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

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

## **1.0 OBSERVATIONS**

### **1.1 FIELD PROGRAM AND INSTRUMENTATION STATUS**

The Fall 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 Benjamin Lou, EIT and Olawale Odusi, Geotechnical Technologist on September 23, 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 a Slope Indicator VW Data Recorder PN 52613500.

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 Fall 2024 reading cycle.

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## **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 was 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 decreased by about 0.1 m from their historic maximum piezometric elevations. VW17-01 and VW17-02 showed a current piezometric level of 0.9 m and 1.1 m bgs, respectively.

## **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 Spring 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.

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**Table NC013-1: Fall 2024 Slope Inclinometer Reading Summary**

Instrument Name	Date Initialized	Coordinates <sup>(1)</sup> (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 345° 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 345° 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	642215	6 over 8.9m to 10.4m depth in 35° direction	2.9 between May 2022 and Sep 2022	Operational	May 15, 2024	<1	<1	0
				2 over 12.9 m to 14.9 m depth in 35° direction	1.6 between Jul 2021 and Sep 2021			<1	<1	<-1
Note: (1) Updated September 23, 2024, with approximate accuracy of ± 3 m.										

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**Table NC013-2: Fall 2024 Vibrating Wire Piezometer Reading Summary**

Instrument Name	Date Initialized	Coordinates <sup>(1)</sup> (UTM 11U, NAD1983) (m)		Tip Elevation (m) (aMSL) <sup>(2)</sup>	Ground Elevation <sup>(1)</sup> (m) (aMSL)	Current Status	Maximum Piezometric Elevation (m)	Measured Piezometric Elevation (Fall 2024) (m)	Previous Piezometric Elevation (Spring 2024) (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	642253	730.3	739.8	Operational	738.9 on May 2024	738.8 (1.0 m bgs)	738.9 (0.9 m bgs)	-0.1
VW17-02 (100D1701604)	Nov. 24, 2017	5942598	642215	727.4	741.1	Operational	740.0 on May 2024	739.9 (1.2 m bgs)	740.0 (1.1 m bgs)	-0.1
Note: (1) Updated September 23, 2024 with approximate accuracy of ± 3 m. (2) aMSL = Above Mean Sea Level										

