

TECHNICAL MEMORANDUM

DATE June 7, 2021

Project No. 20138294

TO Vanessa Heilman, P.Eng.
City of Saskatoon

CC Hung Vu; Greg Misfeldt

FROM Blaise Wilson; Phil Bruch

EMAIL blaise_wilson@golder.com;
phil_bruch@golder.com

NUTANA SLOPE INSTABILITY UPDATE – MAY 2021

This memorandum presents monitoring data for the slope failures (referred to as the west slide and east slide) at the Nutana Slope Instability site. Locations of survey pins are shown in Figure 1. Locations of slope inclinometers, piezometers, settlement points, crack meters, and tilt plates are shown in Figure 2. Locations of the Saskatoon Light & Power (SL&P) tilt plates and survey pins installed on power poles are shown in Figure 3.

The west slide occurred in June 2012 and impacted a slope area approximately 70 m (230 ft) long and 40 m (130 ft) wide. It is most pronounced in the back yards of 229, 231, 233/235, and 237/239 11th Street East, through the back alley, and into the back yard of 222 Saskatchewan Crescent East.

The east slide occurred in June 2013 and impacted a slope area of approximately 50 m (165 ft) long and 30 m (100 ft) wide. It is most pronounced in the back yards of 303, 305, 307, and 309 11th Street East, through the back alley, and into the back yard of 306, 310 and 316 Saskatchewan Crescent East.

The monitoring results and photographs from this monitoring period are attached. A summary of the monitoring results is provided below.

Survey Pin Data:

- Monitoring of the survey pins at the site was not performed during this monitoring period.

Slope Inclinometer Data:

- Inclinometer COS-13-002 indicated insignificant movement (less than 2 mm or 0.08 in) between August 13, 2020 and May 31, 2021.
- Inclinometer COS-13-004 indicated insignificant movement (less than 2 mm or 0.08 in) between August 13, 2020 and June 3, 2021.
- As discussed in the previous monitoring update, the inclinometer casing for COS-13-005 was cut off by approximately 6.5 centimetres (2.6 inches) in 2020. During this monitoring period the August 13, 2020 reading was used as a new baseline. Inclinometer COS-13-005 indicated insignificant movement (less than 2 mm or 0.08 in) between August 13, 2020 and May 31, 2021.
- Inclinometer COS-13-006 was decommissioned in 2020 and will no longer be read.

- Inclinometer 20-109 was installed in 2020 and Golder collected a baseline reading in October 2020. This inclinometer indicated less than 2.5 mm (0.10 in) of movement between October 28, 2020 and May 31, 2021.
- Inclinometer 20-111 was installed in 2020 and a baseline reading was collected in October 2020. This inclinometer indicated insignificant movement (less than 2 mm or 0.08 in) between October 28, 2020 and May 31, 2021.

Vibrating Wire (VW) & Standpipe Piezometer Data:

- Piezometers were monitored by the City of Saskatoon during this period and are not presented in this memorandum.

Tilt Plate Data:

- The results of tilt plate monitoring are shown on Figure 4 for the City of Saskatoon tilt plates, and in Figure 5 for the tilt plates installed on SL&P power poles.
- Tilt plates TP4, TP5, TP6, and TP7 indicate insignificant changes in angle of tilt (less than 0.05 degrees) between August 13, 2020 and May 31, 2021.
- Tilt plates SLP4, SLP5, and SLP 6 indicated insignificant changes in angle of tilt (less than 0.05 degrees) between August 13, 2020 and May 31, 2021.
- Tilt plate SLP3 indicated a change in angle of tilt of approximately 0.47 degrees, towards the north, between August 13, 2020 and May 31, 2021.

Crack Meter Data:

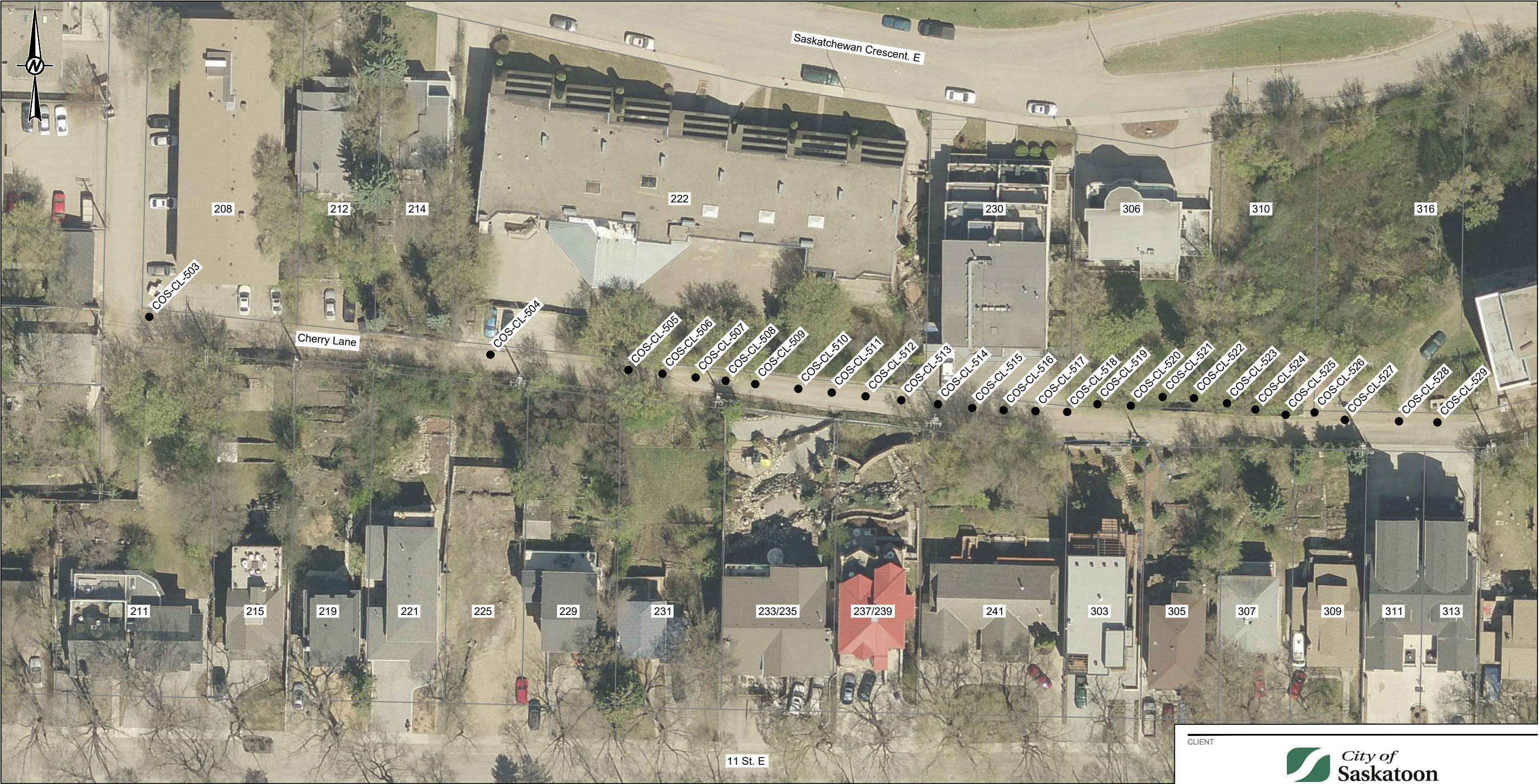
- Crack meters were not read during this monitoring period.

