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| SITE NUMBER AND NAME: NC031 – Deer Lodge | HIGHWAY AND KM: 22:32, km 28.857 | PREVIOUS INSPECTION: May 25, 2020 | CURRENT INSPECTION: July 14, 2021 |
| LEGAL DESCRIPTION: SE 20-56-08-W5M | NAD83 COORDINATES: UTM11U 5968389N, 622217E | | RISK ASSESSMENT: PF: 3 CF: 5 Total: 15 |
| AVERAGE ANNUAL DAILY TRAFFIC (AADT): 1,070 (2020) | | CONTRACTOR MAINTENANCE AREA (CMA): 509 | |

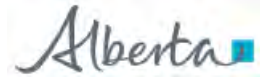
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| SUMMARY OF INSTRUMENTATION: Two vibrating wire piezometers functional. | INSPECTED BY: Stantec: Leslie Cho and Carrie Murray AT: Bernard Ching, Rishi Adhikari, Kathleen Davis, and Dave Farr |
| LAST READING DATE: July 4, 2021 | |
| PRIMARY SITE ISSUE: Slope failure due to combination of high groundwater table, poor drainage, and weak foundation soils. | |
| APPROXIMATE DIMENSIONS: 70 m wide by 15 m long | |
| DATE OF ANY REMEDIAL ACTION: Highway patched in 2010 and 2015. Toe berm with drainage constructed in 2016. | |

| ITEM | CONDITIONS EXIST | | DESCRIPTION AND LOCATION | NOTICEABLE CHANGE FROM LAST INSPECTION | |
|-------------------------|------------------|----|---|--|----|
| | YES | NO | | YES | NO |
| Pavement Distress | X | | Semi-circular pavement cracking near SI-1R / SP1. | | X |
| Slope Movement | X | | Pavement crack with dip towards southbound lane (SBL). | | X |
| Erosion | | X | | | |
| Seepage | | X | | | |
| Bridge/Culvert Distress | X | | Sag in culvert, approximately one-third to one-quarter of the way in from outlet, likely under highway. | | X |

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| COMMENTS |
| <ul style="list-style-type: none"> • The site appears unchanged from the previous inspection. <ul style="list-style-type: none"> – A semi-circular pavement crack was observed north of SI-1R. A slight dip of about 5 mm to 10 mm towards the west was observed since 2020. The crack is mostly contained within the SBL with a small section (about 1 m to 2 m long) that encroaches into the northbound lane (NBL) by about 0.3 m (Photos 1 to 3). – Longitudinal cracking observed on the SBL in front of the farm access at the north limits of the site. • The culvert did not have flowing water during the current inspection. The ground at the inlet was saturated while the ground at the outlet was wet. • A sag was observed about one-quarter to one-third of the way in from the outlet, approximately below the west highway edge (Photo 4). AT informed Stantec that this sag is not a new feature and was present during the berm construction in 2016. • A shallow groundwater table continues to be observed at the site with current readings showing the water level approximately 1.5 m to 2.5 m below ground surface. • The Consequence Factor was increased to 5 since the slope failure may lead to closure of the SBL with partial loss of the NBL. In addition, the culvert could be damaged from slide movements. |



**NORTH CENTRAL REGION GRMP
EDSON / STONY PLAIN
SITE INSPECTION FORM**



- A potential detour at this location would be to drive around the site using Township Road 562 and 563. The detour is expected to require less than 15 minutes travel time. However, the township roads are gravel surfaced and may not be suitable for semi-trucks or other large vehicles.

RECOMMENDATIONS

- Pavement cracks should be sealed to reduce surface water infiltration into the embankment.
- SI-1R and SP1 could not be located since 2018 and was likely buried as a result of highway maintenance activities. The highway maintenance contractor (HMC) should attempt to locate the two instruments so that the landslide can be further monitored, if functional. Otherwise, replacement slope inclinometers can be considered to monitor the site.
- Site inspections should continue to be completed annually.
- Instrumentation monitoring should continue to be completed annually in the spring.

PREPARED BY: LESLIE CHO, M.ENG., P.ENG.

REVIEWED BY: CARRIE MURRAY, M.ENG., P.ENG.

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2021 Site Inspection Photos at NC031



Photo 1: South limits of semi-circular crack. Looking north.



Photo 2: Approximately midway of semi-circular crack near SI-1R. Looking south.