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## **CLOSING**

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

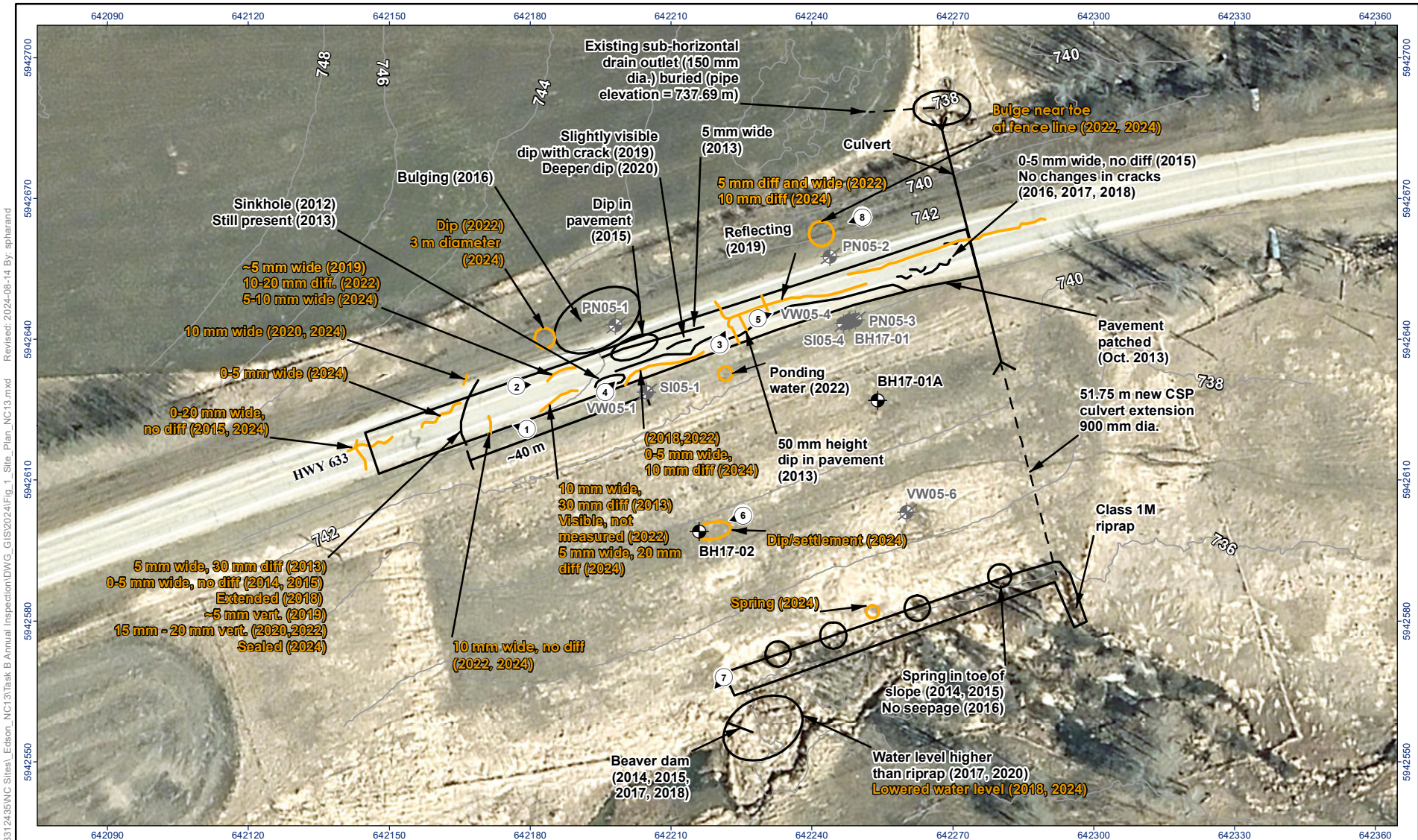
**Stantec Consulting Ltd.**

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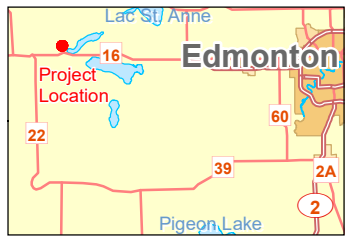
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Phone: 780-917-7247  
[xiteng.liu@stantec.com](mailto:xiteng.liu@stantec.com)

Attachment: Figure 1 – Site Plan  
S117-02 Slope Inclinator Plots  
Vibrating Wire Piezometer Depth vs Time Plot  
Vibrating Wire Piezometer Elevation vs. Time Plot

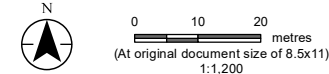




\ltd1001-c200\WORKGROUP\1233124-35\NC Siles\Edson\_NC131\Task B Annual Inspection\DWG\_GIS\2024\Fig\_1\_Site\_Plan\_NC13.mxd  
 Revised: 2024-08-14 By: spharand



- Photo Number and Direction
- Borehole Location
- Non-Operational Instrument
- Previous Observation
- 2024 Observation
- Ground Elevation Contours (m AMSL, LiDAR Nov. 2014)

