**ALBERTA TRANSPORTATION**
**GEOHAZARD ASSESSMENT PROGRAM**
**PEACE REGION – SWAN HILLS**
**2020 INSPECTION**

THURBER ENGINEERING LTD.

| Site Number | Location | Name | Hwy | km |
|---|---|---|---|---|
| SH024-12<br>SH024-12B*<br>SH024-12A*<br>SH024-12D** | Little Smoky River | Little Smoky River Valley, North Hill – Sites #12, #12B, #12A, and #12D | 744:02 | 20.80-20.90<br>20.94-21.03<br>21.03-21.12<br>21.17-21.30 |

| Legal Description | UTM Co-ordinates | | | |
|---|---|---|---|---|
| Site 12: NE21-76-22-W5M | 11U | E 478,432 | N | 6,162,375 |
| Site 12B: NE21-76-22-W5M | 11U | E 478,472 | N | 6,162,492 |
| Site 12A: NE21-76-22-W5M | 11U | E 478,504 | N | 6,162,588 |
| Site 12D: NE21- and SE28-76-22-W5M | 11U | E 478,550 | N | 6,162,737 |

| | Date | PF | CF | Total |
|---|---|---|---|---|
| **Previous Inspection:** | 12-Jun-2019 | 9 | 3 | 27 |
| **Current Inspection:** | 3-Jun-2020 | 9 | 3 | 27 |
| **Road AADT:** | 240 | | **Year:** | 2020 |
| **Inspected By:** | Rocky Wang, TRANS | | Ken Froese, Thurber | |
| **Report Attachments:** | ☑ Photographs<br>☑ Plans | | ☐ Maintenance Items | |

| | | |
|---|---|---|
| **Primary Site Issue:** | Highway traverses deep-seated, retrogressive landslides with ongoing creep movements due partly to erosion at toe by the Little Smoky River and Peavine Creek resulting in cracking and sagging of the pavement surface at numerous locations. Approx. 4 km of the highway crosses this unstable north valley slope. These Sites are 55 m to 60 m above and 375 m to 475 m away from the Peavine Creek. | |
| **Dimensions:** | Site 12: 95 m length of highway affected by cracking and guardrail distortion.<br>Site 12B: 65 m length of highway with cracking.<br>Site 12A: 90 m length of highway with cracking.<br>* In 2016, a review of historical documentation for this Site determined that Site #12C should be #12B (south portion) and #12A (north portion).<br>** Site #12D not assessed since 2015. | |
| **Date of Remediation:** | 2002: Site #12A subexcavated and reconstructed with pitrun gravel with 2 m high toe berm, subdrain installation, and culvert extension.<br>2003: Site #12A: culvert lined with 762 mm smooth-wall steel<br>2004: Site #12 subexcavated and replaced with pitrun gravel with clay toe berm and subdrain; west ditch erosion also repaired. | |
| **Maintenance:** | Routine ACP crack sealing, milling, and patching, when required.<br>2019: Milling over most of the sites<br>2020: Line painting | |
| **Observations (Site 12):** | **Description** | **Worsened?** |
| ☑ Pavement Distress | Vertical distortion over historical scarp crack and associated cracking. | ☑ |
| ☑ Slope Movement | Site is located on an active deep-seated landslide moving toward the Peavine Creek. There is vertical and horizontal distortion of the guardrail. | ☑ |

