Stantec

Memo

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 NC080 - Highway 47:06 Fickle Creek Slide, Spring 2024 Instrumentation Monitoring Report

1.0 OBSERVATIONS

1.1 FIELD PROGRAM AND INSTRUMENTATION STATUS

The Spring 2024 reading cycle consisted of instrument readings on one slope inclinometer (SI13-01) and two pneumatic piezometers (PN13-01 and PN13-02). Figure 1 attached provides a schematic of the site. The instruments were read by Andres Padros, Technician and Olawale Odusi, Geotechnical Technologist on May 13, 2024.

The slope inclinometer (SI) was measured using an RST MEMS digital inclinometer probe with 0.5 m increments and RST handheld PC. The pneumatic piezometers (PN) were read with an RST C109 readout box.

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

2.0 INTERPRETATION

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 are provided in Table NC80-1 and the attachments.

The PN groundwater level results are summarized in Table NC80-2 and in the following sections with resulting plots attached.

2.2 ZONES OF MOVEMENT

No new zones of movement were observed in any of the operational slope inclinometers. Directions of movement are referenced to the azimuth of the A+ groove in each SI casing in Table NC80-1.

Reference: **North Central Region, Edson, Site NC080 - Highway 47:06 Fickle Creek Slide, Spring 2024 Instrumentation Monitoring Report**

2.3 INSTRUMENTATION READINGS

2.3.1 Slope Inclinometers

SI13-01 had an average movement rate of approximately 8 mm/yr between 1.8 m to 3.8 m depth since the completion of pile wall installation near the end of 2013 to Fall 2020. From Fall 2020 to Spring 2023, little to no movement was observed. The rate of movement observed during this reading cycle is just under 5 mm/yr.

2.3.2 Piezometers

The groundwater level in PN13-01 increased by 1.1 m compared to the previous Spring 2023 reading cycle. PN13-02 also showed an increase in piezometric level by 0.6 m. The current piezometric levels are at 1.9 m and 6.0 m below ground surface in PN13-01 and PN13-02, respectively.

3.0 RECOMMENDATIONS

FUTURE WORK

It is recommended that the next reading cycle take place in Spring 2025.

3.1 INSTRUMENTATION REPAIRS

No instruments require repair at this time.

Reference: **North Central Region, Edson, Site NC080 - Highway 47:06 Fickle Creek Slide, Spring 2024 Instrumentation Monitoring Report**

Table NC80-1: 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							
SI13-01	Aug. 28, 2013	5918626	522508	153 over 1.8 m to 3.8 m depth in 349^0 direction	540 on Oct. 2013 (during construction); 57 on Sept. 2017 (post construction)	Operational	May 3, 2023	5	5	4
(1) Updated May 13, 2024, with approximate accuracy of ± 3 m										

Table NC80-2: Spring 2024 Piezometer Reading Summary

Instrument Name	Date Initialized	Coordinates (1) (UTM 11U, NAD1983) (m)		Bottom/Tip Elevation (m)	Current Status	Maximum Piezometric Level (m bgs)	Measured Water Level, (May 13, 2024) (m bgs) (Elevation)	Previous Water Level, (Spring 2023) (m bgs) (Elevation)	Change in Water Level (m)
		Northing	Easting						
PN13-1 (34189)	Aug. 23, 2013	5918636	522511	951.6	Operational	-1.2 (953.8) June 2017	1.9 (952.8 m bgs)	3.0 (951.7 m bgs)	1.1
PN13-2 (34190)	Aug. 23, 2013	5918636	522511	948.0	Operational	3.8 (949.2) June 2017	6.0 (948.7 m bgs)	6.6 (948.1 m bgs)	0.6
(1) Updated May 13, 2024, with approximate accuracy of ± 3 m.									

Reference: **North Central Region, Edson, Site NC080 - Highway 47:06 Fickle Creek Slide, Spring 2024 Instrumentation Monitoring Report**

4.0 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
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June 18, 2024
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Attachment:
Figure 1 – Site Plan
SI13-01 Slope Inclinometer Plots
Pneumatic Piezometer Elevation vs. Time Plot
Pneumatic Piezometer Depth 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

EROSION UP TO 450mm DEEP AND 500mm WIDE EXTENDING TO ABOUT 2m FROM NORTH TREELINE (2021, 2022)

EROSION GULLY FROM CLEARING TO ACCESS PIPE LINING
UP TO 300 mm WIDE (2016) VEGETATION GROWING IN (2017)
EROSION GULLY (2018)
1.5 m WIDE, 1 m DEEP (2019)
UP TO 2 m WIDE x 1 m DEEP (2020, 2021, 2022)

CULVERT LIFTED. WATER FLOWING UNDER CULVERT (2018)
SAME WATER ENTERING FROM NEXT SEGMENT
APPROX. 2-3 m in (2019, 2022)

EROSION GULLY (VEGETATED) (2022)

1.2 m EROSION BELOW PIPE (2016)
NO CHANGE (2017, 2018, 2019),
DRAIN FLOWING, HIGH WATER BELOW (2020)
DRY (2021)
INTERMITTENT FLOW (2022)