Settlement Points:

- Settlement points were not read during this monitoring period

[https://golderassociates.sharepoint.com/sites/122189/project files/5 technical work/monitoring/reports/3. may 2021/20138294 - nutana monitoring data update memo_may21.docx](https://golderassociates.sharepoint.com/sites/122189/project%20files/5%20technical%20work/monitoring/reports/3.%20may%202021/20138294%20-%20nutana%20monitoring%20data%20update%20memo_may21.docx)

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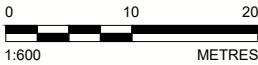


LEGEND

- PIN LOCATION
- 303 LOT NUMBER

REFERENCE(S)

AERIAL PHOTOGRAPH PROVIDED BY CITY OF SASKATOON, MAY 15, 2011
CITY OF SASKATOON DATUM



CLIENT



PROJECT

NUTANA SLOPE INSTABILITY

TITLE

INSTRUMENTATION PLAN No. 1

CONSULTANT



GOLDER
MEMBER OF WSP

YYYY-MM-DD 2020-06-02

DESIGNED BW

PREPARED JMC

REVIEWED

APPROVED

PROJECT NO.
20138294

PHASE
1000

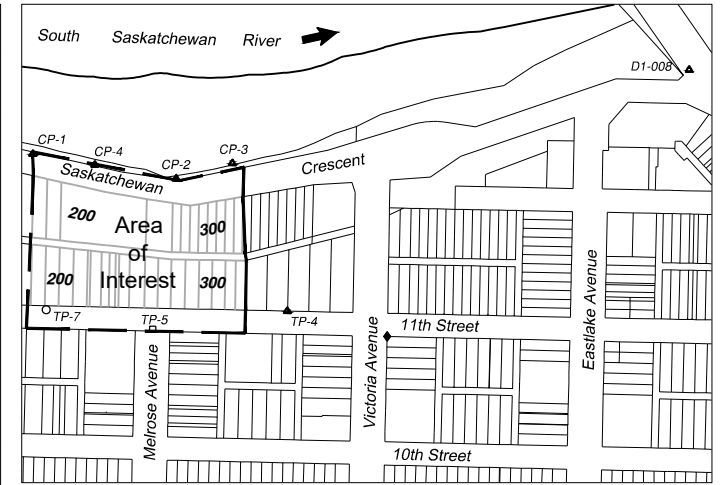
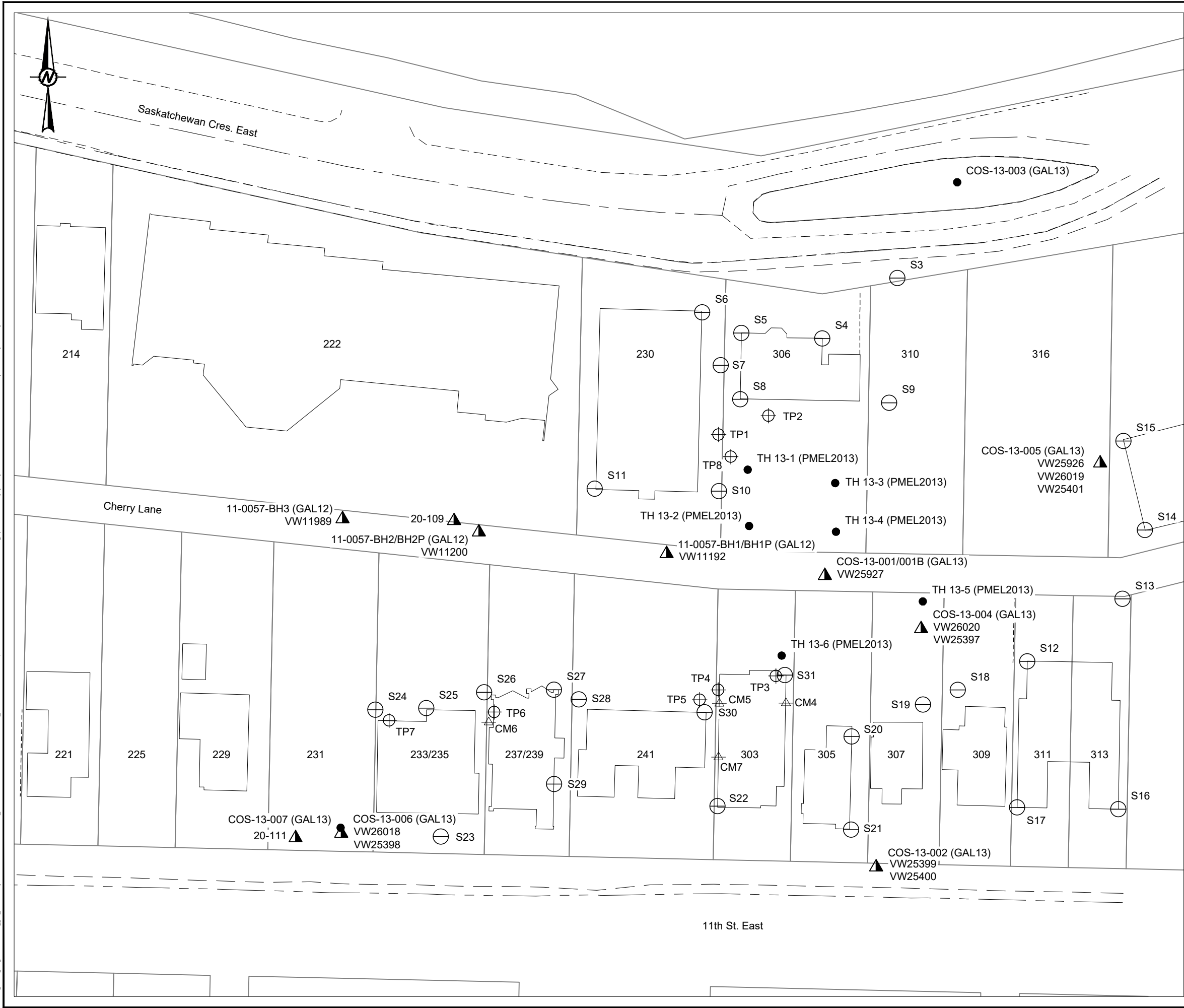
REV.
A

FIGURE
1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

25 mm

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CONTROL POINTS				
COORDINATE TABLE NAD 83 (CSRS)			UTM ZONE 13	
POINT	NORTHING (m)	EASTING (m)	ORTHOMETRIC ELEVATION (m) HTv2.0	DESCRIPTION
CP-1	5,775,701.84	385,897.84	477.97	24" REBAR WITH PLASTIC CAP
CP-2	5,775,680.32	386,022.25	478.99	24" REBAR WITH PLASTIC CAP
CP-3	5,775,693.72	386,071.10	479.49	24" REBAR WITH PLASTIC CAP
CP-4	5,775,692.40	385,951.67	477.95	GPS CONTROL POINT
TP-4	5,775,565.50	386,118.76	499.32	X IN CONCRETE
TP-5	5,775,549.79	386,001.87	498.05	X IN NORTH RIM CATCH BASIN
TP-7	5,775,566.48	385,909.52	491.32	X IN SOUTH RIM MANHOLE
TP-8	5,775,560.37	385,809.26	484.62	X IN WEST RIM MANHOLE
D1-008	5,775,775.85	386,467.62	499.033	CONTROL TABLET

LEGEND	
	SETTLEMENT POINT LOCATION
	TELL-TALE CRACK LOCATION MONITOR
	TILT PLATE LOCATION
	SI & VIBRATING WIRE PIEZOMETER LOCATION
	STANDPIPE PIEZOMETER LOCATION
303	LOT NUMBER

REFERENCE(S)
LOT LOCATIONS PROVIDED BY CITY OF SASKATOON
CITY OF SASKATOON DATUM

0 10 20
1:600 METRES

CLIENT

PROJECT
NUTANA SLOPE INSTABILITY

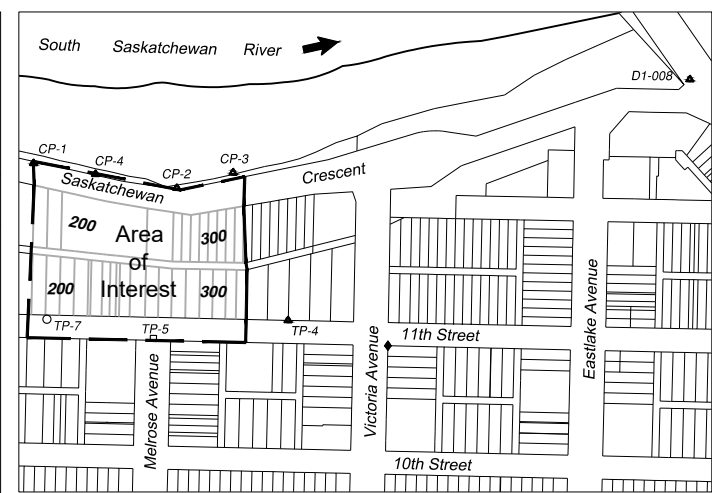
TITLE
INSTRUMENTATION LOCATION PLAN No. 2

CONSULTANT	YYYY-MM-DD	2020-06-02
 MEMBER OF WSP	DESIGNED	BW
	PREPARED	JMC
	REVIEWED	
	APPROVED	

PROJECT NO.	PHASE	REV.	FIGURE
20138294	1000	A	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

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CONTROL POINTS				
COORDINATE TABLE NAD 83 (CSRS)			UTM ZONE 13	
POINT	NORTHING (m)	EASTING (m)	ORTHOMETRIC ELEVATION (m) HTv2.0	DESCRIPTION
CP-1	5,775,701.84	385,897.84	477.97	24" REBAR WITH PLASTIC CAP
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TP-8	5,775,560.37	385,809.26	484.62	X IN WEST RIM MANHOLE
D1-008	5,775,775.85	386,467.62	499.033	CONTROL TABLET

LEGEND	
	TILT PLATE LOCATION
	POWER POLE LOCATION
	LOT NUMBER
	VECTOR OF TILT OF POLES (MAY 5, 2015)