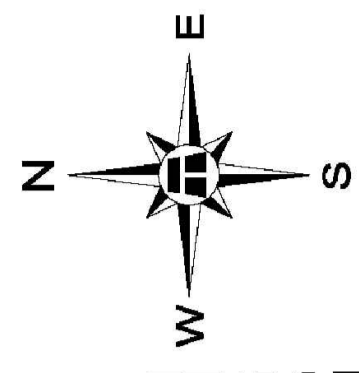
2021 Site Inspection Photos at NC031



Photo 3: North limits of semi-circular crack. Looking south.

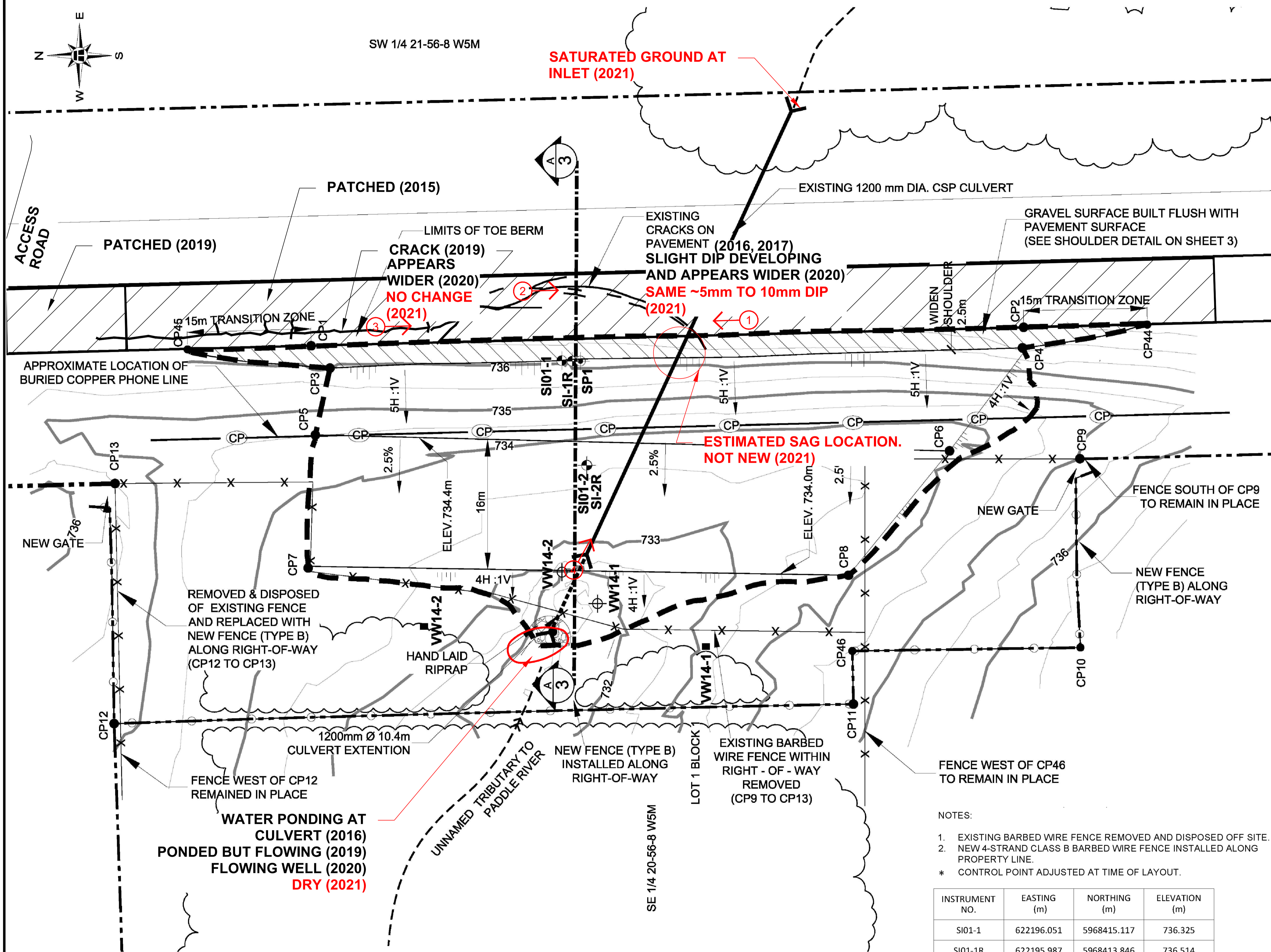


Photo 4: Culvert outlet. Looking southeast.