0 - 5 mm WIDE, NO DIFF (2015)

SOFT SPONGE LIKE GROUND (2015)

0 - 5 mm WIDE, NO DIFF (2015)

SHADOW OF CRACK REFLECTING THROUGH PATCH 2-5 mm DIFF (2014)

SLIGHT DIP TO THE EAST. CRACKS UP TO 20 mm WIDE (2020)
~25mm DIP (2021)
DIP MORE APPARENT (2022)

HAIRLINE CRACKS OUTSIDE OF GUARDRAIL (2021)
NOT OBSERVED (2022)

PATCHED (AUGUST 2014)

MILLED AND FILLED IN SEPTEMBER 2015
NO CRACKS (2016, 2017)

0 - 25 mm WIDE, NO DIFF (2015)

PAVEMENT CRACKS (2018)

PAVEMENT CRACKS (2019)

CRACK RESURFACED (2020)

TO EDSON

1200 mm Ø CULVERT

760 mm Ø CULVERT

400 mm Ø DOWNDRAIN

SHOULDER CRACKS (2014)

TENSION CRACK (2014)

SLOUGH AROUND GUARD RAIL POST (2015)

DIP IN PAVEMENT (2015)

PAVEMENT CRACK

PILE WALL INSTALLED (FALL 2013)

SIDE SLOPE RE-GRADED (FALL 2014)

PN13-01
PN13-02

SI13-02

SI13-01

SP13-01

TOE BULGE (2016)

PONDED WATER ON TEMPORARY BENCH (2014)
DRY (2016)

TOE BULGE

TREE LINE

SURFACE EROSION (2016-2020)

1200 mm Ø CULVERT RE-LINED (2014)
RIP RAP AROUND CULVERT (2016)
DRAINING (2017, 2018, 2019)

EROSION FEATURE

SLUMP 2 m WIDE,
1 m DEEP SCARP (2020)
SCARP 4 m BACK FROM EDGE OF CREEK AND 1.2 m DEEP (2021)
PROGRESSING SOUTH (2022)

SURFACE EROSION (2018)
MINOR SLUMPING (2019)

EXTENDED DOWNSLOPE (2019)

1.2 m WIDE AND DEEP SCOUR HOLE/EROSION.
SATURATED (2020, 2021)
MAX 2.2 m DEEP, 1.2 m WIDE (2022)

HWY 47:06

950 955 960 955 957 958 959 960

LEGEND

- FLOW ARROW
- CONTOUR (5 m INTERVAL)
- WATER COURSE
- PIEZOMETER LOCATIONS
- SLOPE INCLINOMETER LOCATIONS
- DRIVEN STEEL PILE
- ① → PHOTO NUMBER AND DIRECTION

NOTES

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. PREVIOUS OBSERVATIONS SHOWN IN BLACK.
3. 2015-2021 OBSERVATIONS SHOWN IN RED
4. 2022 OBSERVATIONS SHOWN IN BLUE

REFERENCE

LIDAR CONTOURS OBTAINED FROM CLIENT.

