Stantec

To:	Amy Driessen Transportation and Economic Corridors	From:	Leslie Cho and Xiteng Liu Stantec Consulting Ltd.
File:	123315222	Date:	June 18, 2024

Reference: North Central Region, Edson, Site NC013 - Highway 633:02 Cattlepass West, Spring 2024 Instrumentation Monitoring Report

1.0 OBSERVATIONS

1.1 FIELD PROGRAM AND INSTRUMENTATION STATUS

The Spring 2024 reading cycle consisted of instrument readings of one slope inclinometer (SI17-02) and two vibrating wire piezometers (VW17-01 and VW17-02). SI05-01 has sheared below 10.5 m, fitting with where movement was previously observed. SI17-01 was found damaged in 2022 and the remaining casing within the ground is full of debris. VW05-6 was found damaged in Spring 2024. The site plan is shown on Figure 1 attached. The instrument readings were taken by Andres Padros, Technician and Olawale Odusi, Geotechnical Technologist on May 15, 2024.

The slope inclinometer (SI) was measured using an RST MEMS digital inclinometer probe with 0.5 m increments and handheld PC. Readings were taken based on cable marks in relation to the top of SI casing. The vibrating wire piezometers (VW) were read with an RST VW2106 readout box.

GPS coordinates of all instruments were surveyed using a Garmin eTrex 22x handheld GPS unit.

2.0 INSTRUMENTATION READINGS

2.1 GENERAL

The SI plots are provided in the attachments and summarized in the following sections. Displacement-time plots in the resultant x-direction (i.e., slope movement direction) along with movement rates, total cumulative movement, maximum movement rates, and incremental movements since initializing each SI are provided in Table NC013-1 and the attachments.

The groundwater levels from VW readings are plotted in the attachments and summarized in Table NC013-2.

2.2 ZONES OF MOVEMENT

No new zones of movement were observed in the one operational SI during the Spring 2024 reading cycle.

Reference: **North Central Region, Edson, Site NC013 - Highway 633:02 Cattlepass West, Spring 2024 Instrumentation Monitoring Report**

2.3 MONITORING RESULTS

2.3.1 Slope Inclinometers

SI17-02 has two movement zones being monitored, the upper movement zone is at 8.9 m to 10.4 m and the lower movement zone is at 12.9 to 14.9 m. The cumulative movement in each zone is 6 mm and 2 mm, respectively. The current rate of movement for both zones is less than or equal to 1 mm/yr.

2.3.2 PIEZOMETERS

VW05-6 is damaged and can no longer be read without repairs. Up to becoming damaged in Fall 2023, water level in VW05-6 had shown a slight increase with each passing cycle. VW05-6 showed artesian groundwater levels prior to construction in 2011.

Water level in VW17-01 and VW17-02 both increased by about 0.1 m. VW17-01 and VW17-02 showed a current piezometric level of 0.9 m and 1.1 m bgs, respectively, marking their highest water levels to date.

3.0 RECOMMENDATIONS

3.1 FUTURE WORK

It is recommended that additional SIs are installed to replace the damaged SIs (SI05-1 and SI17-01). All instruments should be read again during the Fall 2025 reading cycle.

3.1 INSTRUMENTATION REPAIRS

It is not likely that SI05-1 and SI17-01 can be repaired. SI05-01 has shifted, rendering any readings baseless. SI17-01 has been destroyed above ground, possibly due to mowing equipment. The pipe remaining below ground was inferred to have debris at the bottom since the SI probe would not travel the full distance down the pipe.

VW05-6 was not responsive upon attaching the cables to the readout box. The exposed portions of the cables do not show signs of damage suggesting the cable(s) may be damaged below ground surface. Depending on the depth of cable damage, the cables could be spliced to repair VW05-6.

Reference: **North Central Region, Edson, Site NC013 - Highway 633:02 Cattlepass West, Spring 2024 Instrumentation Monitoring Report**

Table NC013-1: Spring 2024 Slope Inclinometer Reading Summary

Instrument Name	Date Initialized	Coordinates (1) (UTM 11U, NAD1983) (m)		Total Cumulative Resultant Movement and Depth of Movement to Date (mm)	Maximum Rate of Movement (mm/yr)	Current Status	Date of Previous Reading	Incremental Movement Since Previous Reading (mm)	Current Rate of Movement (mm/yr)	Change in Rate of Movement Since Previous Reading (mm/yr)
		Northing	Easting							
SI05-1	April 25, 2005	5942608	642213	110 over 2.1m to 8.1m depth in 345º direction	46 between Sept. 2011 and June 2012	Non-operational	May 06, 2022	Found damaged September 2022.		
				130 over 8.1m to 11.6m depth in 345º direction	48 between Sept. 2011 and June 2012					
SI17-01	November 24, 2017	5942648	642249	-	-	Non-operational	May 06, 2022	Found damaged September 2022.		
SI17-02	November 24, 2017	5942598	642214	6 over 8.9m to 10.4m depth in 35º direction	2.9 between May 2022 and Sep 2022	Operational	May 19, 2023	<1	<1	-2
				2 over 12.9 m to 14.9 m depth in 35º direction	1.6 between Jul 2021 and Sep 2021			<1	<1	<1

Note:
(1) Updated May 15, 2024, with approximate accuracy of ± 3 m.