SW 1/4 21-56-8 W5M

SATURATED GROUND AT INLET (2021)



| CONTROL POINT | EASTING (m) | NORTHING (m) | ELEVATION (m) |
|---------------|-------------|--------------|---------------|
| CP1* | 622197.842 | 5968445.499 | 736.370 |
| CP2* | 622200.084 | 5968359.093 | 737.360 |
| CP3* | 622195.134 | 5968443.221 | 736.340 |
| CP4* | 622197.658 | 5968359.225 | 737.300 |
| CP5 | 622187.030 | 5968444.997 | 734.400 |
| CP6 | 622185.091 | 5968368.076 | 734.400 |
| CP7 | 622170.902 | 5968445.871 | 733.812 |
| CP8 | 622170.016 | 5968380.318 | 734.000 |
| CP9 | 622184.152 | 5968352.271 | 735.666 |
| CP10* | 622161.251 | 5968352.202 | 736.760 |
| CP11* | 622154.395 | 5968379.736 | 734.780 |
| CP12* | 622152.026 | 5968469.401 | 735.150 |
| CP13 | 622181.142 | 5968469.288 | 735.598 |
| CP44* | 622200.405 | 5968344.096 | 737.730 |
| CP45* | 622197.402 | 5968460.492 | 736.290 |
| CP46* | 622160.831 | 5968379.865 | 734.500 |

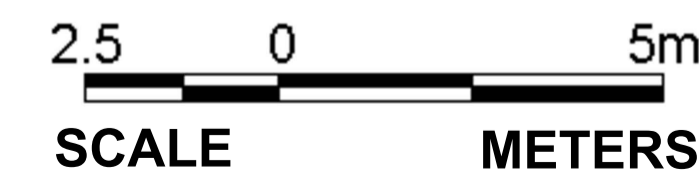
- LEGEND**
- SLOPE INCLINOMETER LOCATION (SI)
 - APPROXIMATE STANDPIPE PIEZOMETER LOCATION (SP)
 - VIBRATING WIRE PIEZOMETER TIP LOCATION (VW)
 - TREE LINE (APPROX.)
 - EXISTING GROUND SURFACE CONTOUR - SURVEYED ON OCTOBER 13, 2015 (CONTOUR INTERVAL = 0.5m)
 - CRACK ON HIGHWAY
 - PROPERTY LINE
 - APPROXIMATE BURIED COPPER PHONE LINE
 - APPROXIMATE FENCE LINE (EXISTING)
 - FENCE LINE (TYPE B) (NEW)
 - CONTROL POINT
 - VIBRATING WIRE PIEZOMETER LEADS STEEL PROTECTOR (APPROX.)
 - PHOTO NUMBER AND DIRECTION**

WATER PONDING AT CULVERT (2016) PONDED BUT FLOWING (2019) FLOWING WELL (2020) DRY (2021)

ESTIMATED SAG LOCATION. NOT NEW (2021)

- NOTES:**
- EXISTING BARBED WIRE FENCE REMOVED AND DISPOSED OFF SITE.
 - NEW 4-STRAND CLASS B BARBED WIRE FENCE INSTALLED ALONG PROPERTY LINE.
- * CONTROL POINT ADJUSTED AT TIME OF LAYOUT.

| INSTRUMENT NO. | EASTING (m) | NORTHING (m) | ELEVATION (m) |
|----------------|----------------------|-----------------------|---------------|
| SI01-1 | 622196.051 | 5968415.117 | 736.325 |
| SI01-1R | 622195.987 | 5968413.846 | 736.514 |
| SP1 | 622195.987 | 5968413.846 | 736.514 |
| SI01-2 | 622183.351 | 5968412.101 | 734.319 |
| SI-2R | 622183.360 | 5968412.034 | 734.412 |
| VW14-1 TIP | 622166.586 | 5968410.779 | - |
| VW14-1 CASING | 622161.356 (APPROX.) | 5968397.620 (APPROX.) | - |
| VW14-2 TIP | 622170.402 | 5968415.079 | - |
| VW14-2 CASING | 622163.808 (APPROX.) | 5968431.793 (APPROX.) | - |



NOTES

- PREVIOUS OBSERVATIONS SHOWN IN BLACK
- 2021 OBSERVATIONS SHOWN IN RED**

REFERENCE
 THURBER ENGINEERING LTD, JOB No.15-16-322, PLAN No. RD19252-C
 DATE NOVEMBER 25, 2015.