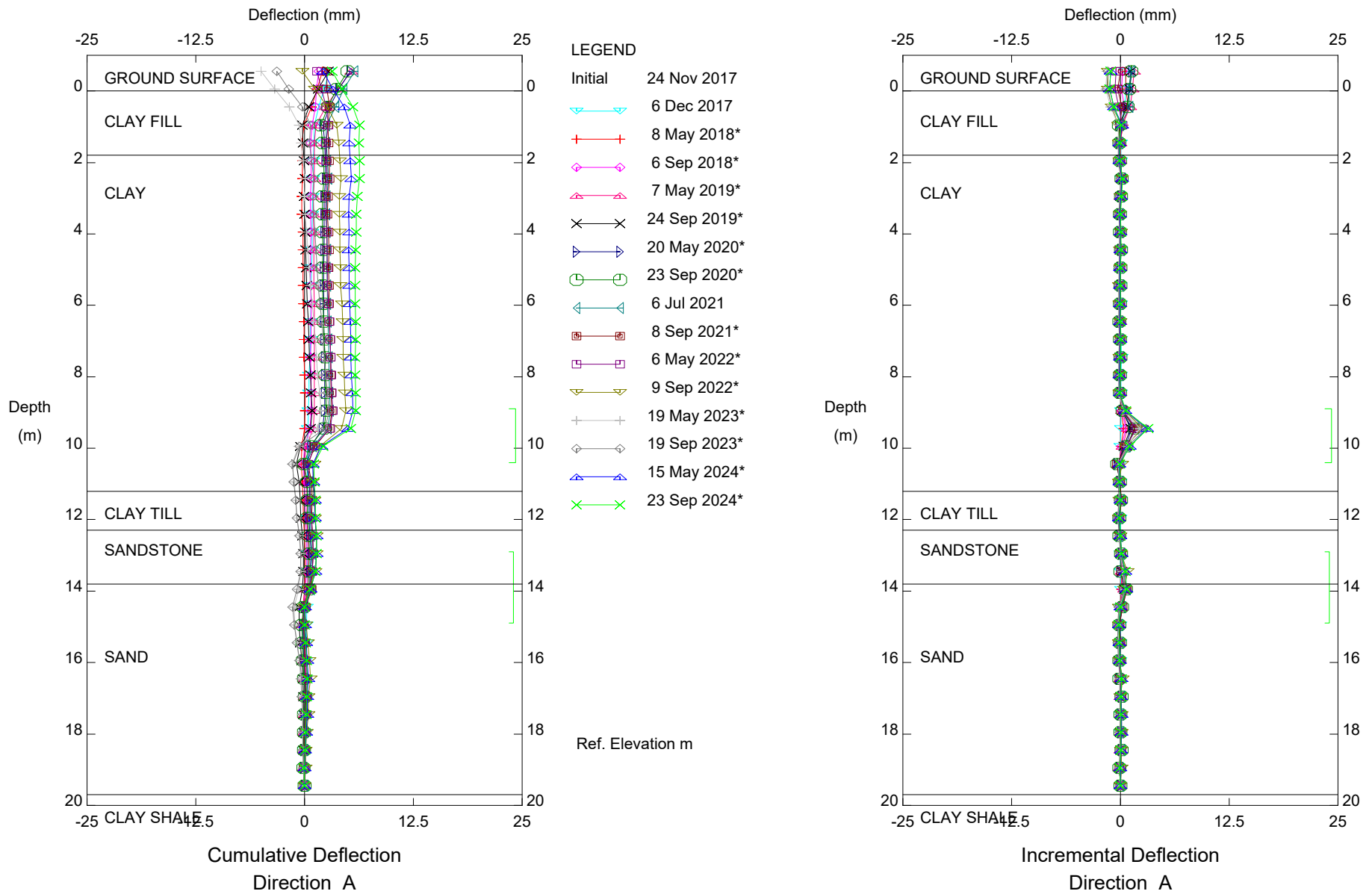


- Notes**
1. Coordinate System: NAD 1983 UTM Zone 11N
  2. Data Sources: Geogratix, ©Department of Natural Resources Canada, All rights reserved.
  3. Background: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Project Location: Hwy 633, Parkland County, Alberta  
 Prepared by SP on 2024-08-13, Quality Review by LC on 2024-08-14, Independent Review by XL on 2024-08-14  
 Client/Project: Alberta Transportation, Geohazard Monitoring Program, NC13 Cattle Pass West  
 123315222