REFERENCE(S)
LOT LOCATIONS PROVIDED BY CITY OF SASKATOON
CITY OF SASKATOON DATUM

0 12.5 25
1:750 METRES

CLIENT

City of Saskatoon

PROJECT
NUTANA SLOPE INSTABILITY

TITLE
INSTRUMENTATION LOCATION PLAN No. 3

CONSULTANT	YYYY-MM-DD	2020-06-02
GOLDER MEMBER OF WSP	DESIGNED	BW
	PREPARED	JMC
	REVIEWED	
	APPROVED	

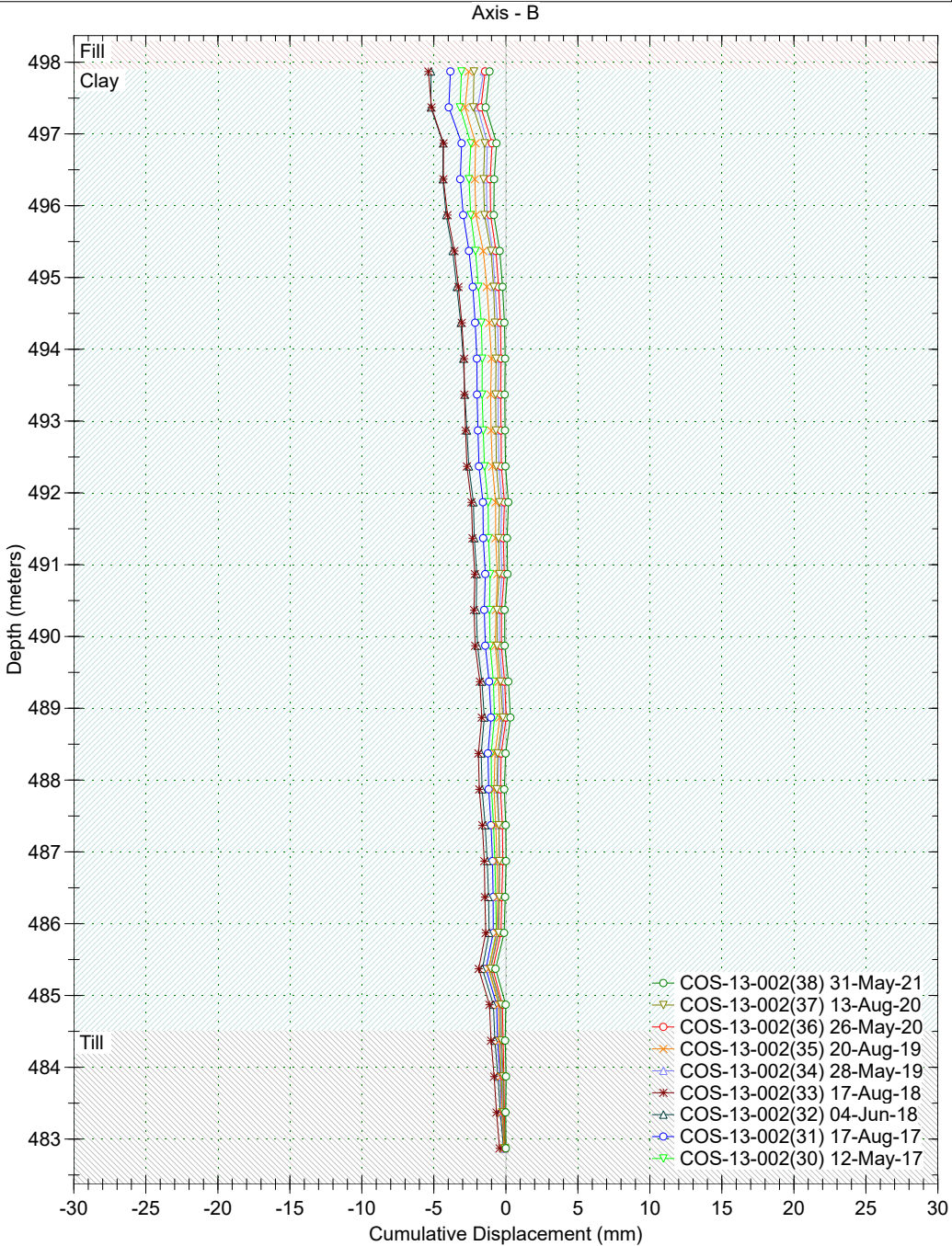
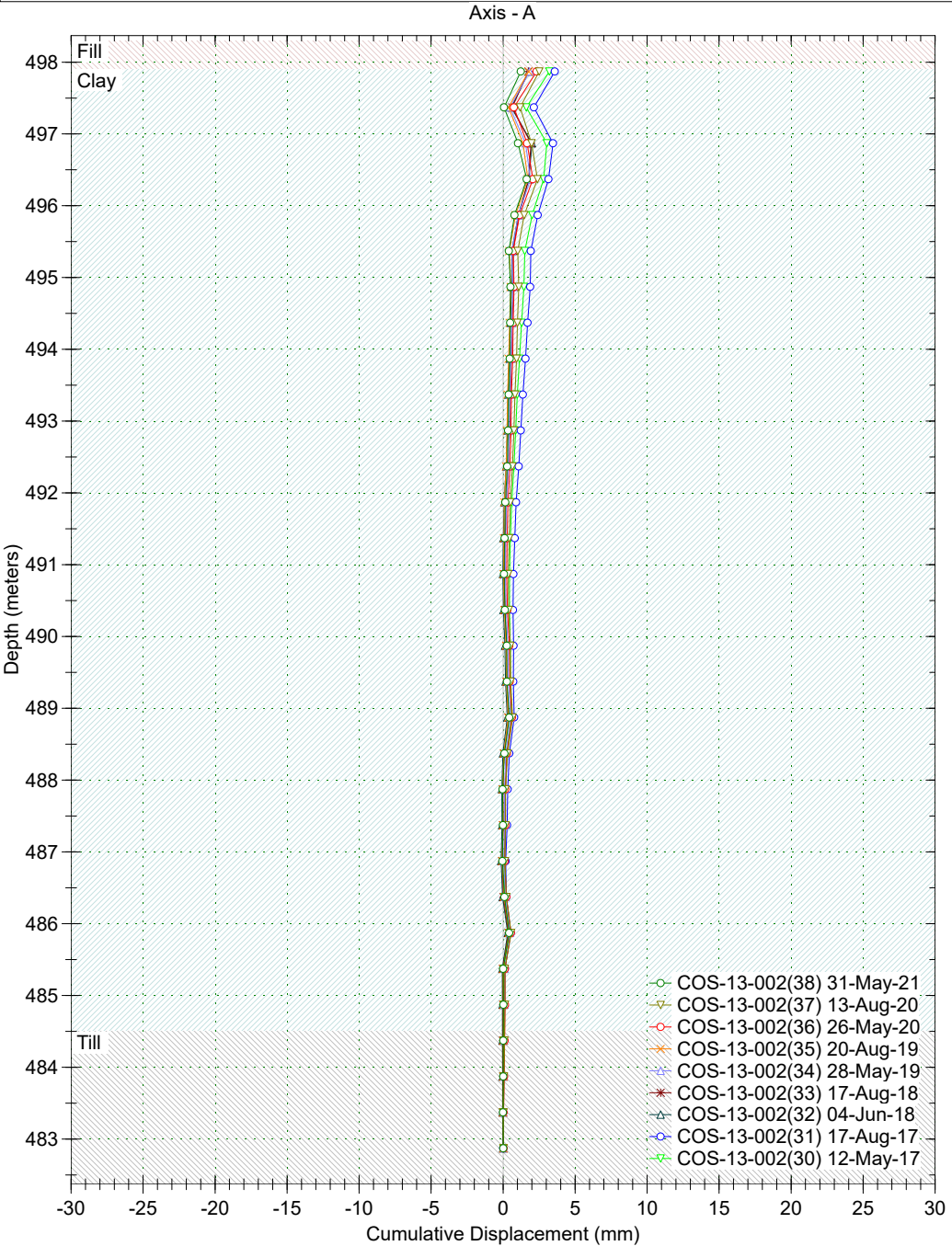
PROJECT NO.	PHASE	REV.	FIGURE
20138294	1000	A	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