Reference: **North Central Region, Edson, Site NC013 - Highway 633:02 Cattlepass West, Spring 2024 Instrumentation Monitoring Report**

Table NC013-2: Spring 2024 Vibrating Wire Piezometer Reading Summary

Instrument Name	Date Initialized	Coordinates [1] (UTM 11U, NAD1983) (m)		Tip Elevation (m) (aMSL) [2]	Ground Elevation [1] (m) (aMSL)	Current Status	Maximum Piezometric Elevation (m)	Measured Piezometric Elevation (Spring 2024) (m)	Previous Piezometric Elevation (Fall 2023) (m)	Change in Water Level Since Previous Reading (m bgs)
		Northing	Easting							
VW05-6 (79657)	May 6, 2005	5942601	642259	726.4	740.1	Non-Operational	740.8 on May 2013	-	-	N/A
VW17-01 (100D1700263)	Nov. 24, 2017	5942621	642252	730.3	739.8	Operational	738.9 on May. 2024	738.9 (0.9 m bgs)	738.8 (1.0 m bgs)	0.1
VW17-02 (100D1701604)	Nov. 24, 2017	5942598	642214	727.4	741.1	Operational	740.0 on May 2024	740.0 (1.1 m bgs)	739.9 (1.2 m bgs)	0.1

Note:
(1) Updated May 15, 2024 with approximate accuracy of ± 3 m.
(2) aMSL = Above Mean Sea Level

Reference: **North Central Region, Edson, Site NC013 - Highway 633:02 Cattlepass West, Spring 2024 Instrumentation Monitoring Report**

CLOSING

We trust this instrumentation report meets your requirements. If you have any questions, please do not hesitate to contact the undersigned.

Stantec Consulting Ltd.

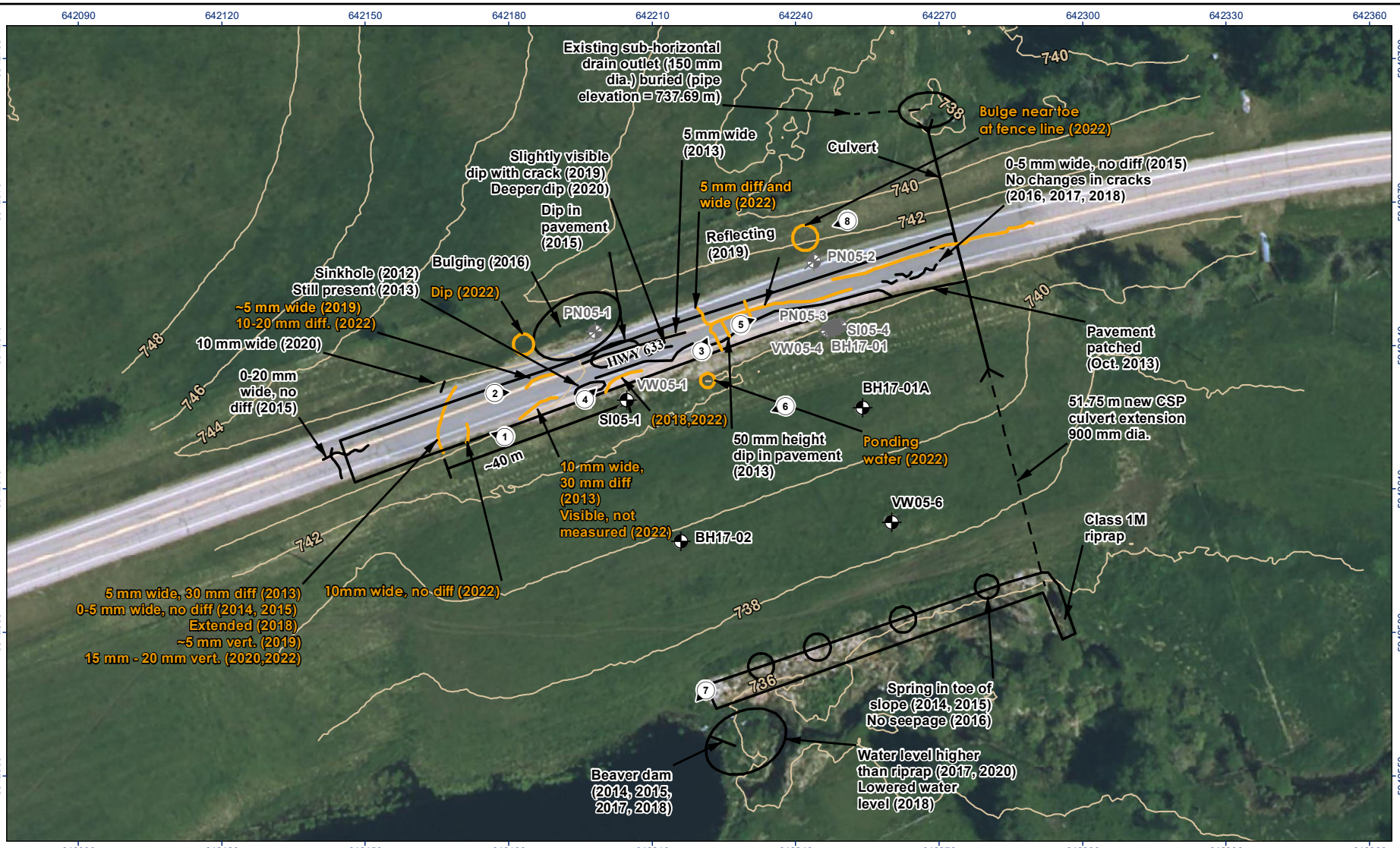
PROFESSIONAL ENGINEER ALBERTA
LESLIE CHO
June 18, 2024
ID# 139079

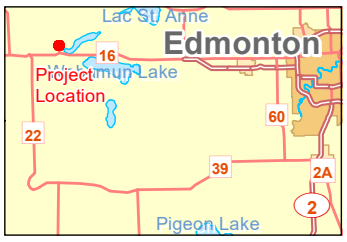
Leslie Cho M.Eng., P.Eng.
Senior Associate, Geotechnical Engineer
Phone: 780-917-7403
leslie.cho@stantec.com