| | | |
|---|---|---|
| ☐ Erosion | | ☐ |
| ☐ Seepage | | ☐ |
| ☐ Bridge/Culvert Distress | | ☐ |
| ☐ Other | | ☐ |
| **Observations (Site 12B):** | **Description** | **Worsened?** |
| ☑ Pavement Distress | Scarp crack visible through patching. | ☑ |
| ☑ Slope Movement | Site is located on an active deep-seated landslide moving toward the Peavine Creek. | ☑ |
| ☐ Erosion | | ☐ |
| ☐ Seepage | | ☐ |
| ☐ Bridge/Culvert Distress | | ☐ |
| ☐ Other | | ☐ |
| **Observations (Site 12A):** | **Description** | **Worsened?** |
| ☑ Pavement Distress | Some longitudinal and traverse cracking which may not be related to slope movement. | ☑ |
| ☑ Slope Movement | Site is located on an active deep-seated landslide moving toward the Peavine Creek. The toe berm appears to be functioning to stabilize the local embankment. | ☐ |
| ☑ Erosion | Minor erosion along grassed-lined channel at culvert outlet (km 21.081). | ☐ |
| ☐ Seepage | | ☐ |
| ☑ Bridge/Culvert Distress | Culvert at km 21.081: outlet of SWSP liner is rusting. | ☐ |
| ☐ Other | | ☐ |

**Instrumentation:**

None.

**Assessment:**

The overall valley slope is moving as several separate slide blocks in response to the toe erosion and downcutting of two different rivers resulting in numerous scarps, sag ponds, and differential movement zones going in slightly different directions. The highway intersects the scarps of these blocks at several locations resulting in an uneven highway surface and cracking.

Site 12:
The main slide scarp crack was visible at the Township Road 764 (TR764) intersection and the site required milling in 2019 to remove the growing vertical differential. The main crack was also patched afterward. The vertical differential and crack development continued to deteriorate despite the recent maintenance. In 2020, there appeared to be a slight sag in the highway surface just south of the TR764 intersection. The south 2/3's of the guardrail appears to be leaning downslope and vertical deflection of the rail was noted across from the TR764 intersection. Overall, the toe berm appears to be functioning to stabilize the highway fill embankment; however, it is not conclusive if the pavement cracking and guardrail deformation is related to the local or global slope movements. A potential scarp

feature was identified on the sideslope of the highway embankment just north of the toe berm but was not apparent in 2020.

Site 12B:
This site, an area of additional cracking between the two toe berms at Site #12 and Site #12A, was discontinued from the GeoHazard Assessment program in 2007. At the time of the 2016 inspection, there appeared to be a long crack roughly parallel to the highway that may be associated with slope movement and the width and extents of cracking have increased slightly each year following. The recent milling appears to have exposed previously-covered cracks and there does appear to be an arc-shape to the pattern. The crack widths are on the order of 10 mm to 20 mm with some areas up to 30 mm. Some of the cracks are braided with overall widths up to 500 mm and at least had a slight dip over the width of the braided cracks.

Site 12A:
There is some longitudinal and transverse cracking along the highway above the toe berm; however, it was not apparent if this was related to subgrade issues or slope movement. The site was milled in 2019 which has exposed additional cracks. There was continued deterioration observed in 2020. Two zones of seepage were noted in the downslope ditch which may be subdrain outlets It appears that the toe berm has been successful in stabilizing the local highway embankment at this location.

**Recommendations:**

Short-Term:
- Road maintenance should continue as necessary to maintain a safe roadway surface and may consist of milling, patching, and crack sealing of the ACP.

Long-Term:
It is understood that, at this time, the only long-term remediation option under consideration is realignment of the entire north hill section of Highway 744. However, given the high cost of this option and as it is a low volume highway, it is unlikely that realignment will be undertaken in the near future. Consideration is also being given to a shorter realignment which would include Site #12 and potentially a portion of Site #12B. Site #12A would not be included in this shorter realignment option.

Ongoing Investigation:
- It is recommended that the annual GeoHazard inspection should continue as scheduled.