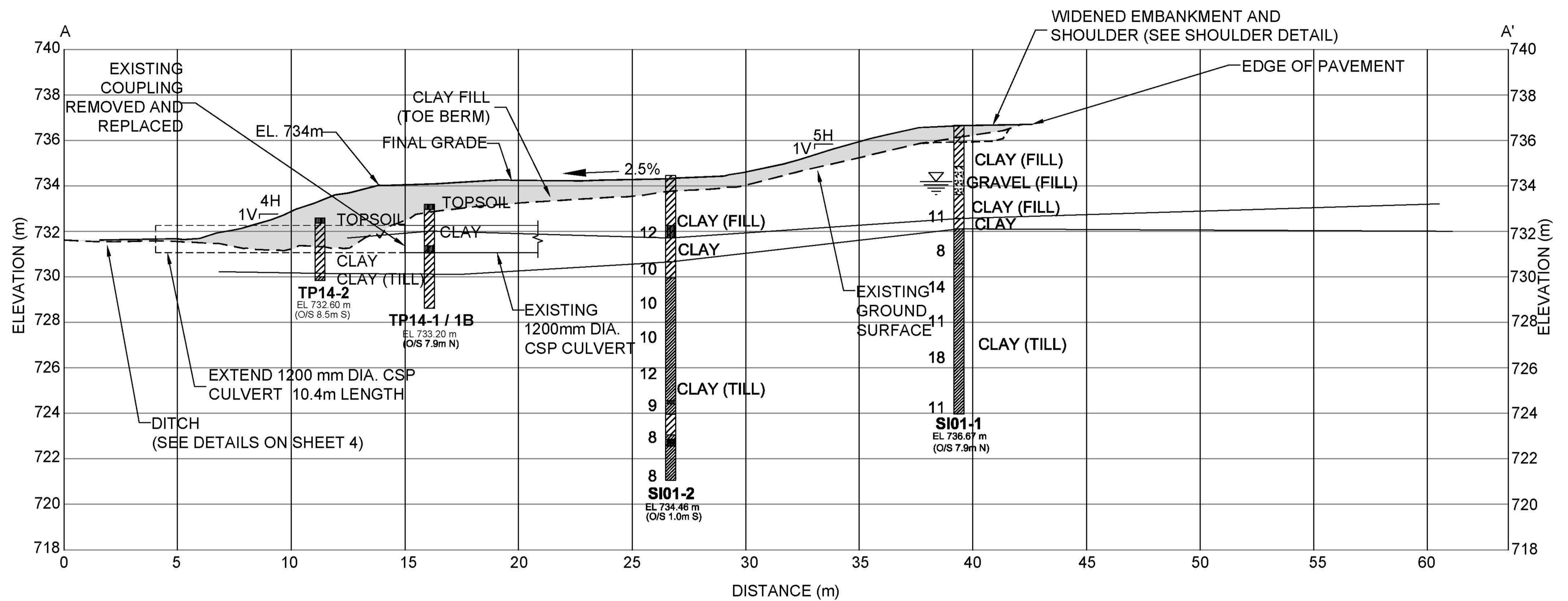
STANTEC CONSULTING
 400-10220 103 AVENUE NW
 EDMONTON, ALBERTA, CANADA
 T5J 0K4

Stantec

ALBERTA TRANSPORTATION
 GEOHAZARD MONITORING PROGRAM
 NC31 DEER LODGE
 SITE PLAN


| | | | |
|--------------------|----------------|---------------------|--|
| DRAWN WW/MK | CHECK CM | APPROVE LC | |
| DATE 03 SEPT. 2021 | SCALE AS SHOWN | PROJECT # 123315222 | |

FIGURE - 1



NOTES:
 CULVERT LOCATION SHOWN FOR INFORMATION PURPOSES.

REFERENCE
 THURBER ENGINEERING LTD, JOB No.15-16-322, PLAN No. RD19253-C
 DATE NOVEMBER 25, 2015.

| | | | |
|---|---------------|---|-----------|
|  | | STANTEC CONSULTING | |
| | | 400-10220 103 AVENUE NW EDMONTON, ALBERTA, CANADA T5J 0K4 | |
| ALBERTA TRANSPORTATION GEOHAZARD MONITORING PROGRAM NC31 DEER LODGE SECTION A - A' | | | |
| DRAWN | WW/MK | CHECK | CM |
| DATE | 03 SEPT. 2021 | SCALE | AS SHOWN |
| APPROVE | LC | PROJECT # | 123315222 |
| FIGURE - 2 | | | - |