Xiteng Liu M.Sc., P.Eng., PMP
Senior Principal, Geotechnical Engineer
Phone: 780-917-7247
xiteng.liu@stantec.com

Attachment:
Figure 1 – Site Plan
SI17-02 Slope Inclinometer Plots
Vibrating Wire Piezometer Depth vs Time Plot
Vibrating Wire Piezometer Elevation vs. Time Plot

PERMIT TO PRACTICE
STANTEC CONSULTING LTD.
Signature
Date 2024-06-18
PERMIT NUMBER: P 0258
The Association of Professional Engineers and Geoscientists of Alberta





- Photo Number and Direction
- Borehole Location
- Non-Operational Instrument
- Previous Observation
- 2022 Observation
- Ground Elevation Contours (m AMSL, LiDAR Nov. 2014)

N

0 10 20 metres
(At original document size of 8.5x11)
1:1,200

Notes
1. Coordinate System: NAD 1983 UTM Zone 11N
2. Data Sources: Geogratis, ©Department of Natural Resources Canada, All rights reserved.
3. Background: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Stantec

Project Location
Hwy 633
Parkland County, Alberta

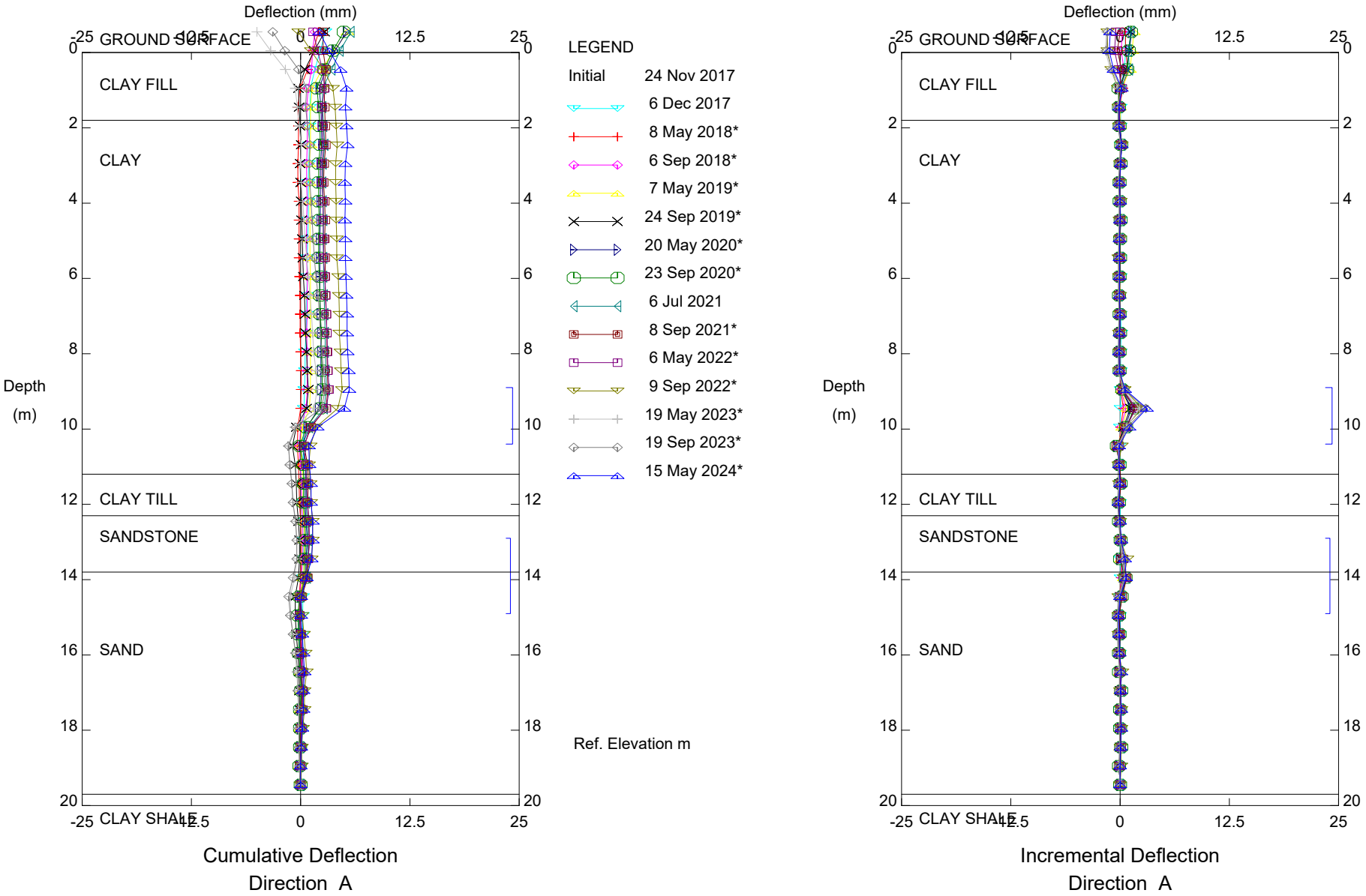
Prepared by SJ on 2022-09-15
Quality Review by LC on 2022-09-22
Independent Review by XL on 2022-09-22

Client/Project
123315222
Alberta Transportation
Geohazard Monitoring Program
NC13 Cattle Pass West