0 8 16 24
SCALE METRES

Stantec
STANTEC CONSULTING
400-10220 103 AVENUE NW
EDMONTON, ALBERTA, CANADA
T5J 05A

ALBERTA TRANSPORTATION
GEOHAZARD MONITORING PROGRAM
NC80 FICKLE CREEK SLIDE
SITE PLAN

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

FIGURE - 1 -

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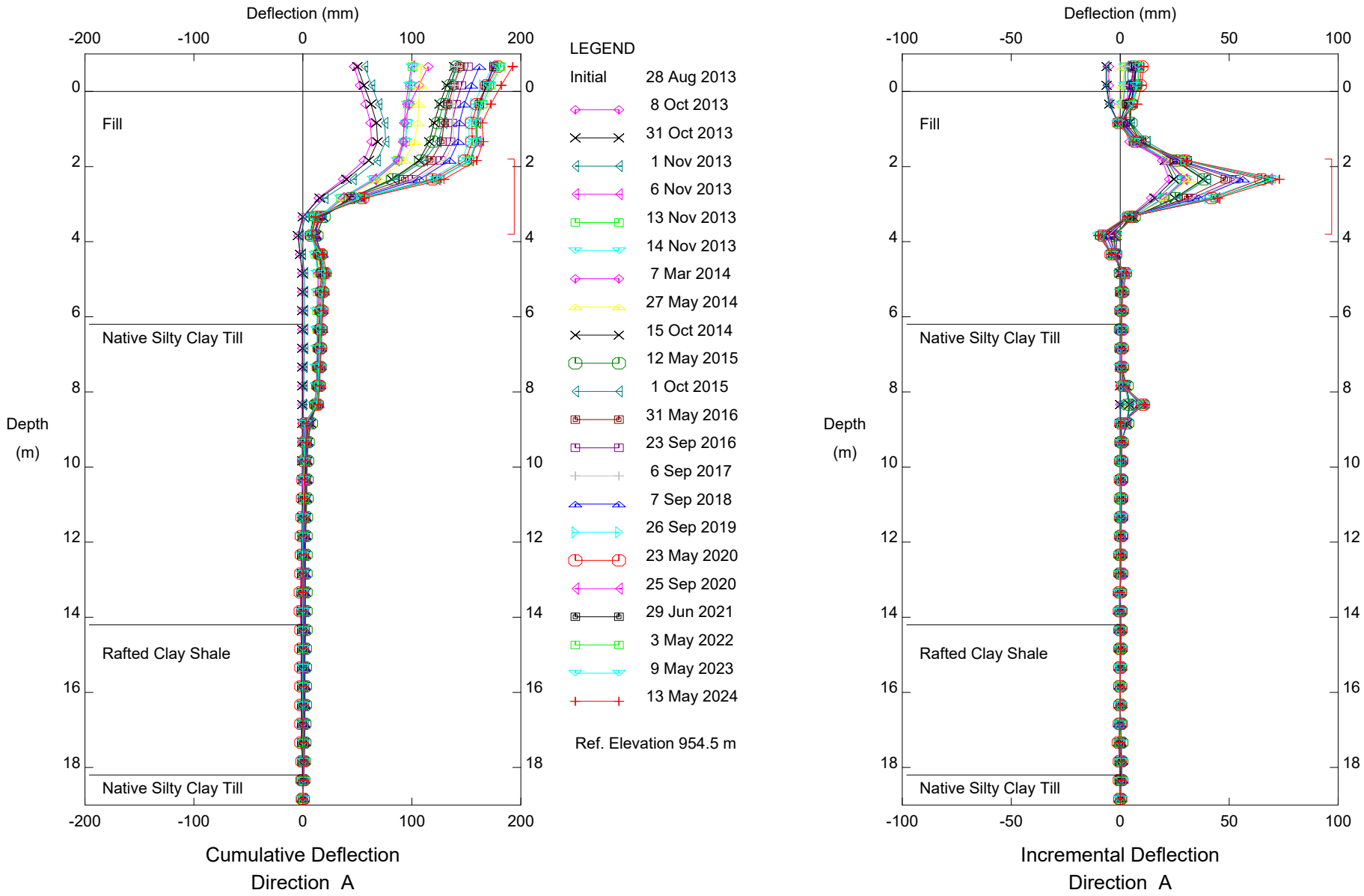

Cumulative Deflection
Direction A

Incremental Deflection
Direction A

HWY 47:06 Fickle Creek Slide (NC80), Inclinometer SI13-01

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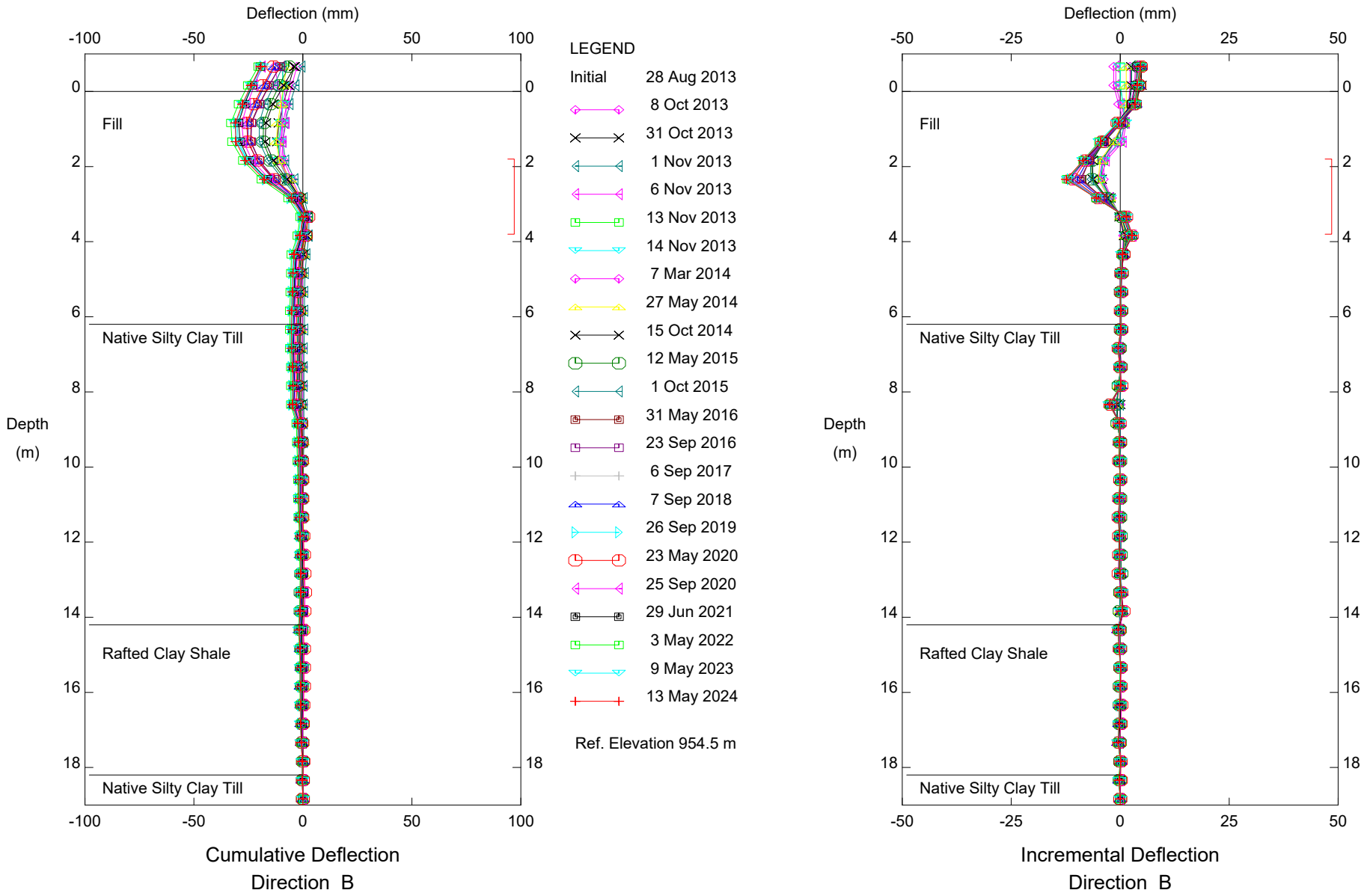