SLOPE INCLINOMETERS

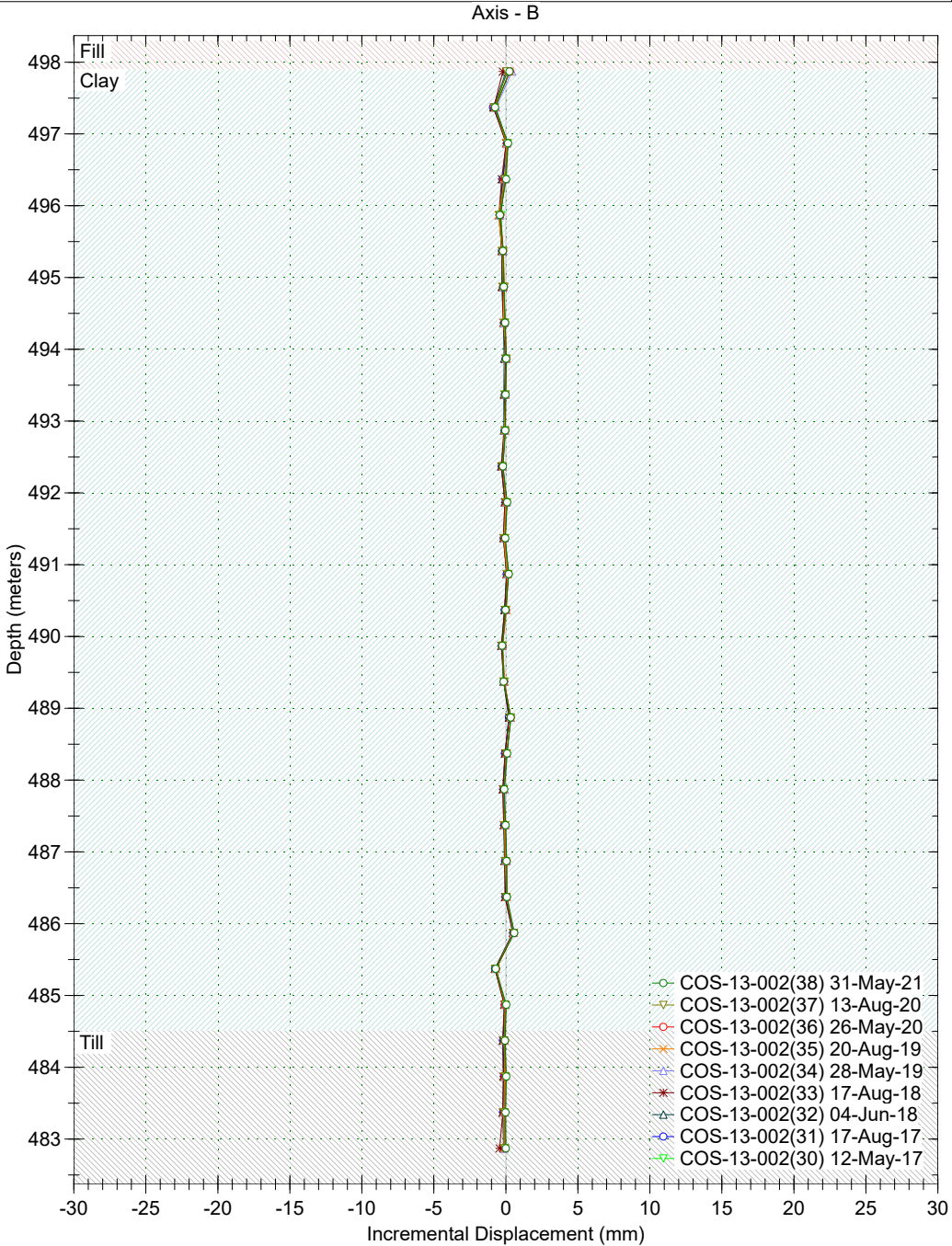
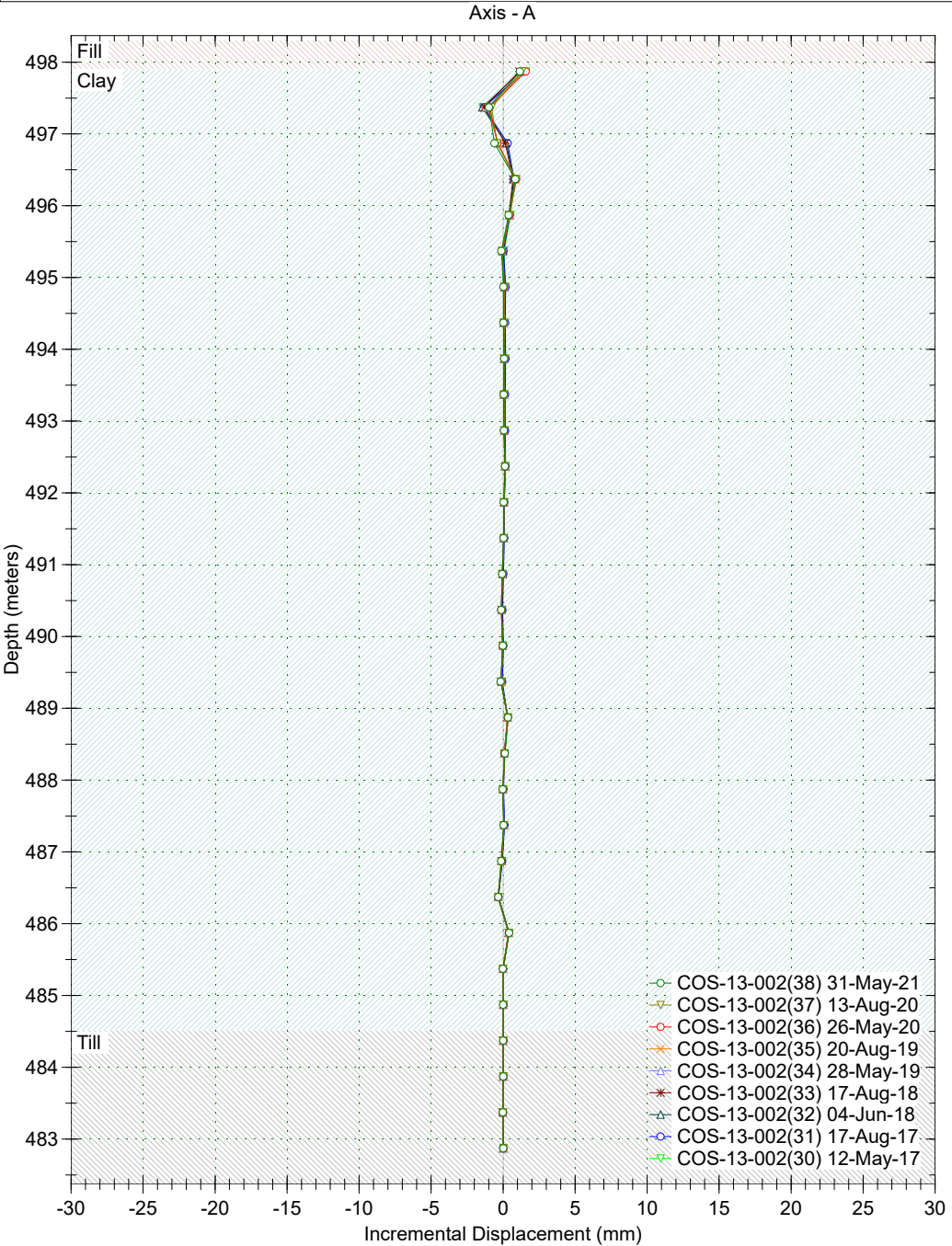
Borehole : COS-13-002
Project : Nutana Slope
Location : 307 11th St. E. (Front)
Northing : 5775567.41
Easting : 386043.54
Collar : -0.113

Spiral Correction : N/A
Collar Elevation : :498.37 meters
Reading Depth : 15.5 meters
A+ Groove Azimuth :
Base Reading : 2013 Jul 30 16:18
Applied Azimuth : 0.0 degrees