Figure No.
1

Title
Site Plan

Stantec Consulting Ltd - Edmonton



Cumulative Deflection
Direction A

Incremental Deflection
Direction A

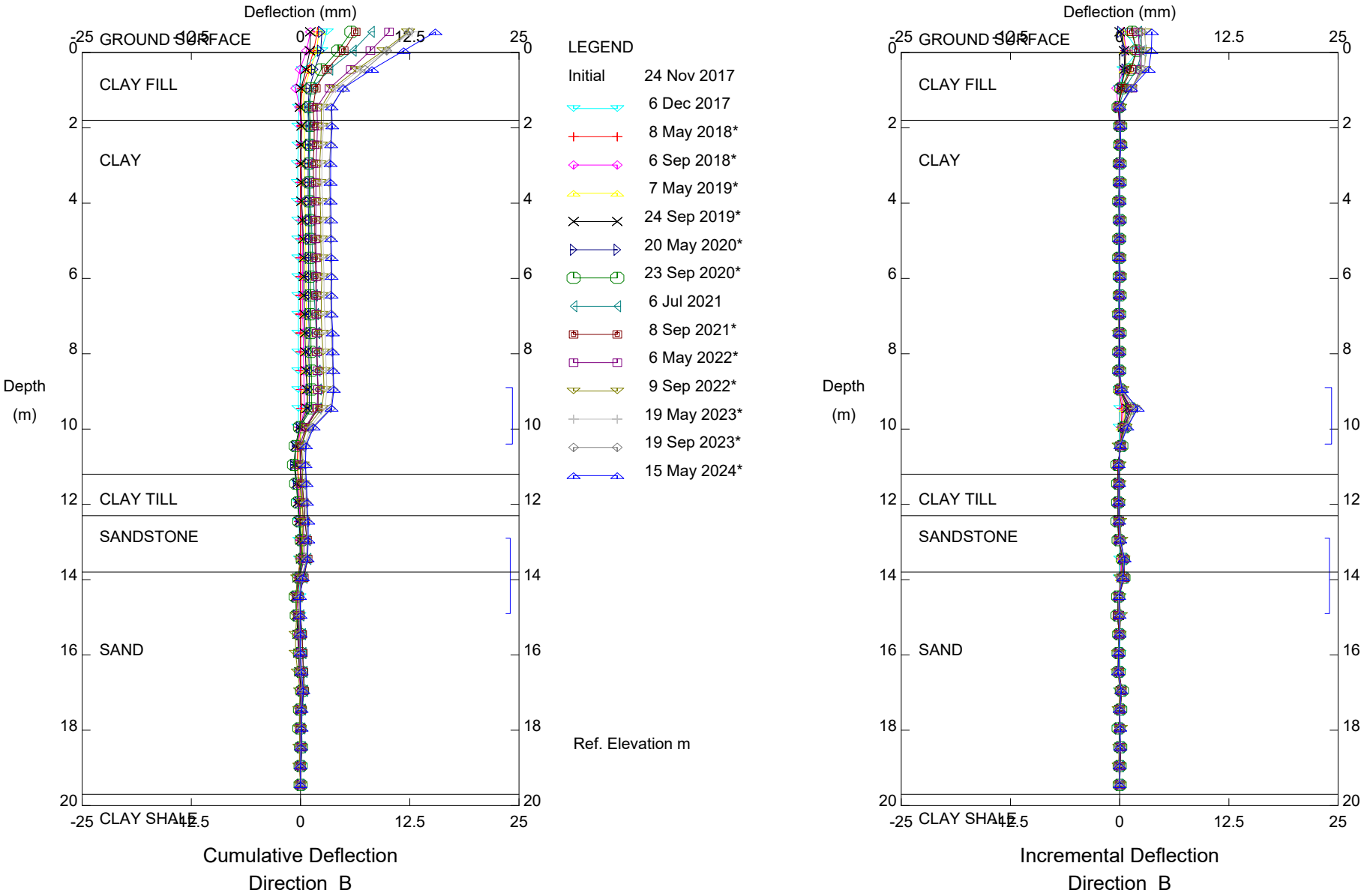
NC13, Inclinometer SI17-02

Transportation & Economic Corridors

Sets marked * include zero shift and/or rotation corrections.

V:\1233\active\123315222\03_data\field\instrumentation\NC013\SI\SI17-02\NC013SI17-02_S2024.gtl