Cumulative Deflection
Direction B

Incremental Deflection
Direction B

HWY 47:06 Fickle Creek Slide (NC80), Inclinometer SI13-01

Transportation & Economic Corridors

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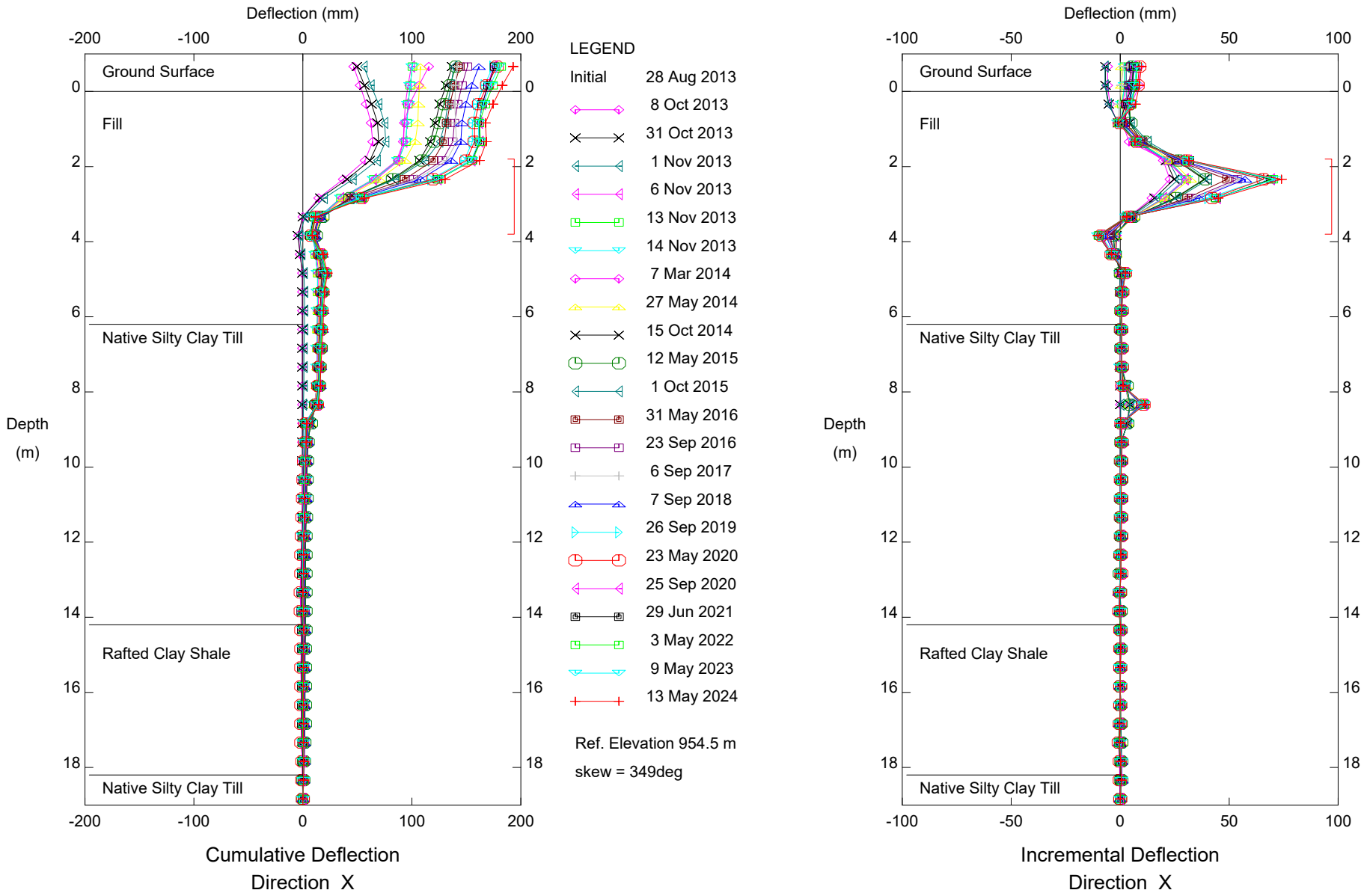