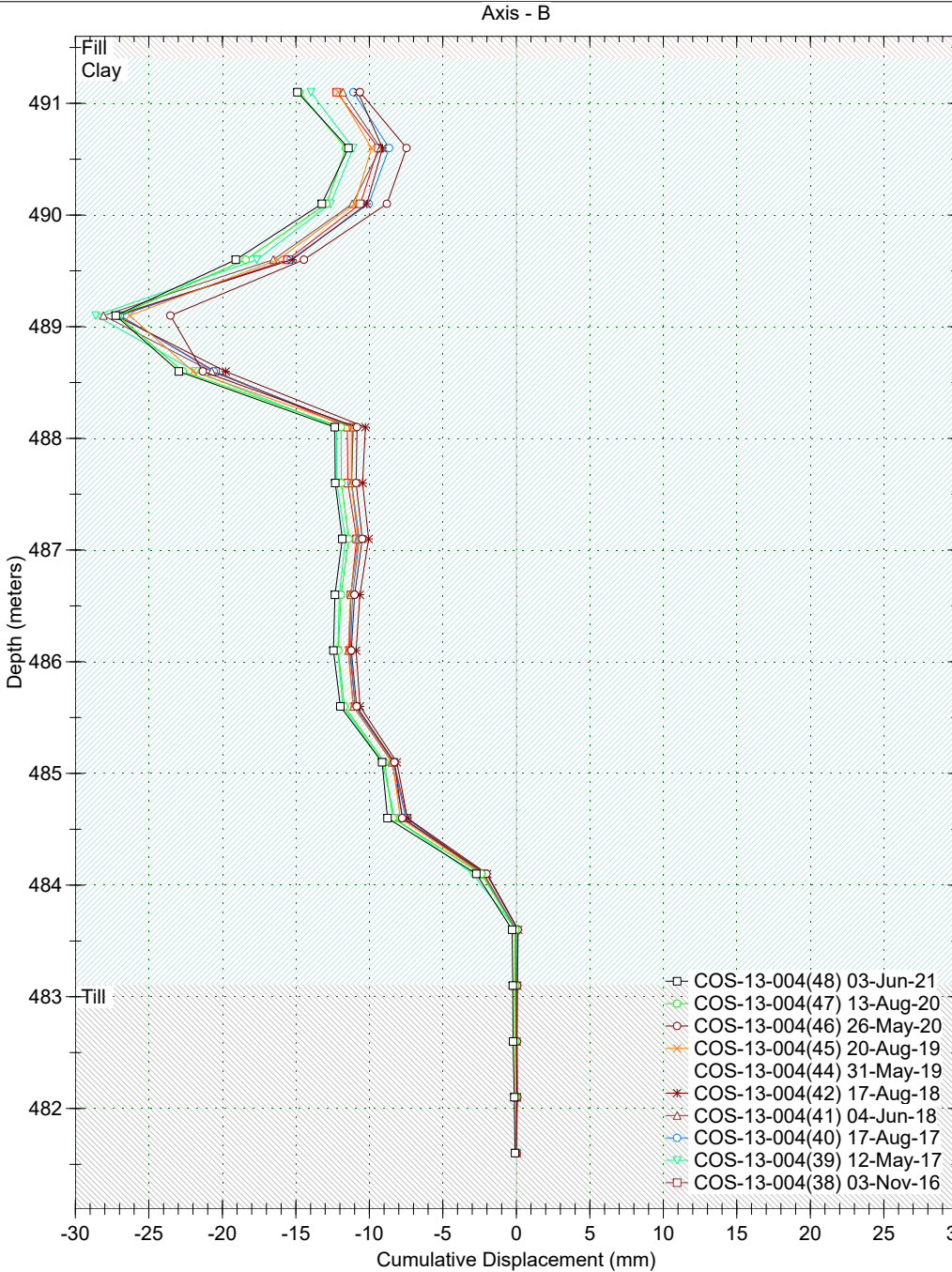
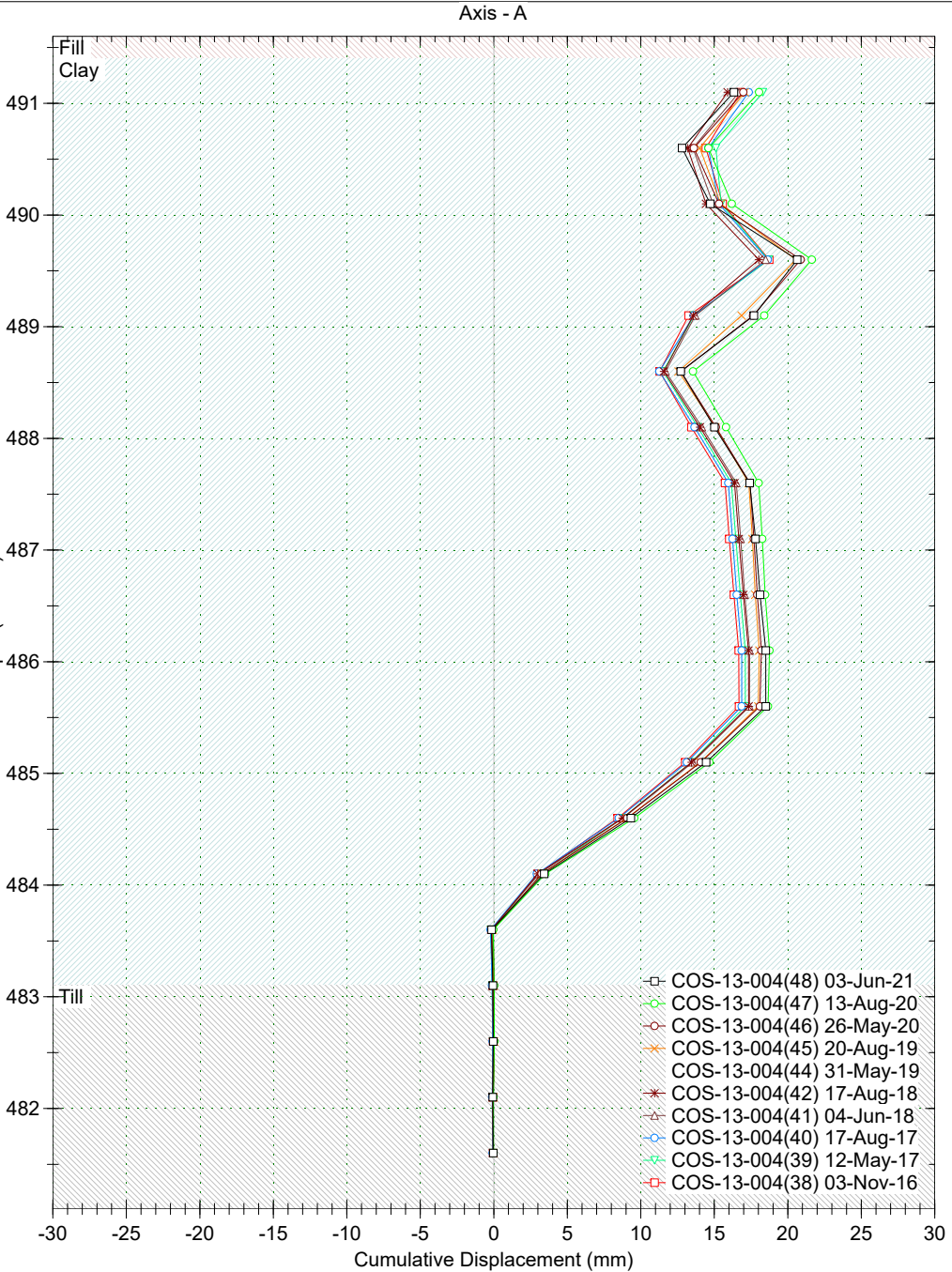
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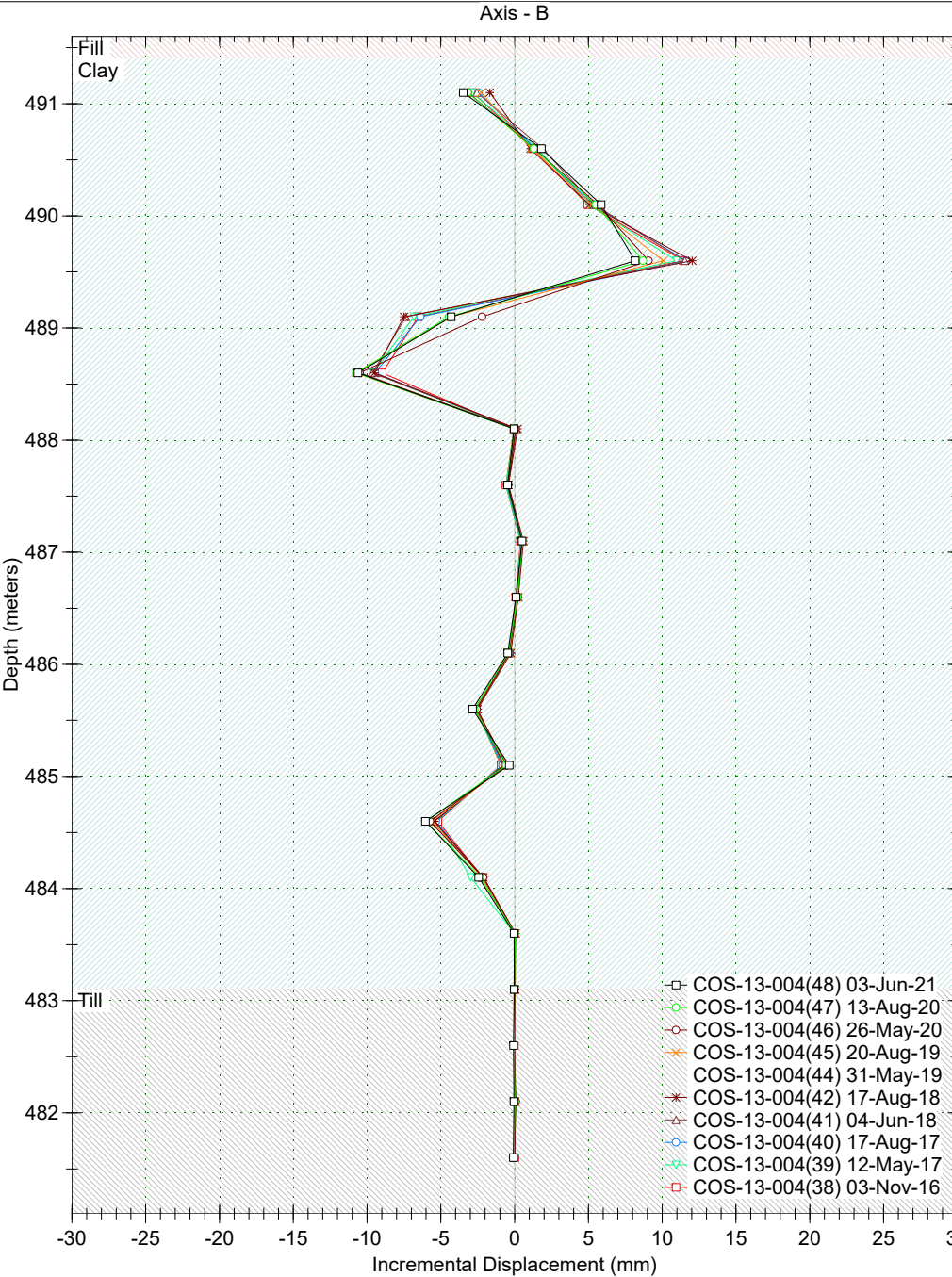