Stantec Consulting Ltd - Edmonton



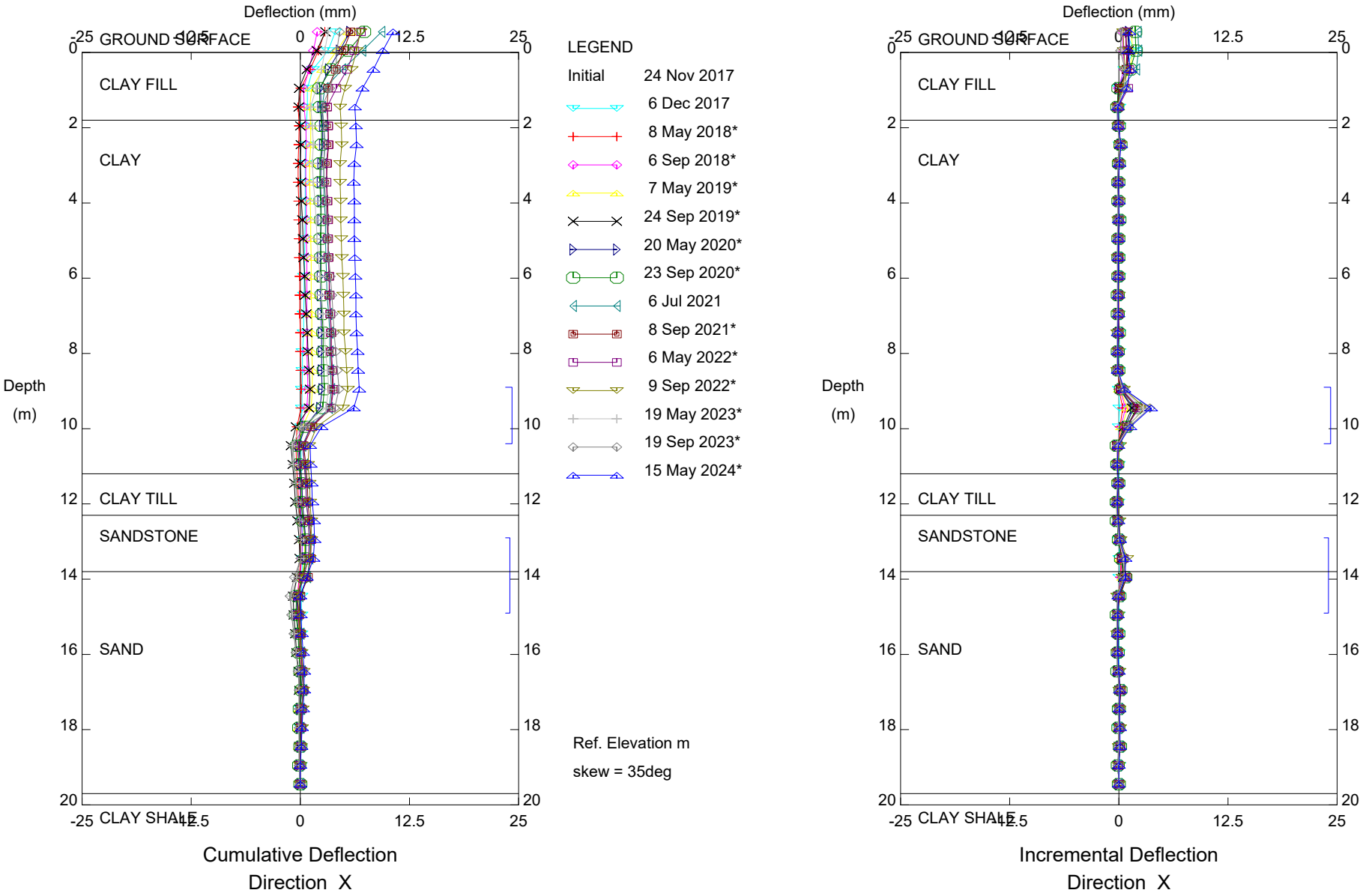
NC13, Inclinometer SI17-02

Transportation & Economic Corridors

Sets marked * include zero shift and/or rotation corrections.

V:\1233\active\123315222\03_data\field\instrumentation\NC013\SI\SI17-02\NC013SI17-02_S2024.gtl

Stantec Consulting Ltd - Edmonton



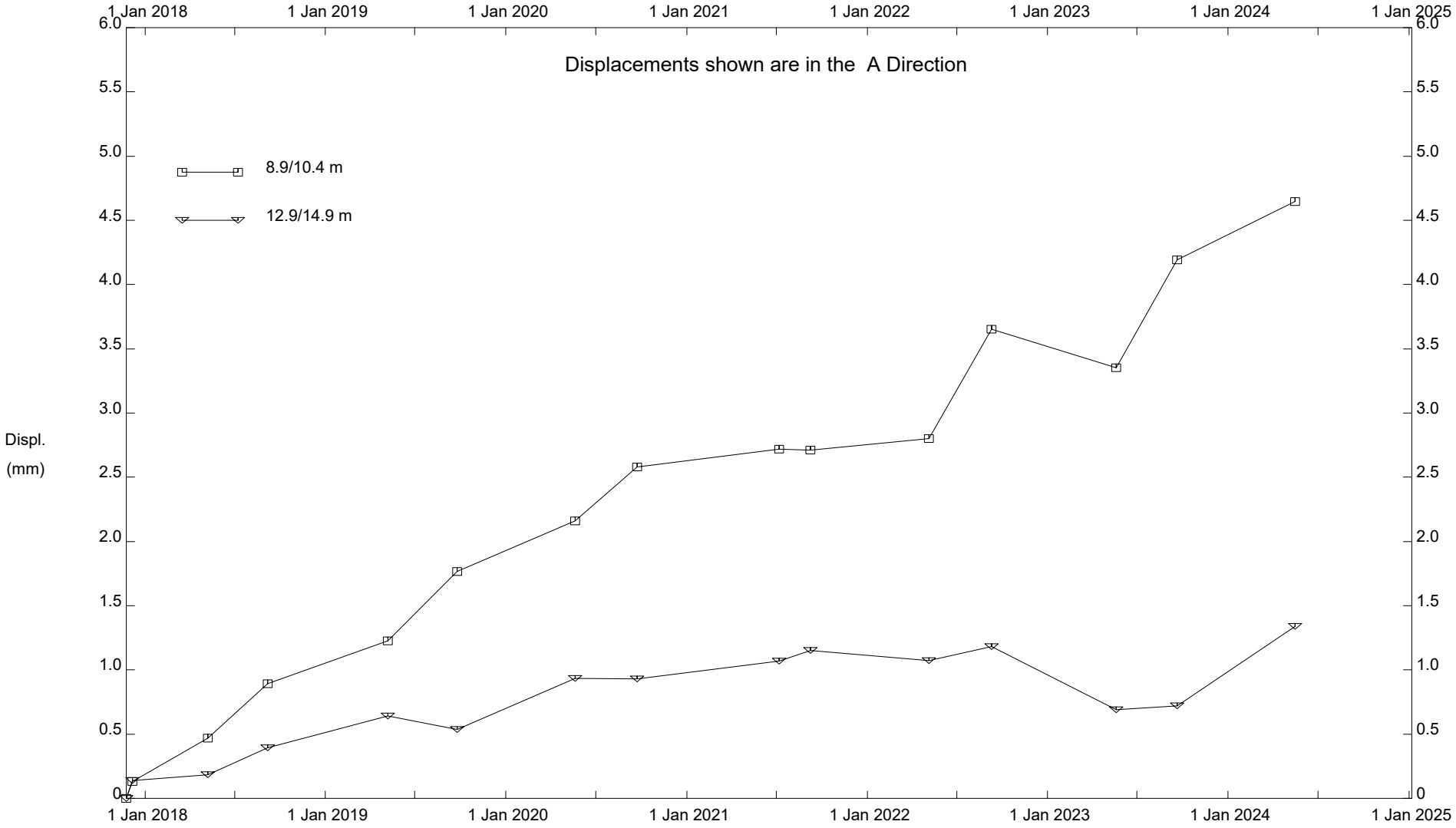
NC13, Inclinometer SI17-02

Transportation & Economic Corridors

Sets marked * include zero shift and/or rotation corrections.