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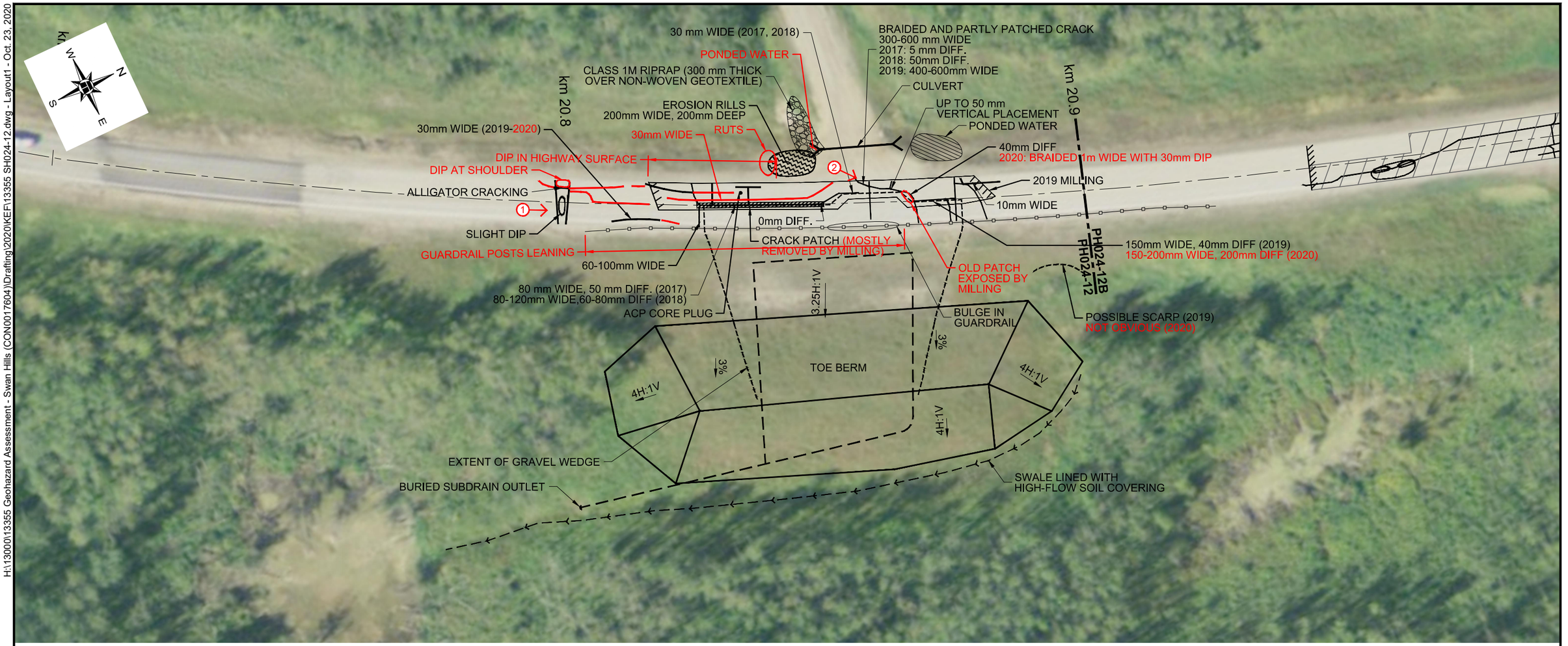
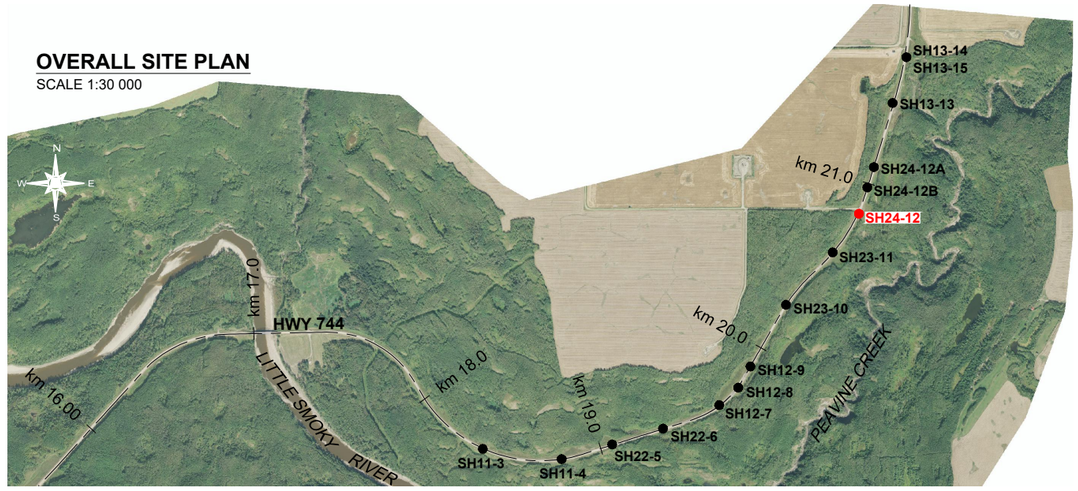



