EROSION <1.3m DEEP x ~3.0m WIDE AGAINST BUSH LINE (SAME)

1.3m DROP OFF AT HEADSCARP (WORSE)

EROSION FORMED A SCOUR BOWL < 1.8m DEEP x 4m WIDE AGAINST BUSHLINE; (DRY IN 2024)

PERMANENT RECP (TRM)

ICE BUILT UP

PONDED WATER

SOUTH DITCH CHANNEL (~9%) LINED WITH CLASS 2 RIPRAP (SAME IN 2024)

3m LONG CRACK ON CENTERLINE. SAME AS DURING 2009 CALLOUT.

SLIDE IN TREE COVERED RIVER BANK EXTENDS ~30m UP BACKSLOPE FACE
-TREES BENDING & SLIDING DOWNSLOPE WITH SOIL
- BACKSLOPE SLID DOWN FURTHER
- RAPID DRAWDOWN FAILURE FROM SPRING 2019 AND 2020 RUNOFF FLOOD EVENTS

SPRING OR SEEPAGE ENTERING DITCH FROM BACKSLOPE OR FROM DITCH BOTTOM (SAME, BUT DITCH WET)

150mm Ø CSP SUBDRAIN EROSION WASHED OUT 2008 SUBDRAIN PIPE

LEGEND :

- ① PHOTO & DIRECTION
- SLOPE INCLINOMETERS
- SLIDE SCARP
- EROSION RILL

NOTE:

1. MAY 8, 2024 OBSERVATIONS SHOWN IN RED

0 25 50 75 100 125 150m
SCALE 1:2500

SATELLITE IMAGE FROM ESRI WORLD IMAGERY (DOWNLOADED 2019-06-17)

Alberta

PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)
PH024: HWY 64:02 CLEAR RIVER EAST HILL SLIDE

PH024 INSPECTION

FIGURE PH024-2

DRAWN BY	ML
DESIGNED BY	BDM
APPROVED BY	DWP
SCALE	1:2500
DATE	MAY 8, 2024
FILE No.	32123

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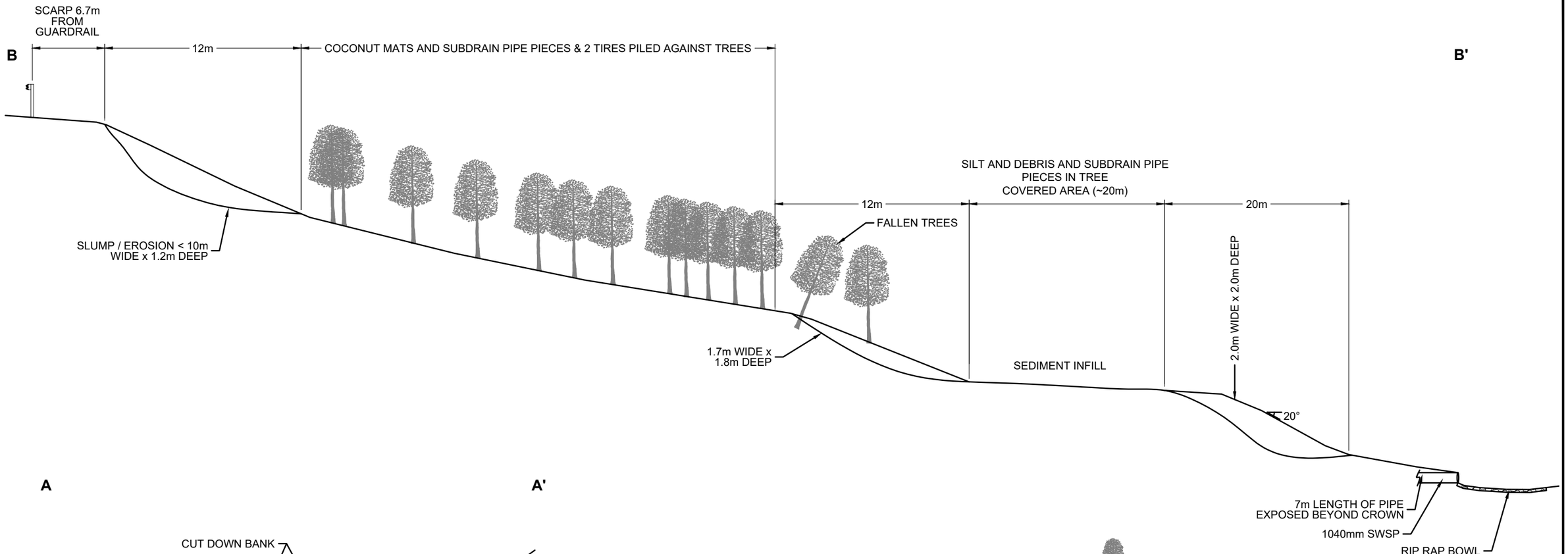
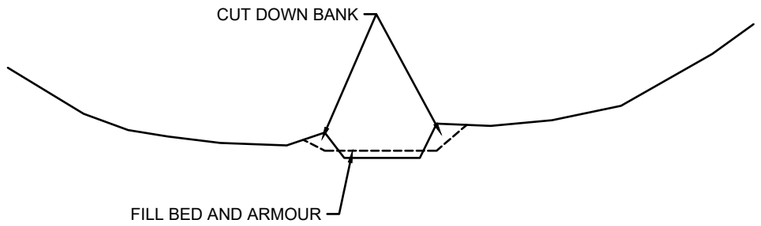
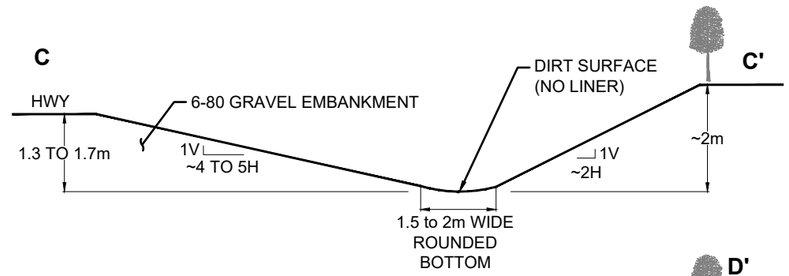
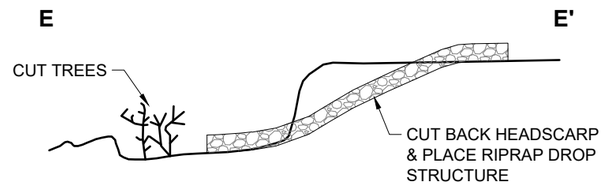
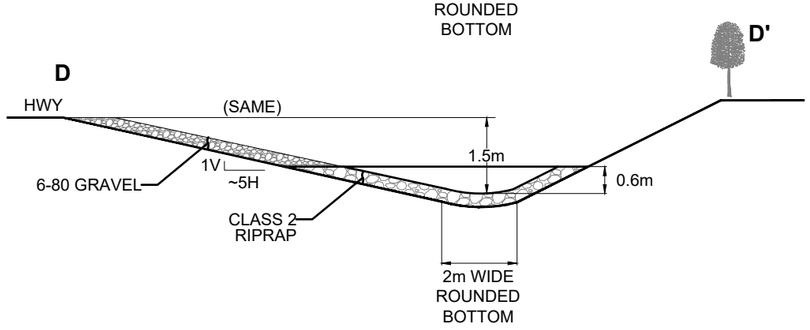