Figure No. **1**  
 Title **Site Plan**



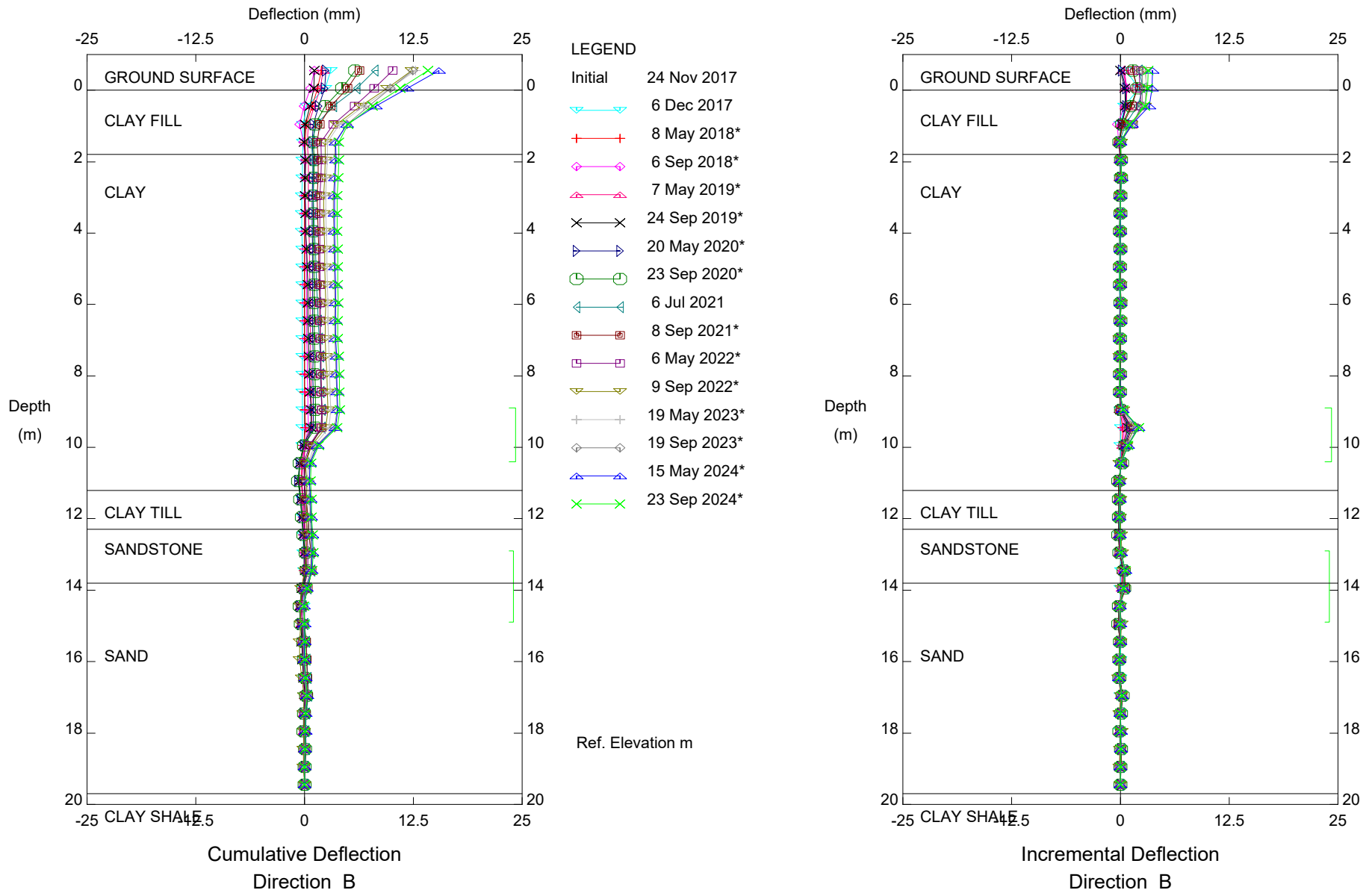


NC13, Inclinometer SI17-02

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