V:\1233\active\123315222\03_data\field\instrumentation\NC013\SI\SI17-02\NC013SI17-02_S2024.gtl

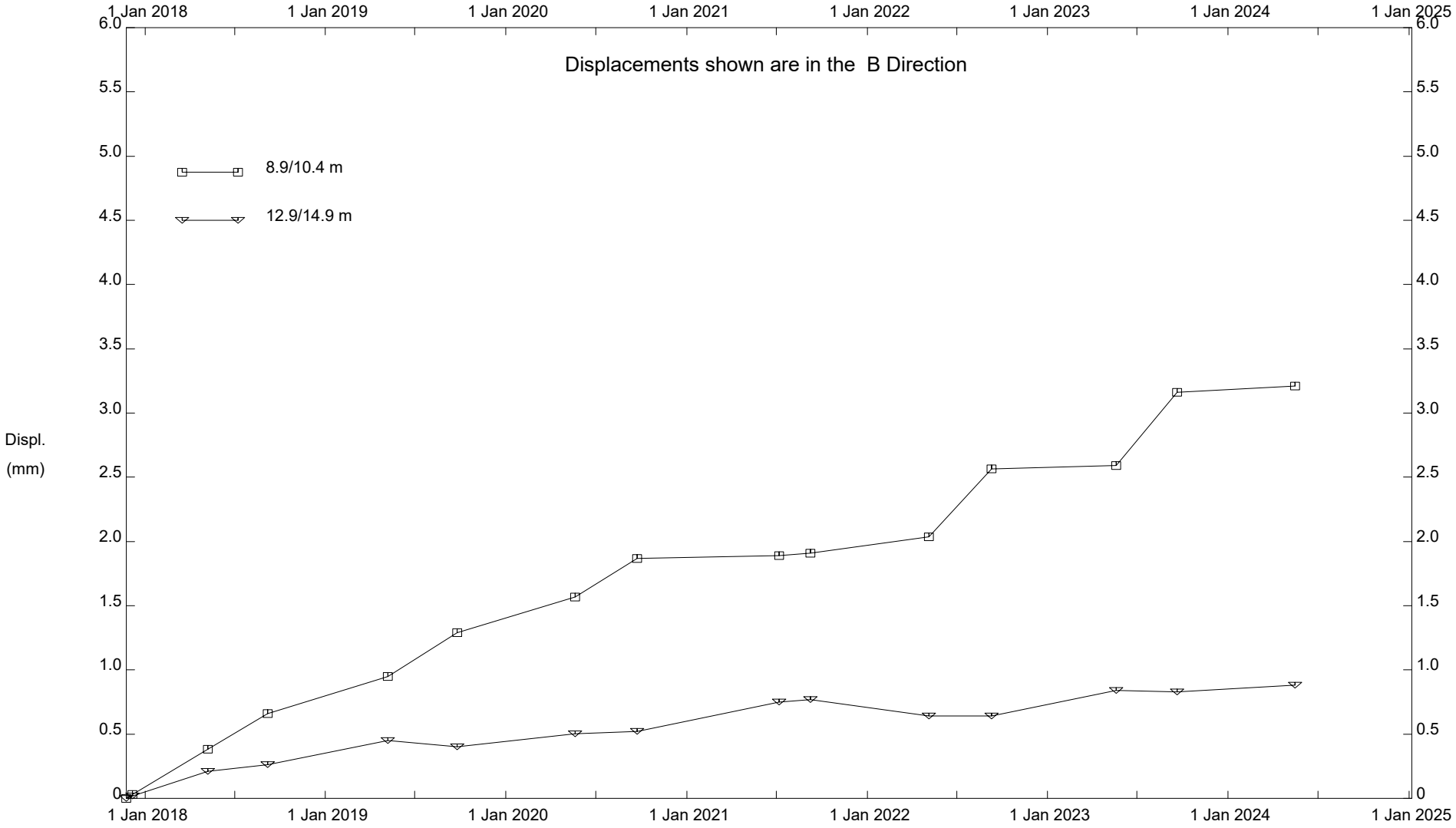
Stantec Consulting Ltd - Edmonton



NC13, Inclinometer SI17-02

Transportation & Economic Corridors