HWY 47:06 Fickle Creek Slide (NC80), Inclinometer SI13-01

Transportation & Economic Corridors

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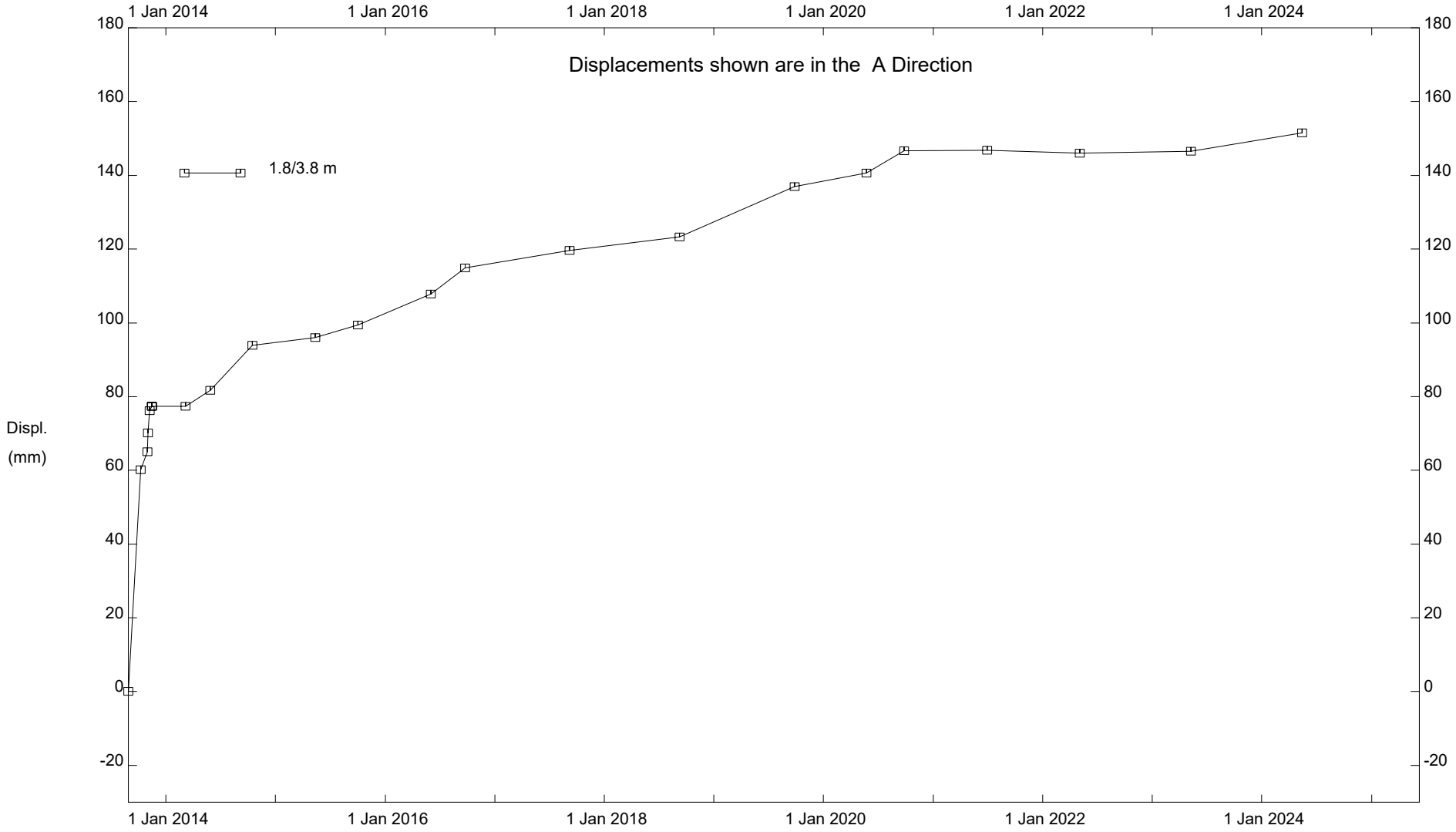