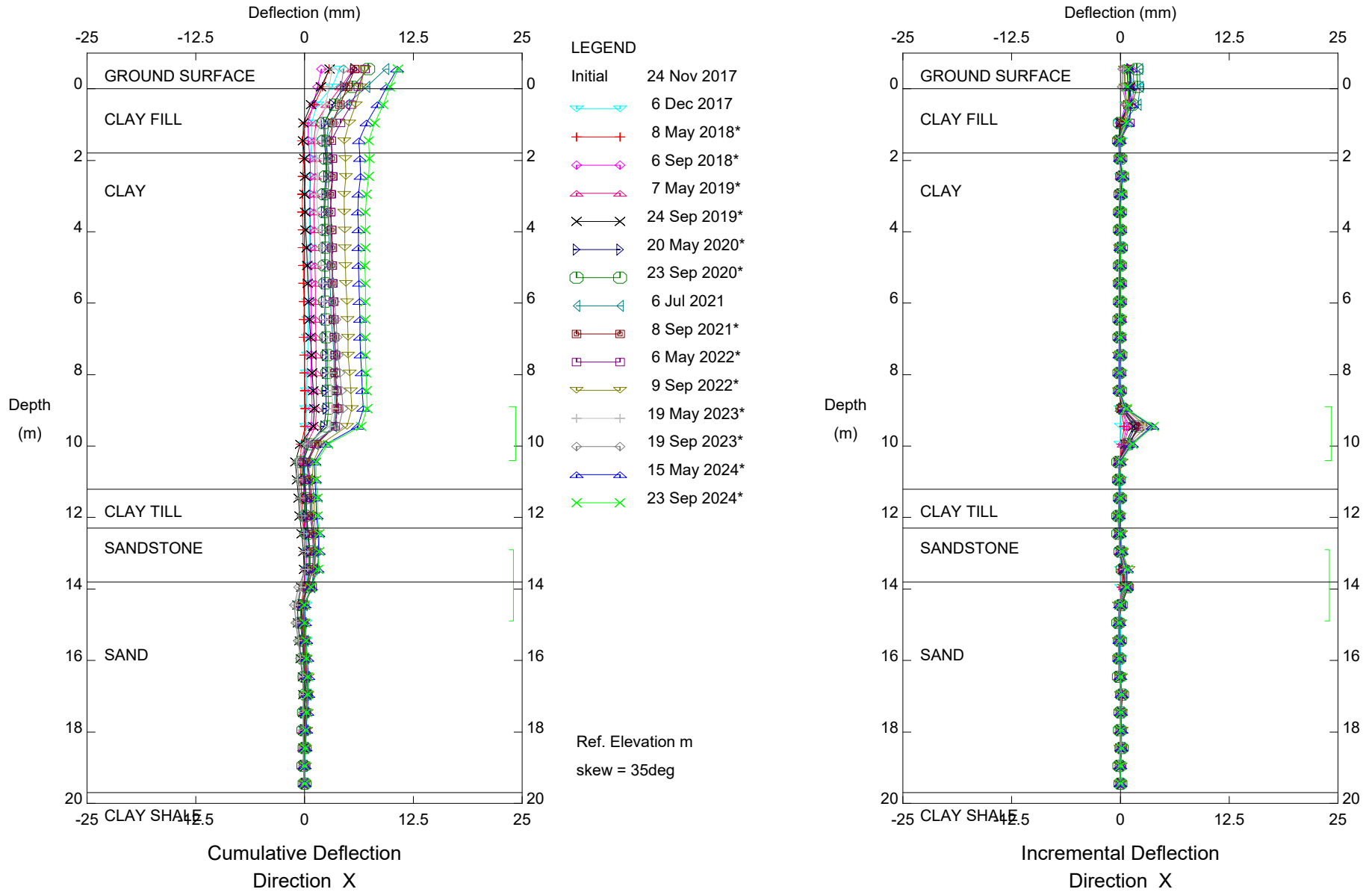


NC13, Inclinometer SI17-02

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

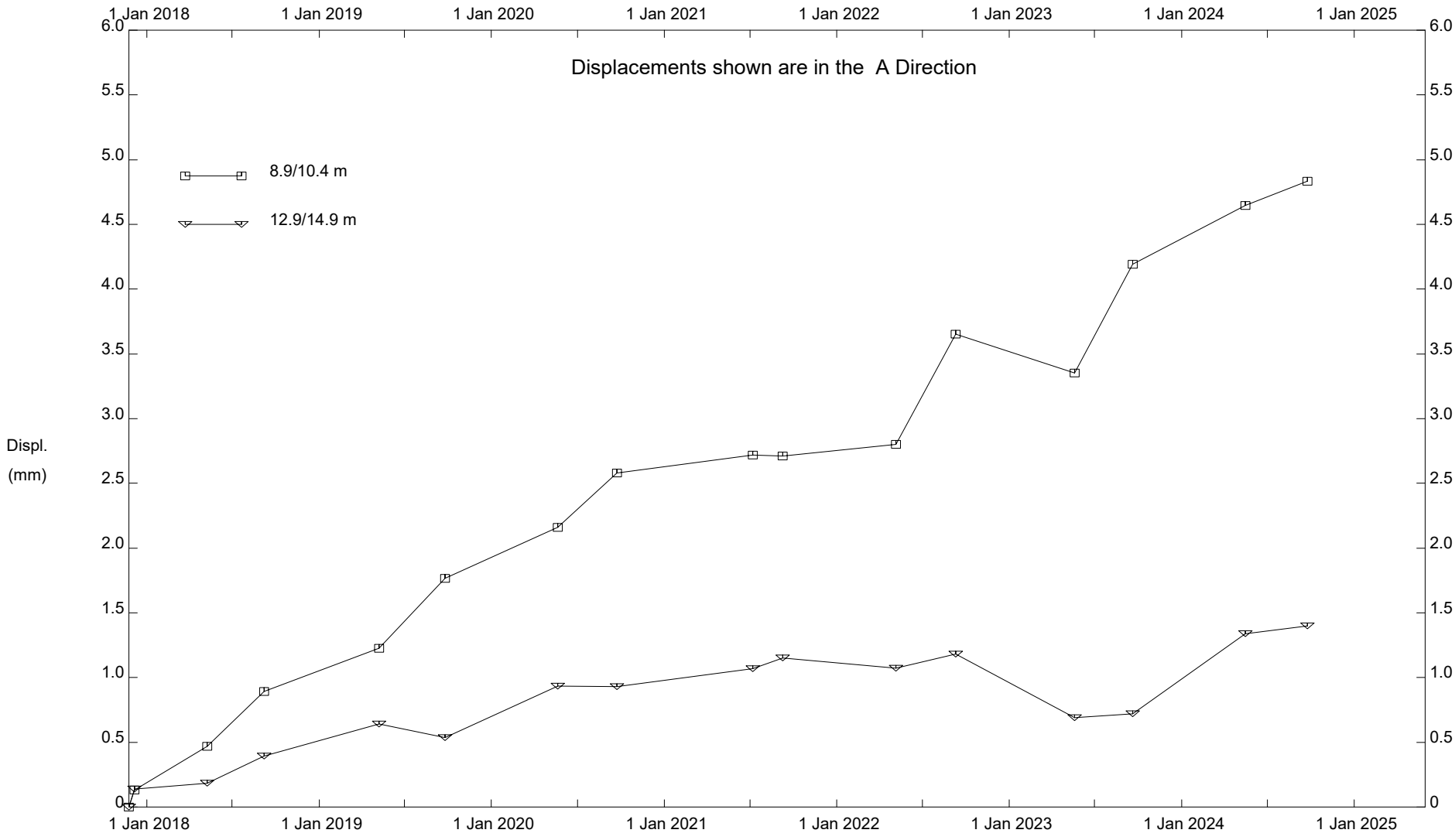