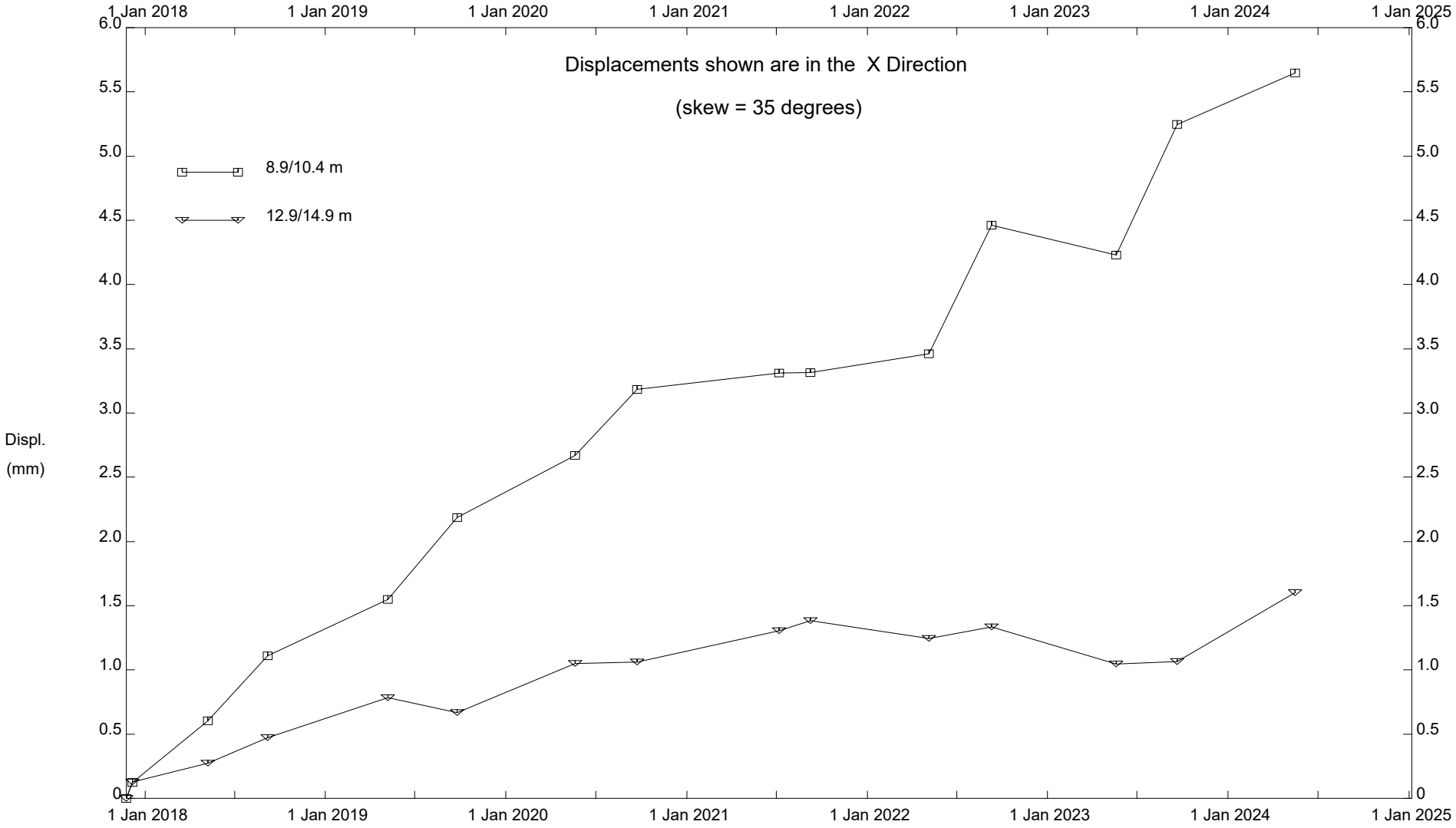
Stantec Consulting Ltd - Edmonton



NC13, Inclinometer SI17-02

Transportation & Economic Corridors

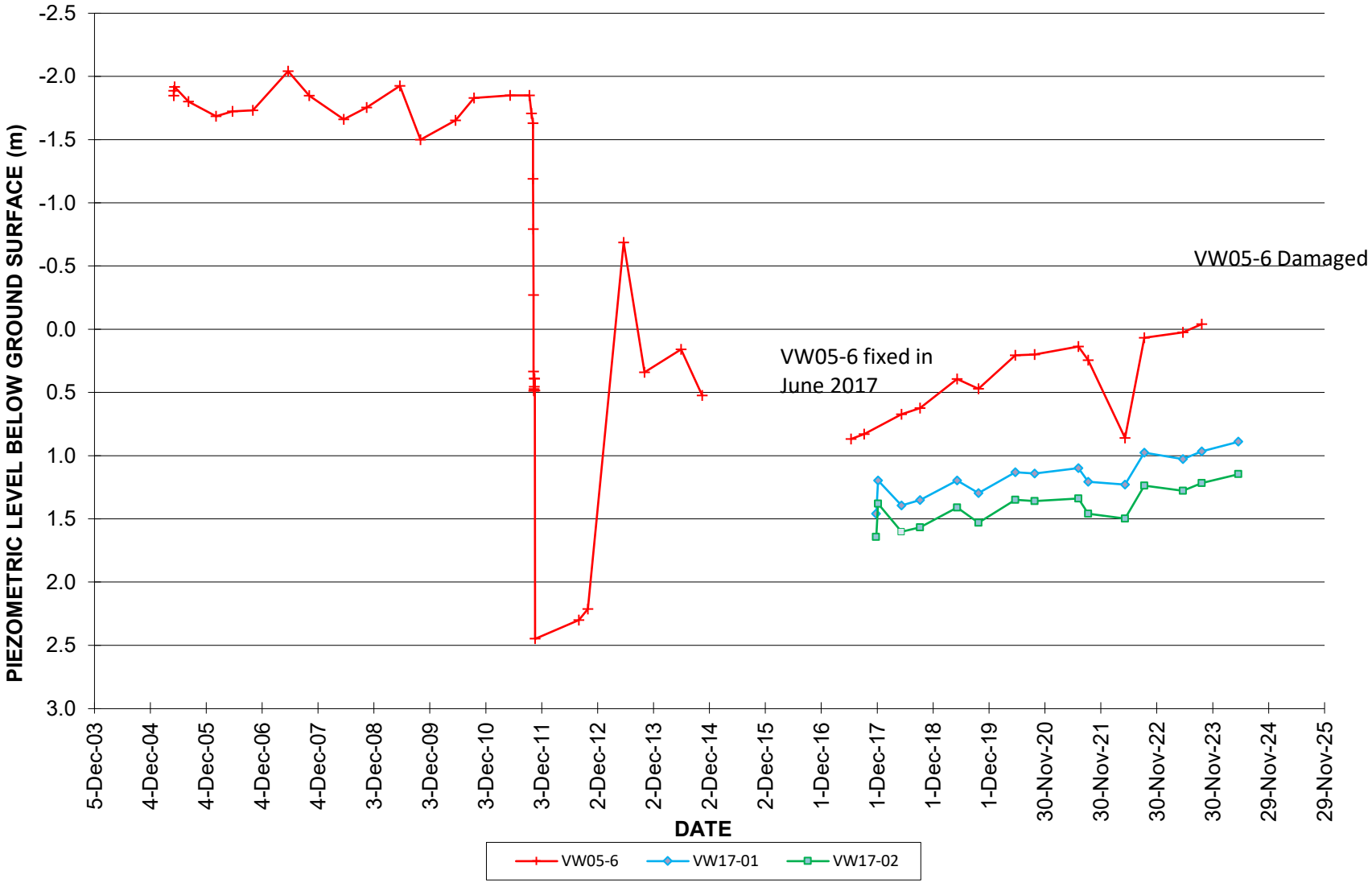
Stantec Consulting Ltd - Edmonton