## DETAILED SITE PLAN

SCALE 1:750

## OVERALL SITE PLAN

SCALE 1:30 000




LEGEND

- CULVERT
- GUARDRAIL
- ① DIRECTION AND NUMBER OF PHOTO

NOTES

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. PREVIOUS OBSERVATIONS SHOWN IN BLACK (2013-2015 FROM AMEC FIGURE 1, PROJECT EG10030, PROVIDED BY ALBERTA TRANSPORTATION).
3. JUNE 2020 OBSERVATIONS SHOWN IN RED.

0 10 20 30 40 50m

SCALE 1:750

SATELLITE IMAGE FROM VALTUS IMAGERY (DATED 2014)

Alberta

**PEACE REGION (SWAN HILLS)**

# SH024-12: HWY 744:02 LITTLE SMOKY RIVER VALLEY 2020 SITE INSPECTION PLAN

**DWG No. 13355-SH024-12**

| | |
|---|---|
| DRAWN BY | KLW |
| DESIGNED BY | KEF |
| APPROVED BY | DWP |
| SCALE | AS SHOWN |
| DATE | OCTOBER 2020 |
| FILE No. | 13355 |

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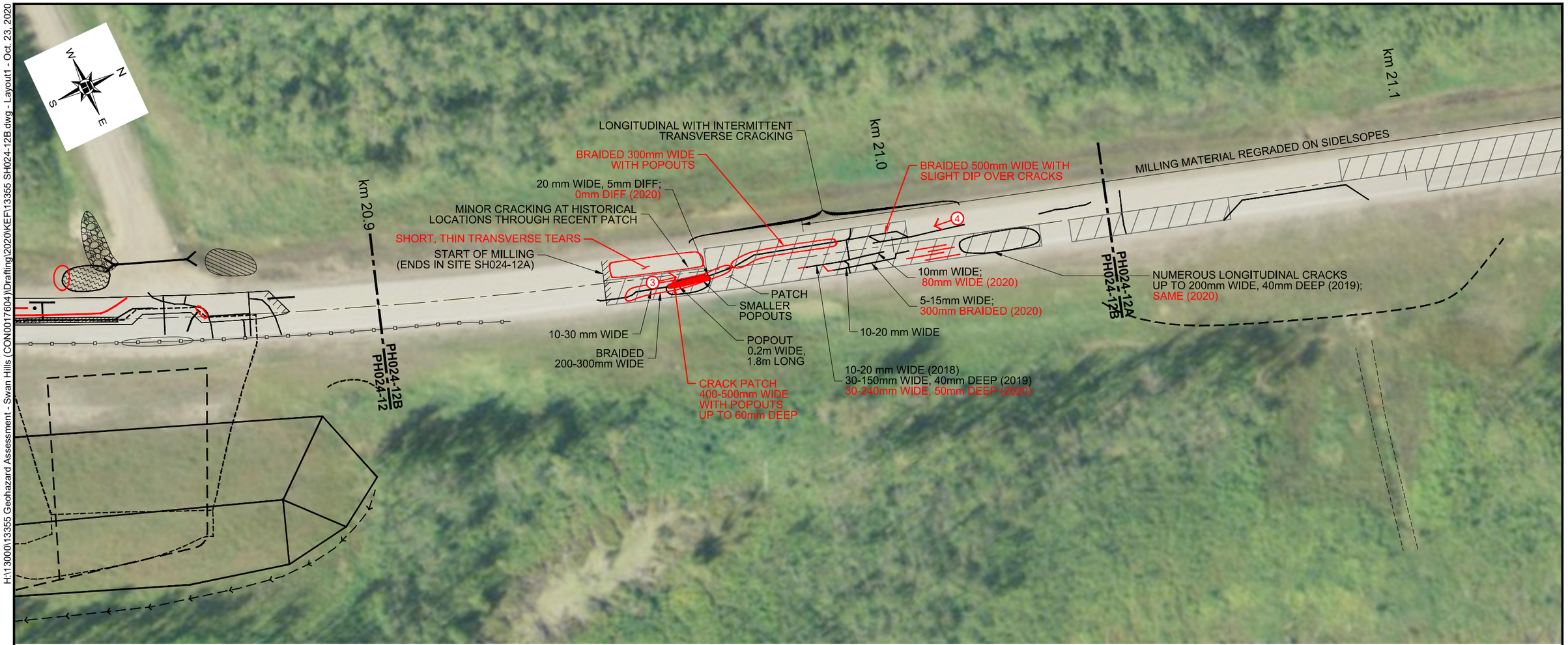
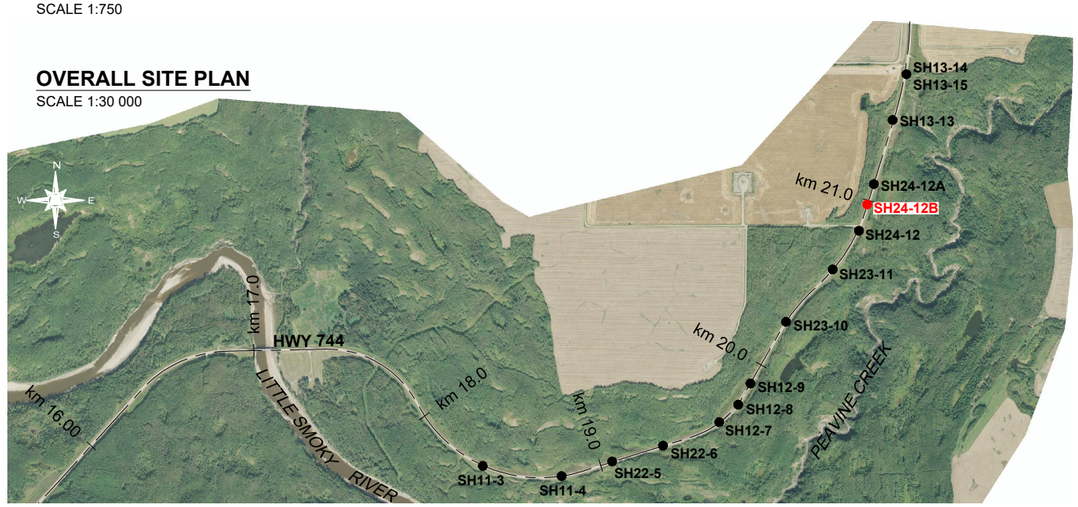



## DETAILED SITE PLAN

SCALE 1:750

## OVERALL SITE PLAN

SCALE 1:30 000




LEGEND

- CULVERT
- GUARDRAIL
- RED TEMPORARY HAZARD SIGN
- ① DIRECTION AND NUMBER OF PHOTO

NOTES

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. PREVIOUS OBSERVATIONS SHOWN IN BLACK (2013-2015 FROM AMEC FIGURE 1, PROJECT EG10030, PROVIDED BY ALBERTA TRANSPORTATION).
3. JUNE 2020 OBSERVATIONS SHOWN IN RED.
4. PREVIOUSLY UNRECORDED CRACKS MAPPED AND ADDED IN 2018