NC13, Inclinometer SI17-02

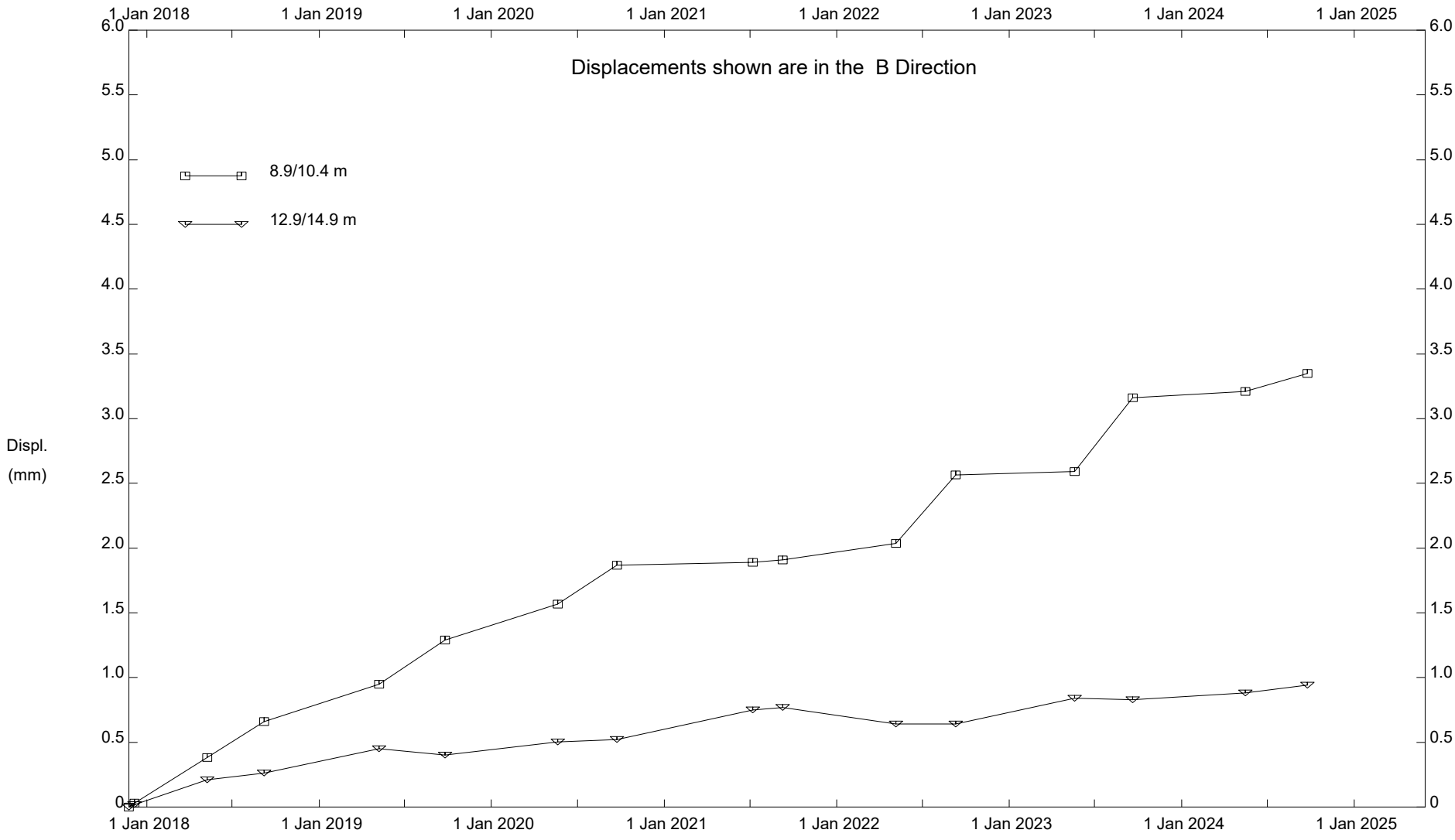
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Sets marked \* include zero shift and/or rotation corrections.