RE-CONSTRUCT DROP STRUCTURE AT DOWNSTREAM END







NOTE :
1. MAY 8, 2024 OBSERVATIONS SHOWN IN RED

Alberta

PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH)
PH024: HWY 64:02 CLEAR RIVER EAST HILL SLIDE

PH024 CROSS-SECTIONS A-A' & B-B'

FIGURE PH024-3

DRAWN BY	ML
DESIGNED BY	BDM
APPROVED BY	DWP
SCALE	N.T.S.
DATE	MAY 8, 2024
FILE No.	32123

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Photo 1 – Looking east along the south ditch at the ditch block and inlet of the 810 CSP on the south side of the hwy embankment.

Photo 2 - Looking west along the unlined south highway ditch from the inlet of the 760 mm dia. SWSP.

Photo 3 – Looking east from near the ditch block along the riprapped south ditch channel from just upslope of the inlet of the 760 mm dia. SWSP.

Photo 4 – Looking west along the south ditch channel and hwy embankment that was lined with 6-80 gravel.

Photo 5 – Looking west at the erosion that formed in 2020 along the boundary of the south embankment fill and the bush line.

Photo 6 - Looking northwest at the 1200 CSP inlet headwall. Note the ice build-up in the channel in front of the culvert.

Photo 7 – Looking north at the 900 SWSP outlet and gabion outlet structure. There was significant ice inside this pipe this year.

Photo 8 – Looking south at the valley slope slumping above the 1200 culvert inlet and gabion outlet area, caused by rapid drawdown of built-up floodwater.

Photo 9 – Looking east along the south gabion-lined ditch from the north 900 mm SWSP entrance.

Photo 10 – Looking east at the rilling adjacent to the north guardrail (just west of the repaired rilling on the north embankment).

Photo 11 - Looking southwest at the 1040 SWSP inlet, at the west end of the north ditch channel.

Photo 12 - Looking west (downstream) along the north ditch channel upstream of the 810 CSP outlet. Note the gabions are still intact here.

Photo 13 – Looking east (upstream) along the north ditch channel (downstream of the 760 SWSP outlet), at the area where flow has bypassed the sediment-filled channel and is creating a wetland south of the channel.

Photo 14 - Looking southeast at the 760 mm SWSP outlet. Note the fresh erosion and associated slumping inside the channel.

Photo 15 – Looking west (downstream) at the erosion just upstream of the 760 SWSP outlet.

Photo 16 - Looking west at the erosion in the north ditch channel at the completely eroded gabion liner between the 760 SWSP and 1200 CSP outlets.

Photo 17 - Looking east at the 1200 CSP outlet area in the north channel. Note the damaged gabions.

Photo 18 – Looking west at the 1200 culvert outlet area. Note the old subsidence behind the riprap.