HWY 47:06 Fickle Creek Slide (NC80), Inclinometer SI13-01

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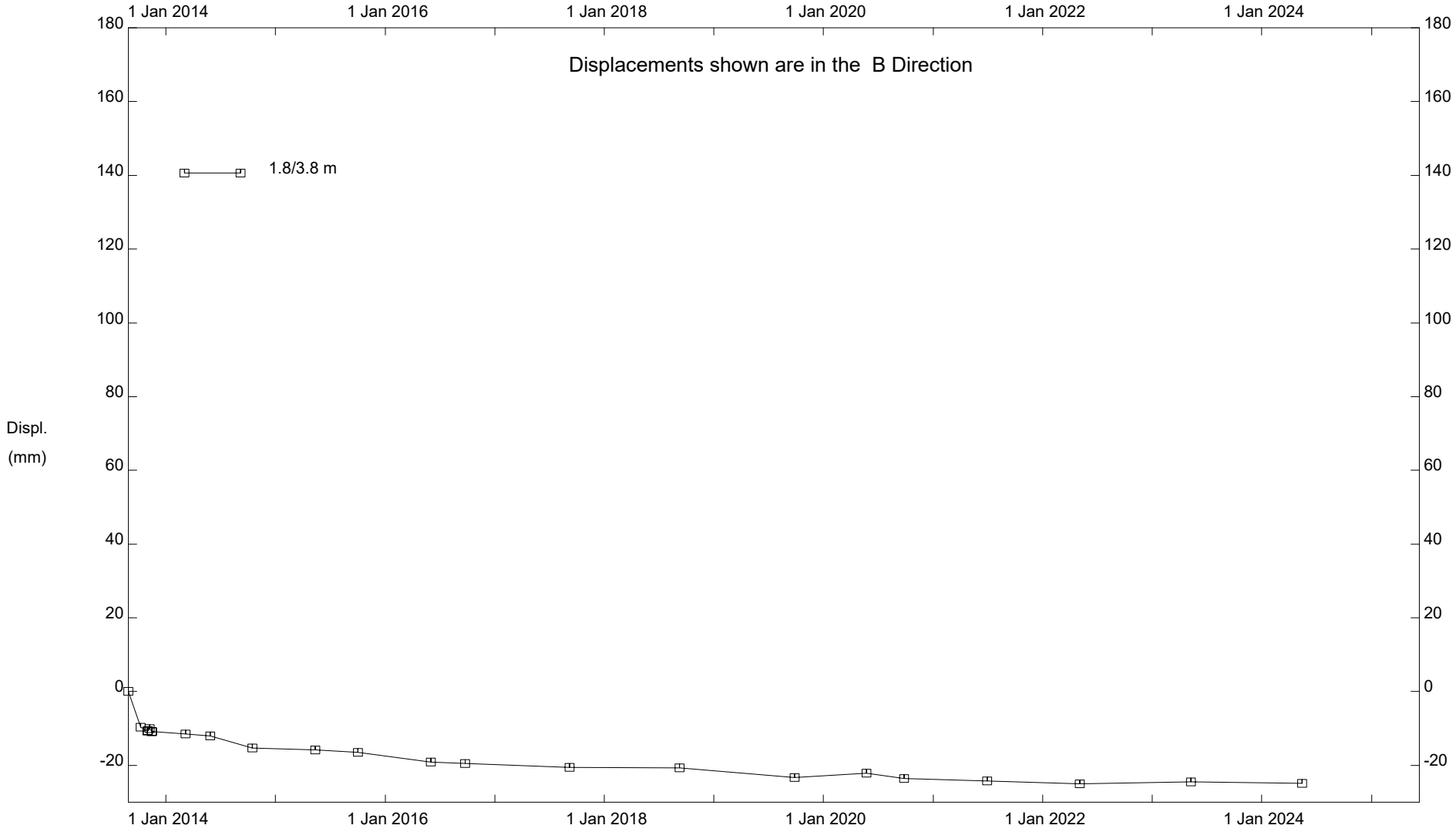