NC13, Inclinometer SI17-02

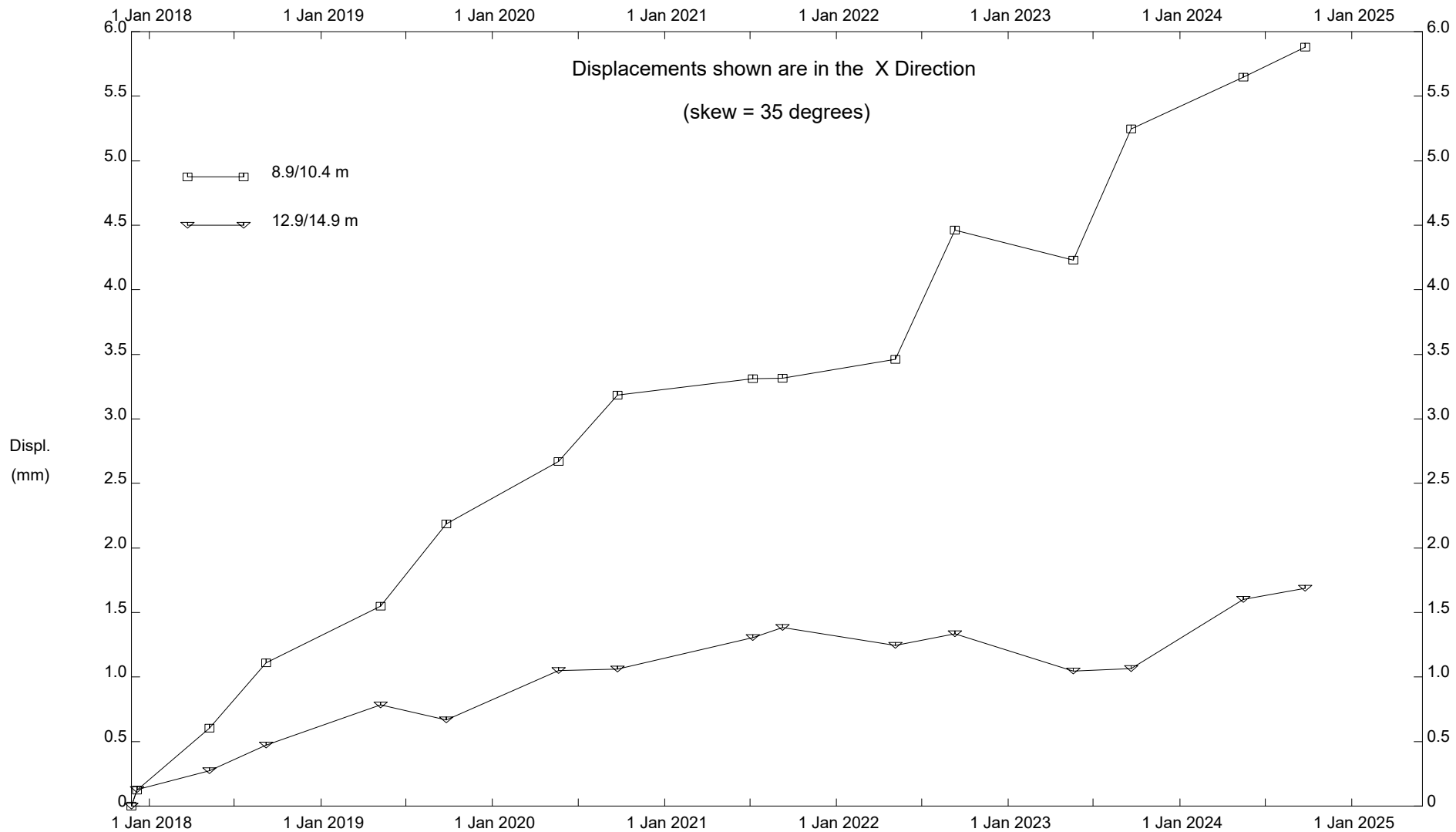
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NC13, Inclinometer SI17-02