0 10 20 30 40 50m

SCALE 1:750

SATELLITE IMAGE FROM VALTUS IMAGERY (DATED 2014)

Alberta

**PEACE REGION (SWAN HILLS)**

# SH024-12B: HWY 744:02 LITTLE SMOKY RIVER VALLEY 2020 SITE INSPECTION PLAN

**DWG No. 13355-SH024-12B**

| | |
|---|---|
| DRAWN BY | KLW |
| DESIGNED BY | KEF |
| APPROVED BY | DWP |
| SCALE | AS SHOWN |
| DATE | OCTOBER 2020 |
| FILE No. | 13355 |

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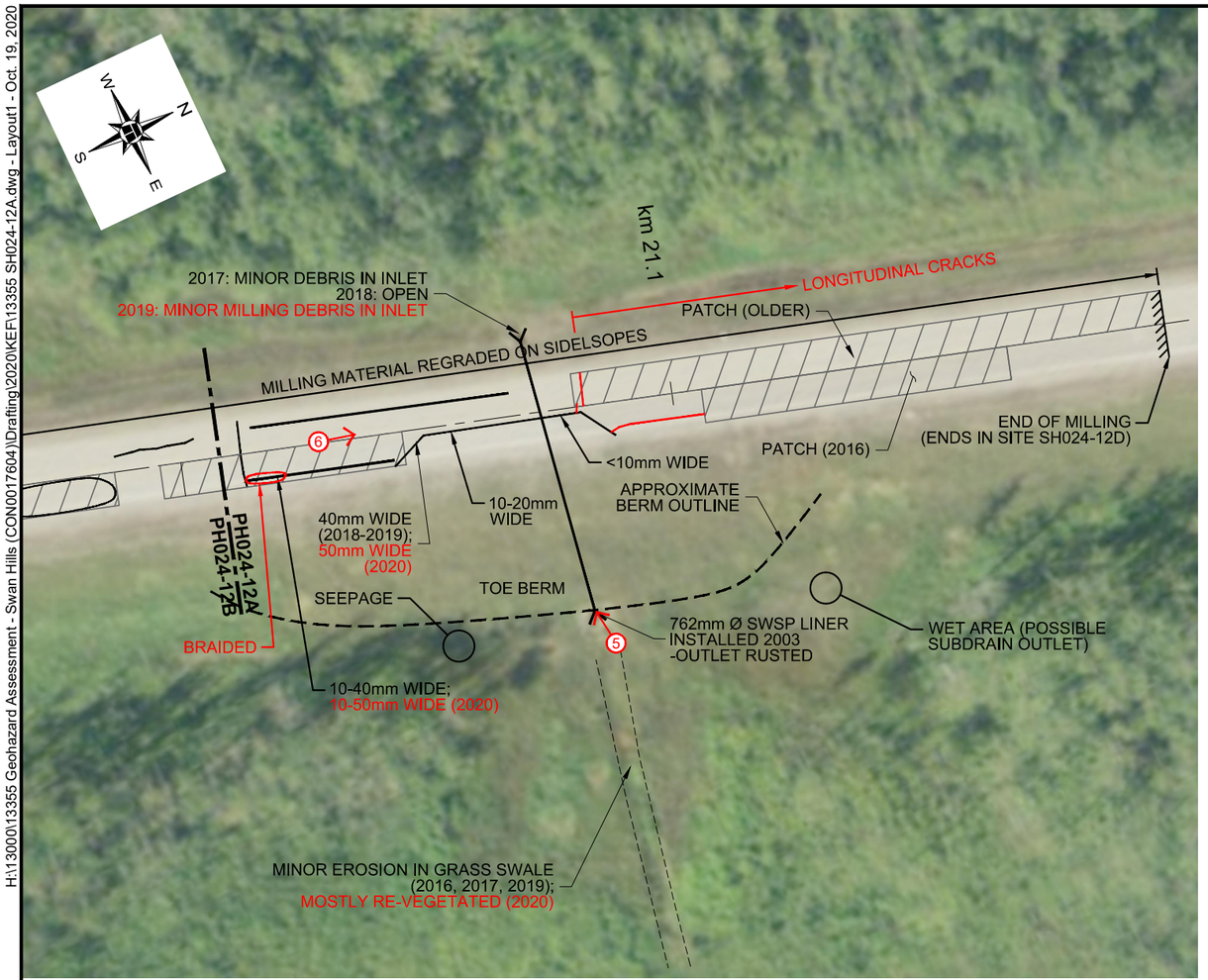
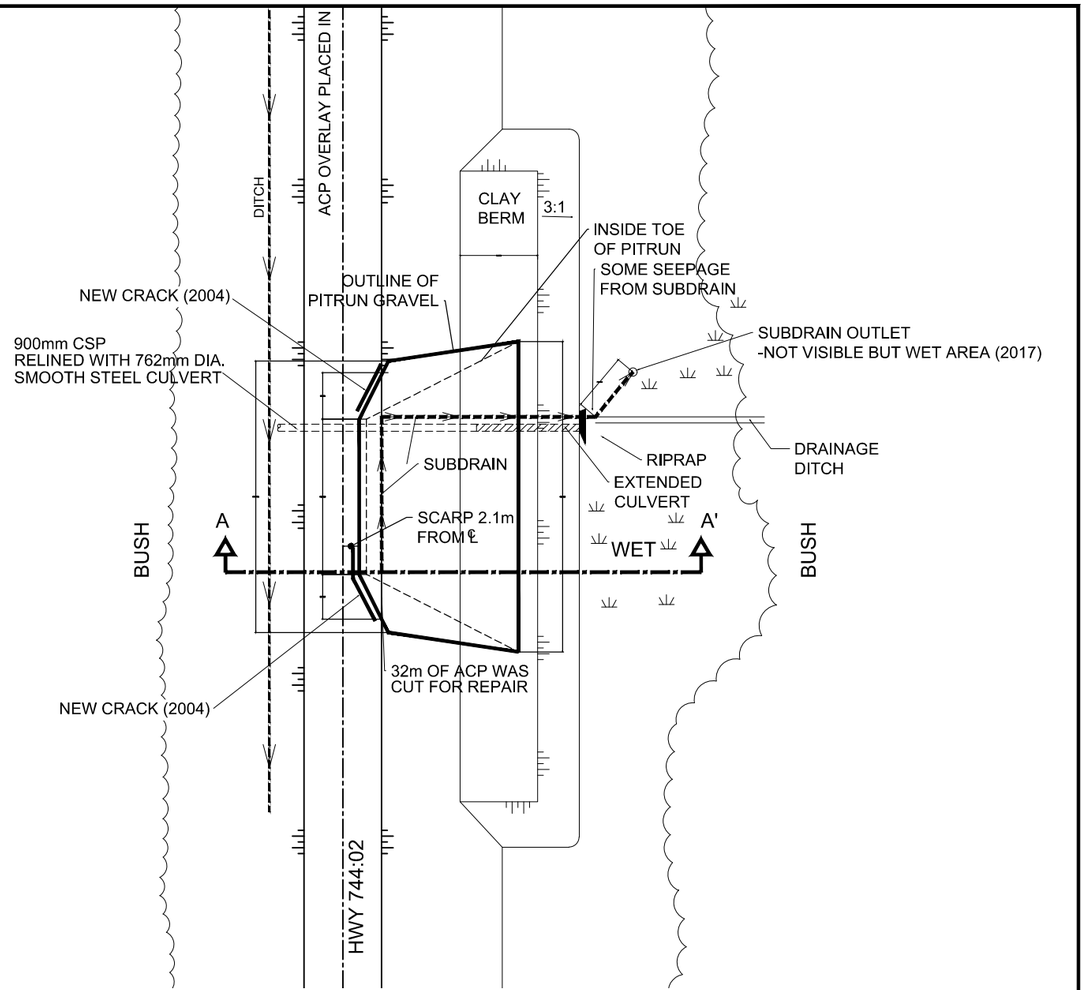
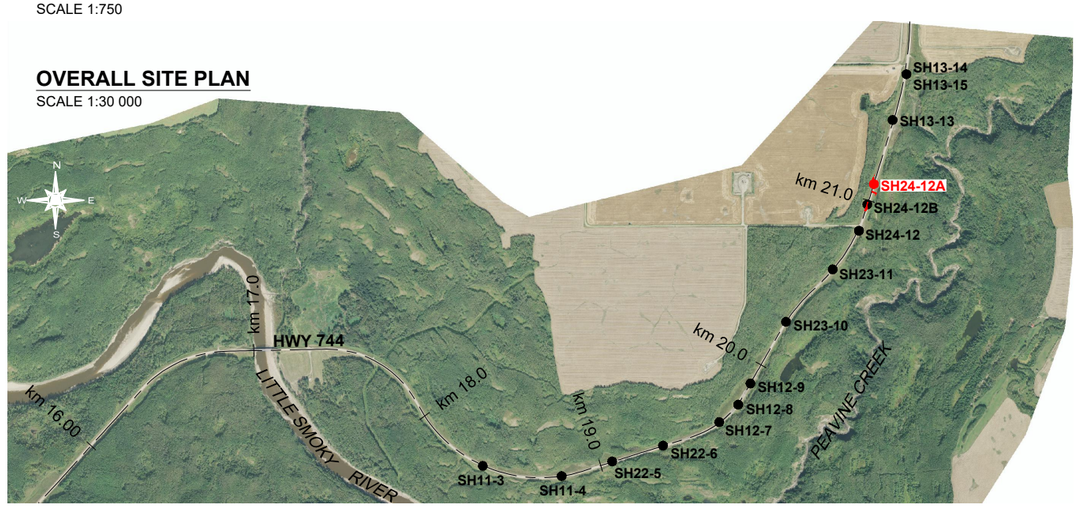