HWY 47:06 Fickle Creek Slide (NC80), Inclinometer SI13-01

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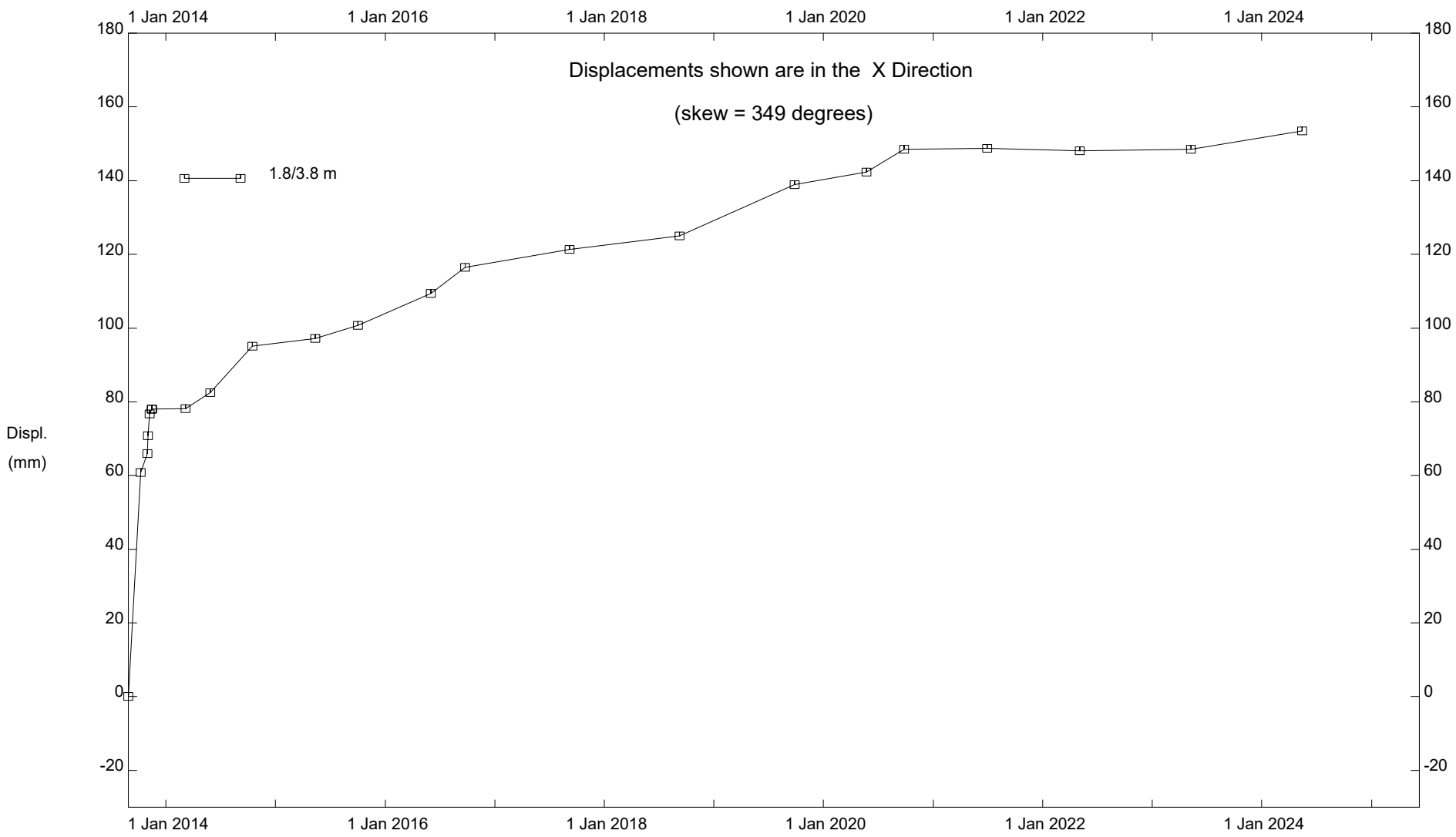