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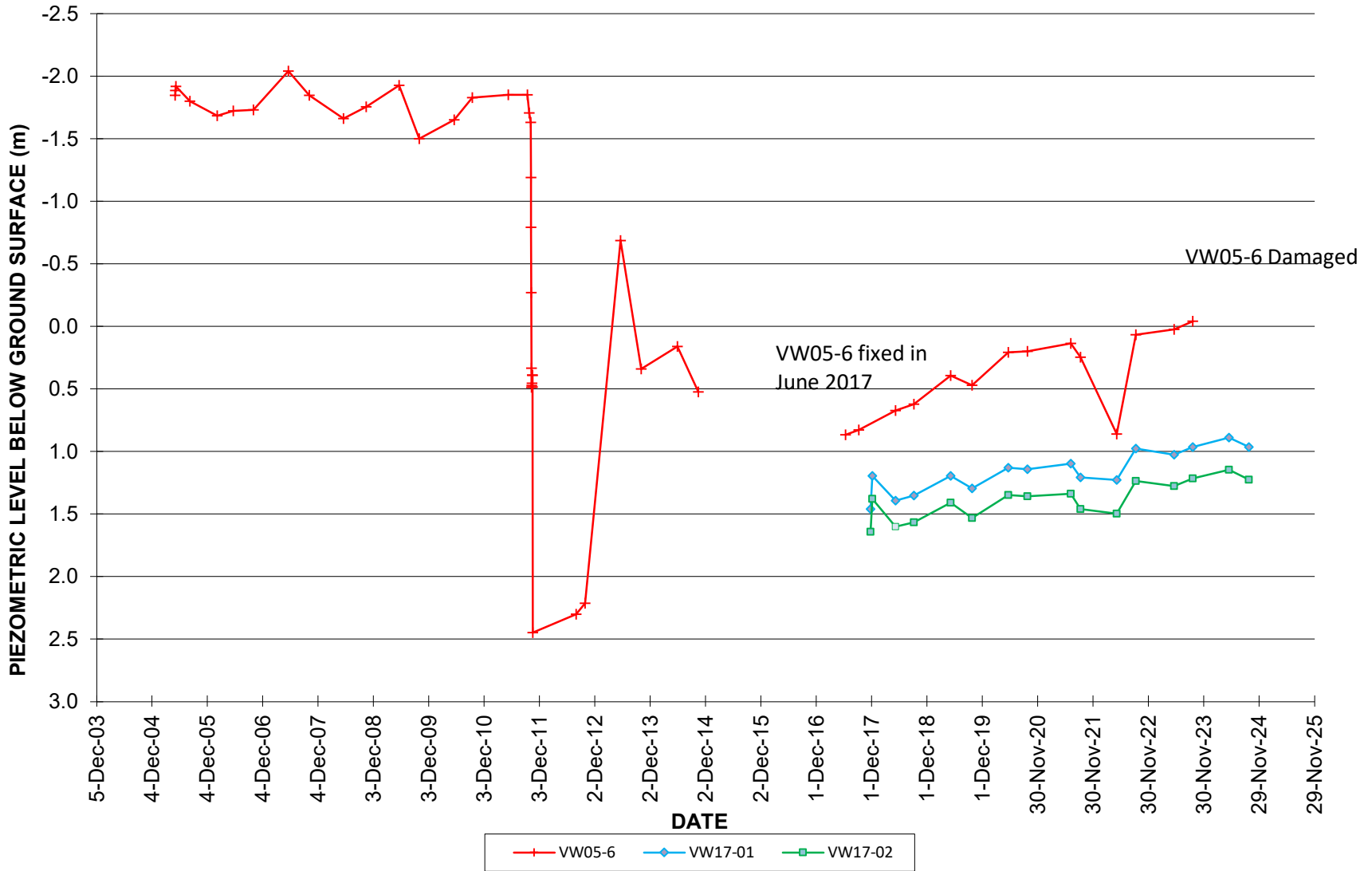
Stantec Consulting Ltd - Edmonton



NC13, Inclinometer SI17-02

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### PIEZOMETER DATA NC13: HWY633:02, Cattlepass West





### PIEZOMETER DATA NC13: HWY633:02, Cattlepass West