NC13, Inclinometer SI17-02

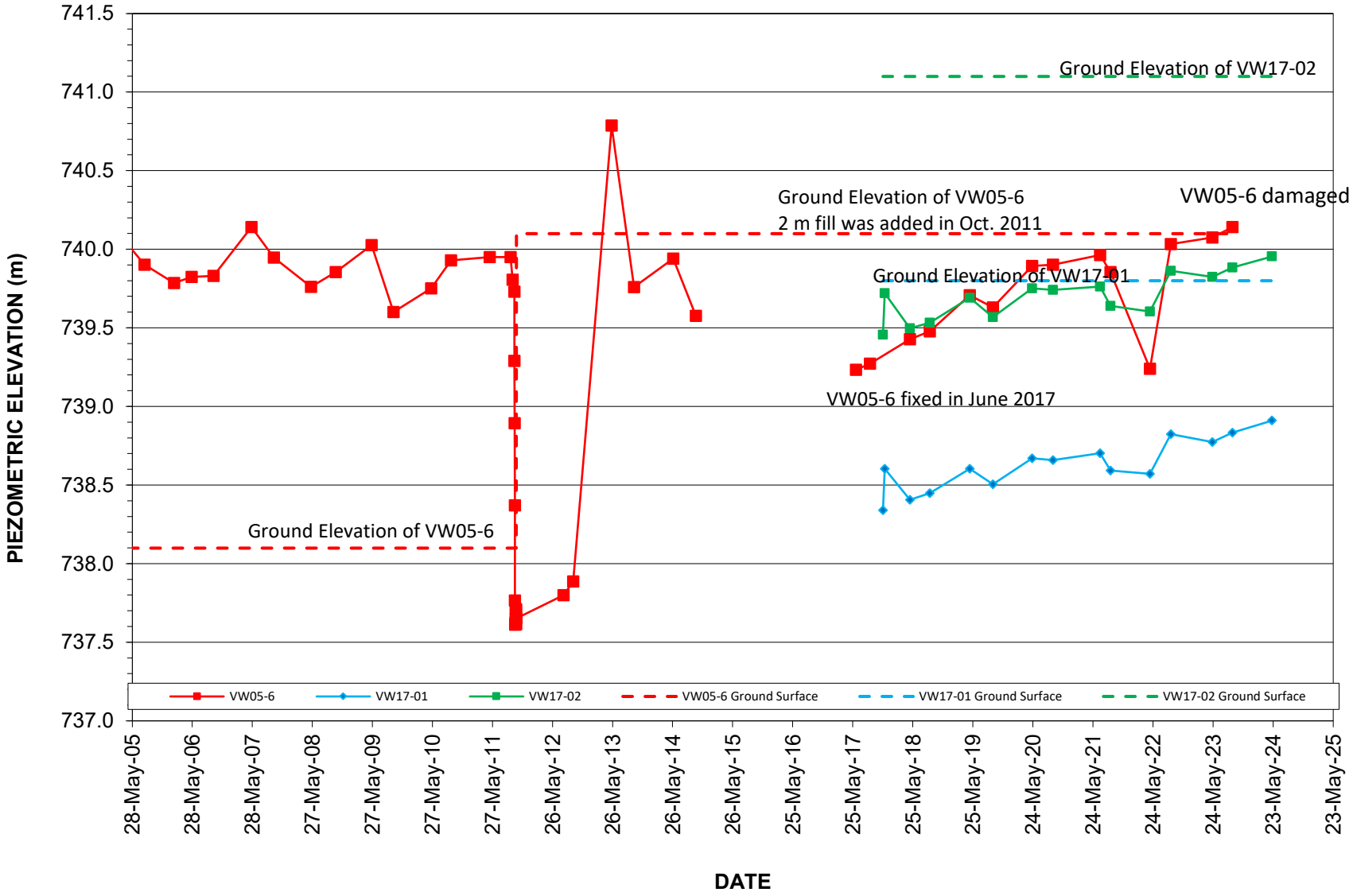
Transportation & Economic Corridors

PIEZOMETER DATA
NC13: HWY633:02, Cattlepass West



Stantec

PIEZOMETER DATA
NC13: HWY633:02, Cattlepass West



Stantec