## DETAILED SITE PLAN
SCALE 1:750




## SCHEMATIC AS-BUILT PLAN
NTS

## OVERALL SITE PLAN
SCALE 1:30 000




LEGEND

CULVERT

DIRECTION AND NUMBER OF PHOTO

NOTES
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3. JUNE 2020 OBSERVATIONS SHOWN IN RED.

0 10 20 30 40 50m
SCALE 1:750

SATELLITE IMAGE FROM VALTUS IMAGERY (DATED 2014)

Alberta

**PEACE REGION (SWAN HILLS)**

# SH024-12A: HWY 744:02 LITTLE SMOKY RIVER VALLEY 2020 SITE INSPECTION PLAN

**DWG No. 13355-SH024-12A**

| | |
|---|---|
| DRAWN BY | KLW |
| DESIGNED BY | KEF |
| APPROVED BY | DWP |
| SCALE | AS SHOWN |
| DATE | OCTOBER 2020 |
| FILE No. | 13355 |

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Photo 1, Site 12 – Looking northeast over toe berm. Note vertical and horizontal deformation of the guardrail.

Photo 2, Site 12 – Looking north from TR764 intersection at main scarp crack.

Photo 3, Site 12B: Looking north at deteriorating patch over crack at south end of site.

Photo 4, Site 12B – Looking south at main crack.

Photo 5, Site 12A – Rusting culvert liner outlet.

Photo 6, Site 12A – Looking north at crack forming along edge of toe berm excavation.