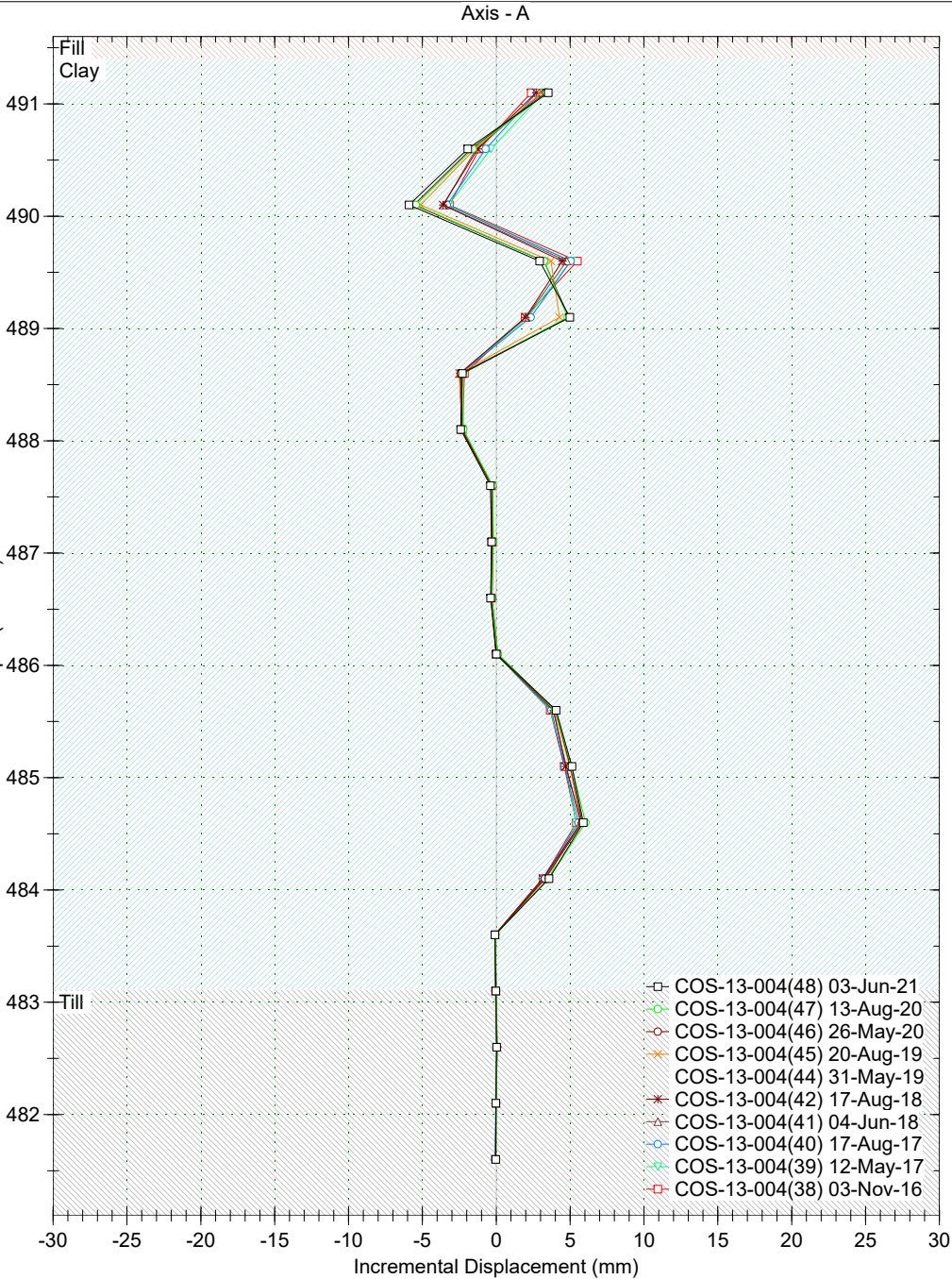
Borehole : COS-13-004
Project : Nutana Slope
Location : 307 11th. St. E. (back)
Northing : 5775604.97
Easting : 386050.63
Collar : -0.677