HWY 47:06 Fickle Creek Slide (NC80), Inclinometer SI13-01

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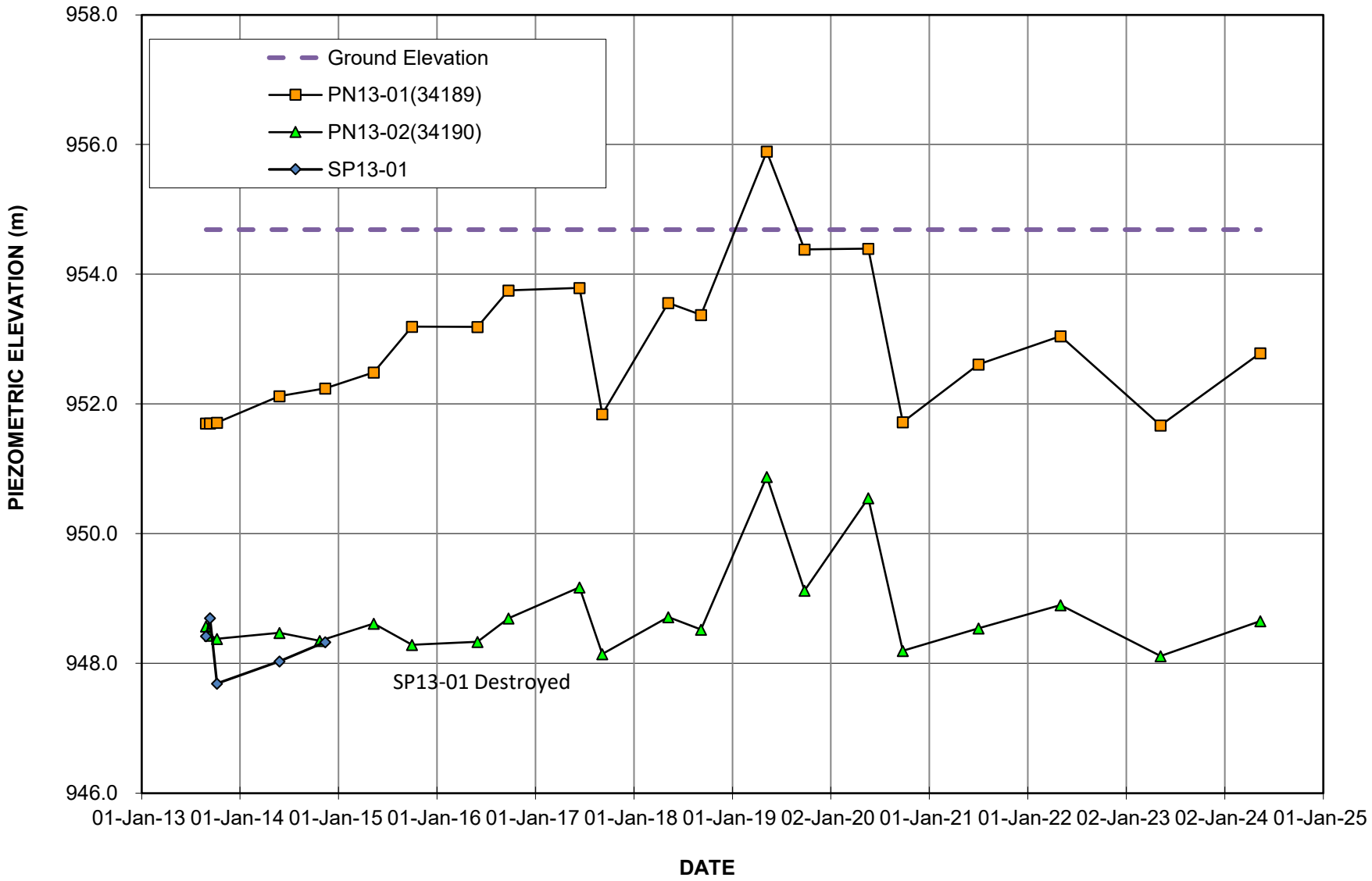
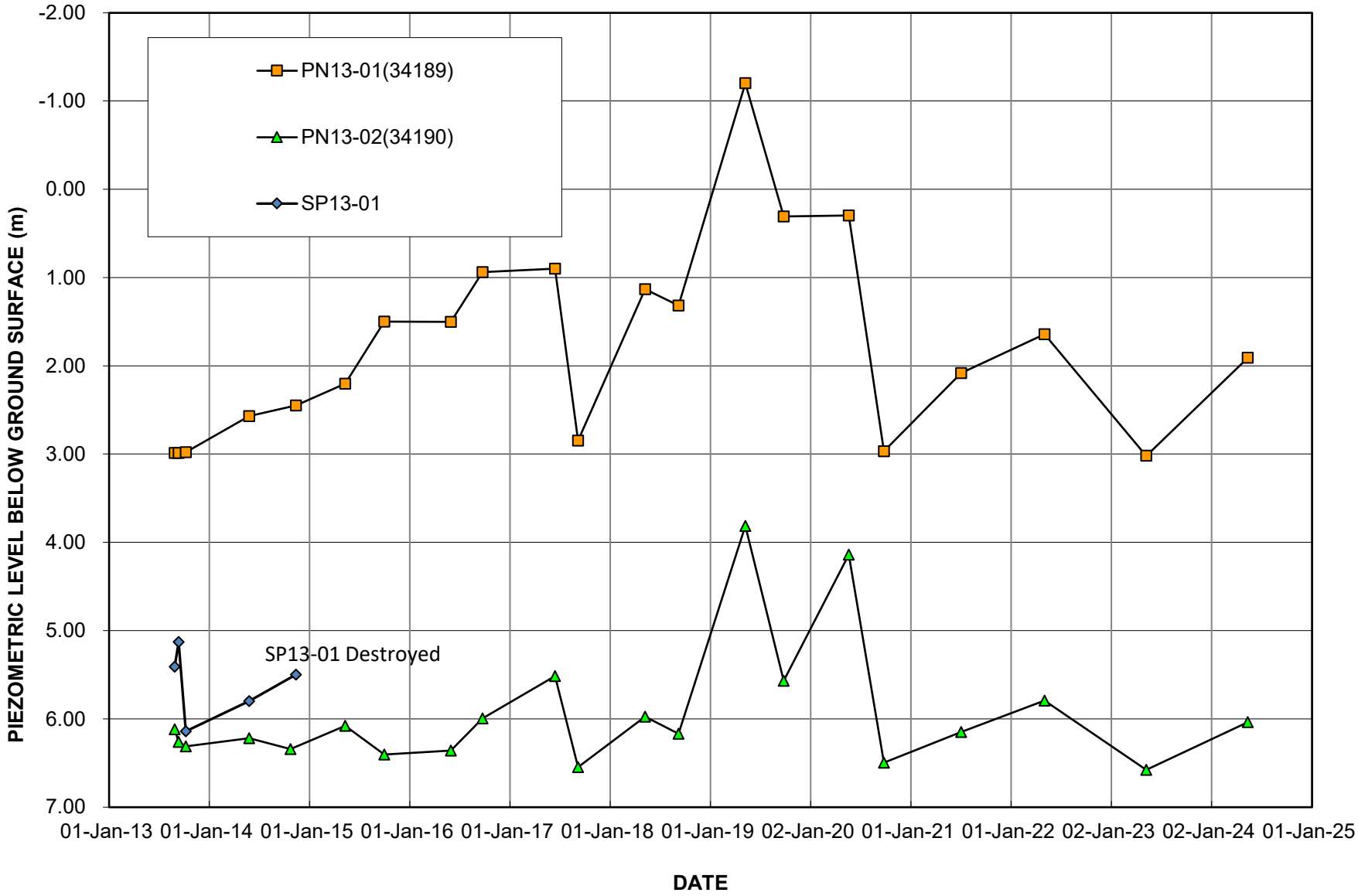
PIEZOMETRIC DATA (Post Construction)
NC 80: HWY 47:06 Fickle Creek Slide



PIEZOMETRIC DATA (Post Construction)
NC 80: HWY 47:06 Fickle Creek Slide



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