Spiral Correction : N/A
Collar Elevation : :491.60 meters
Reading Depth : 10.0 meters
A+ Groove Azimuth :
Base Reading : 2013 Aug 28 08:30
Applied Azimuth : 0.0 degrees



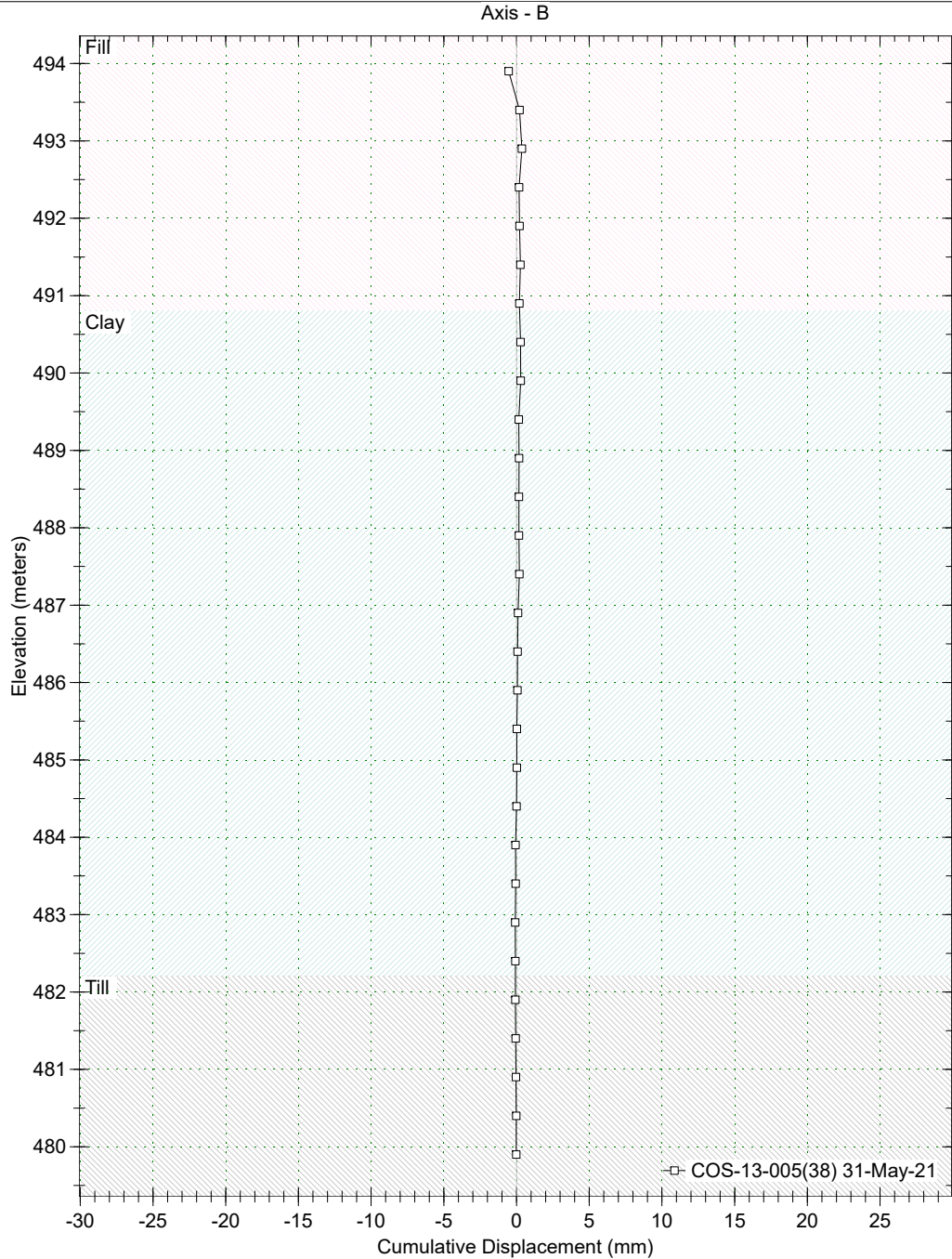
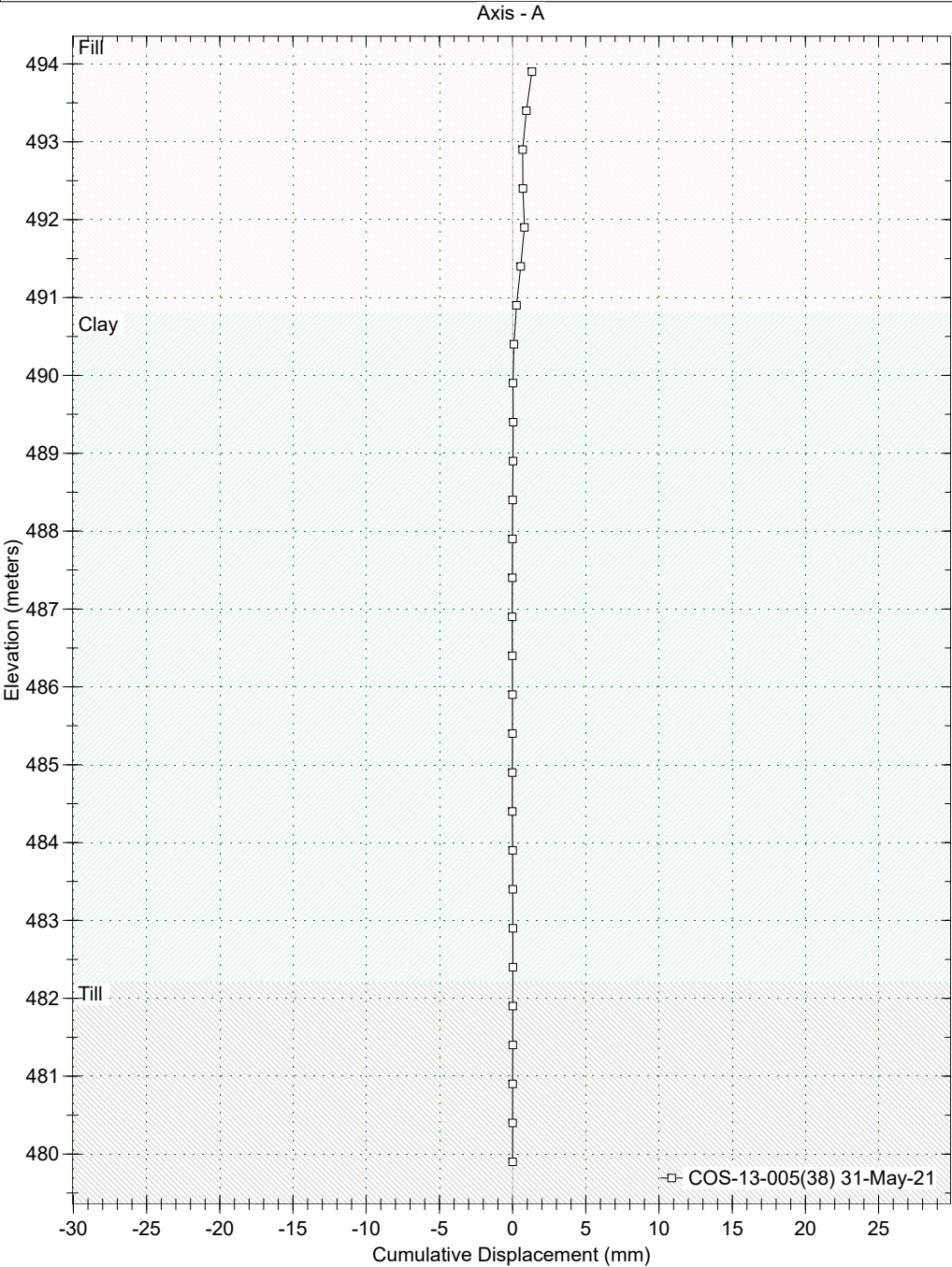
Borehole : COS-13-004
Project : Nutana Slope
Location : 307 11th. St. E. (back)
Northing : 5775604.97
Easting : 386050.63
Collar : -0.677

Spiral Correction : N/A
Collar Elevation : :491.60 meters
Reading Depth : 10.0 meters
A+ Groove Azimuth :
Base Reading : 2013 Aug 28 08:30
Applied Azimuth : 0.0 degrees



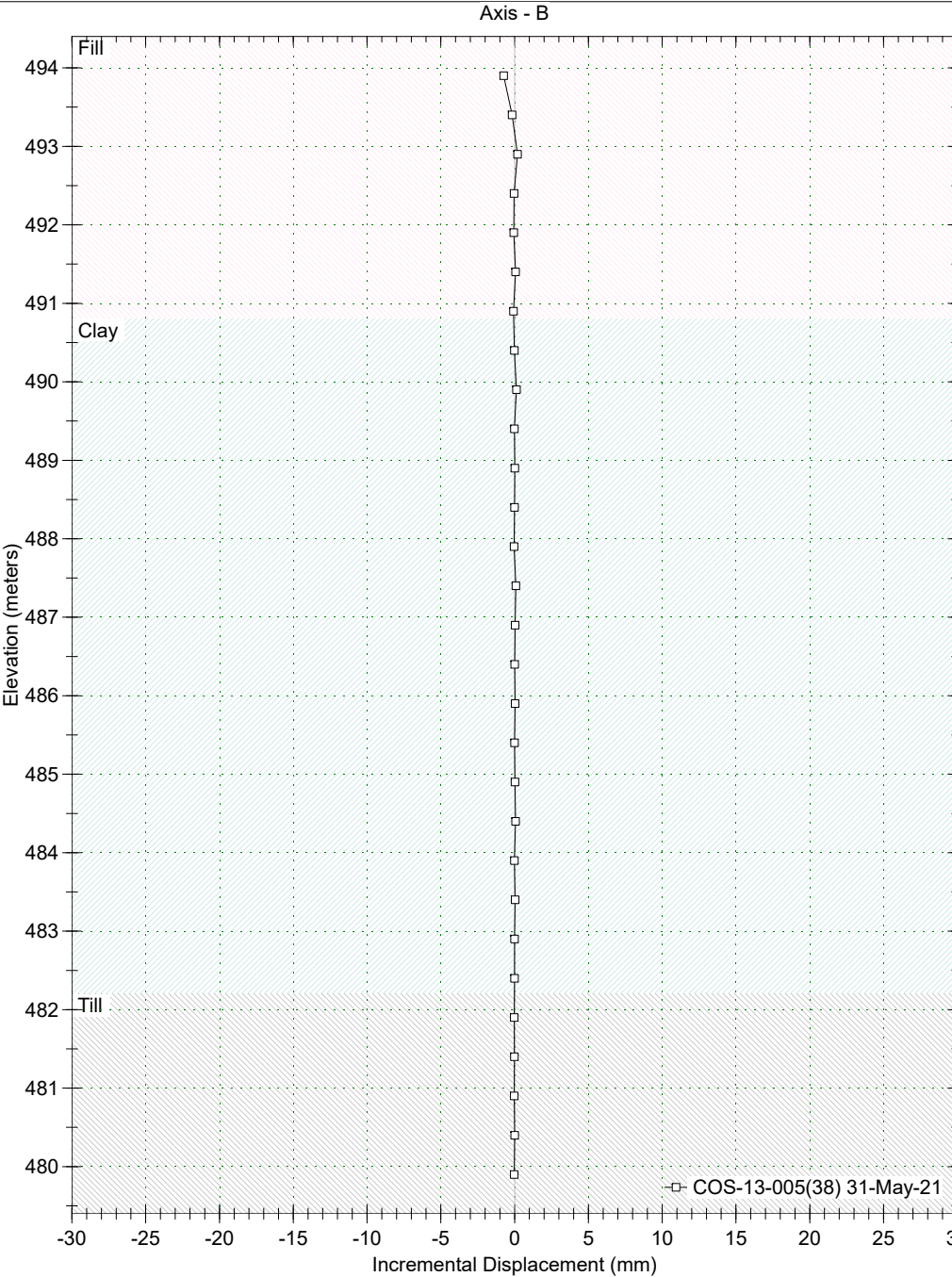
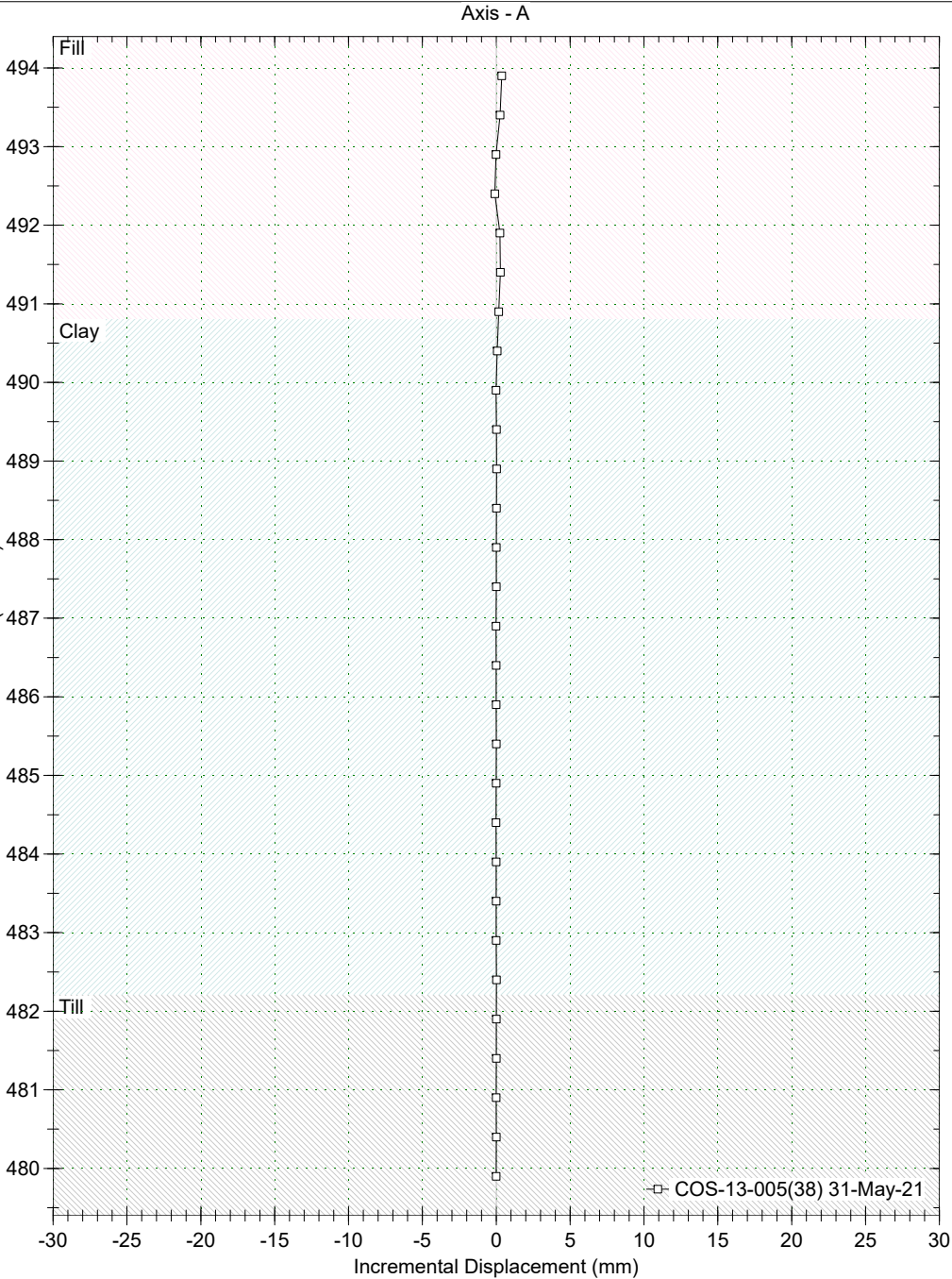
Borehole : COS-13-005 (Aug 13 2020 Baseline)
Project : Nutana Slope
Location : 316 Sask. Cres. E.
Northing : 5775631.299
Easting : 386078.8467
Collar : -0.1

Spiral Correction : N/A
Collar Elevation : :494.40 meters
Reading Depth : 14.5 meters
A+ Groove Azimuth :
Base Reading : 2020 Aug 13 12:59
Applied Azimuth : 0.0 degrees



Borehole : COS-13-005 (Aug 13 2020 Baseline)
Project : Nutana Slope
Location : 316 Sask. Cres. E.
Northing : 5775631.299
Easting : 386078.8467
Collar : -0.1

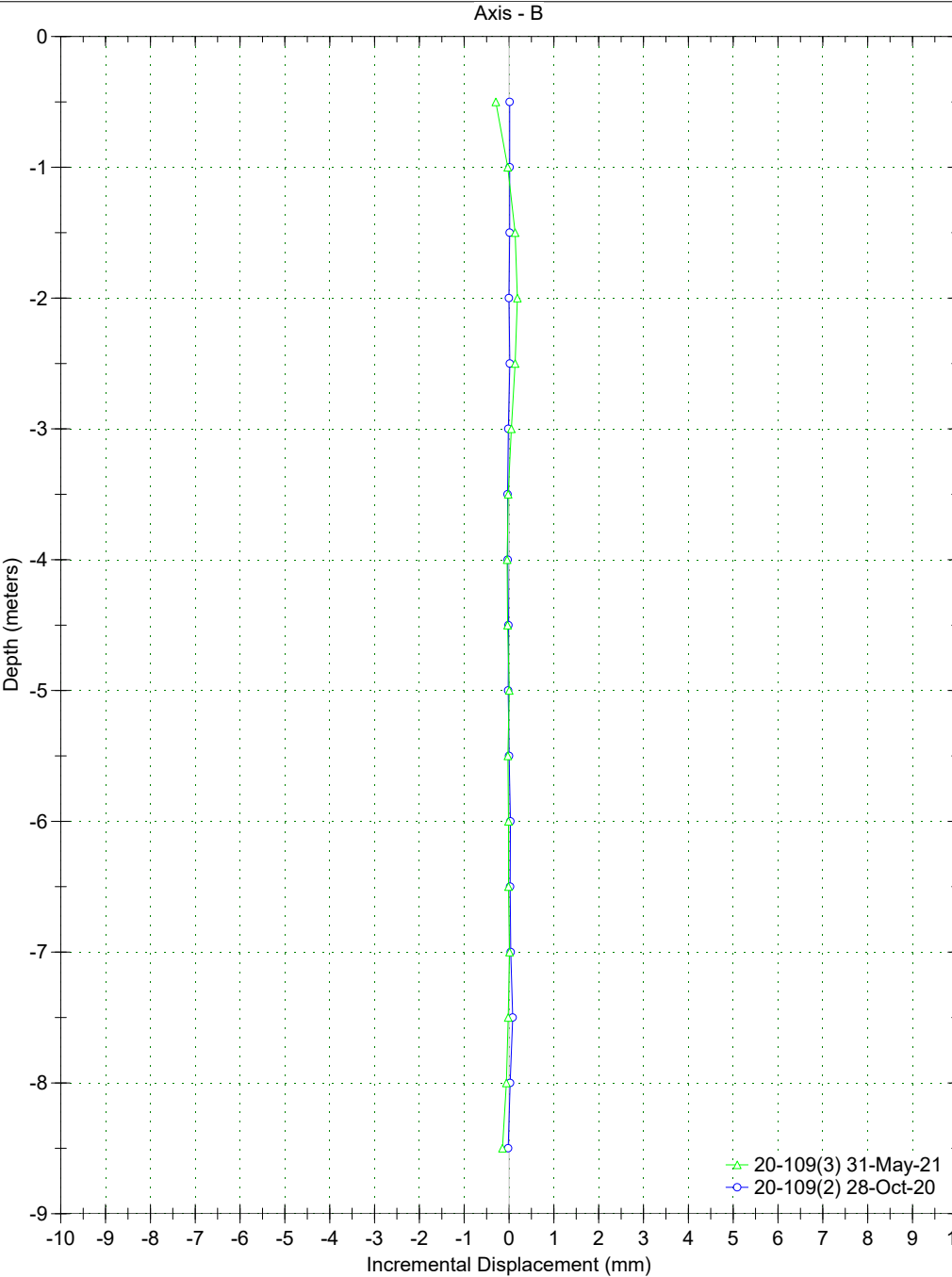
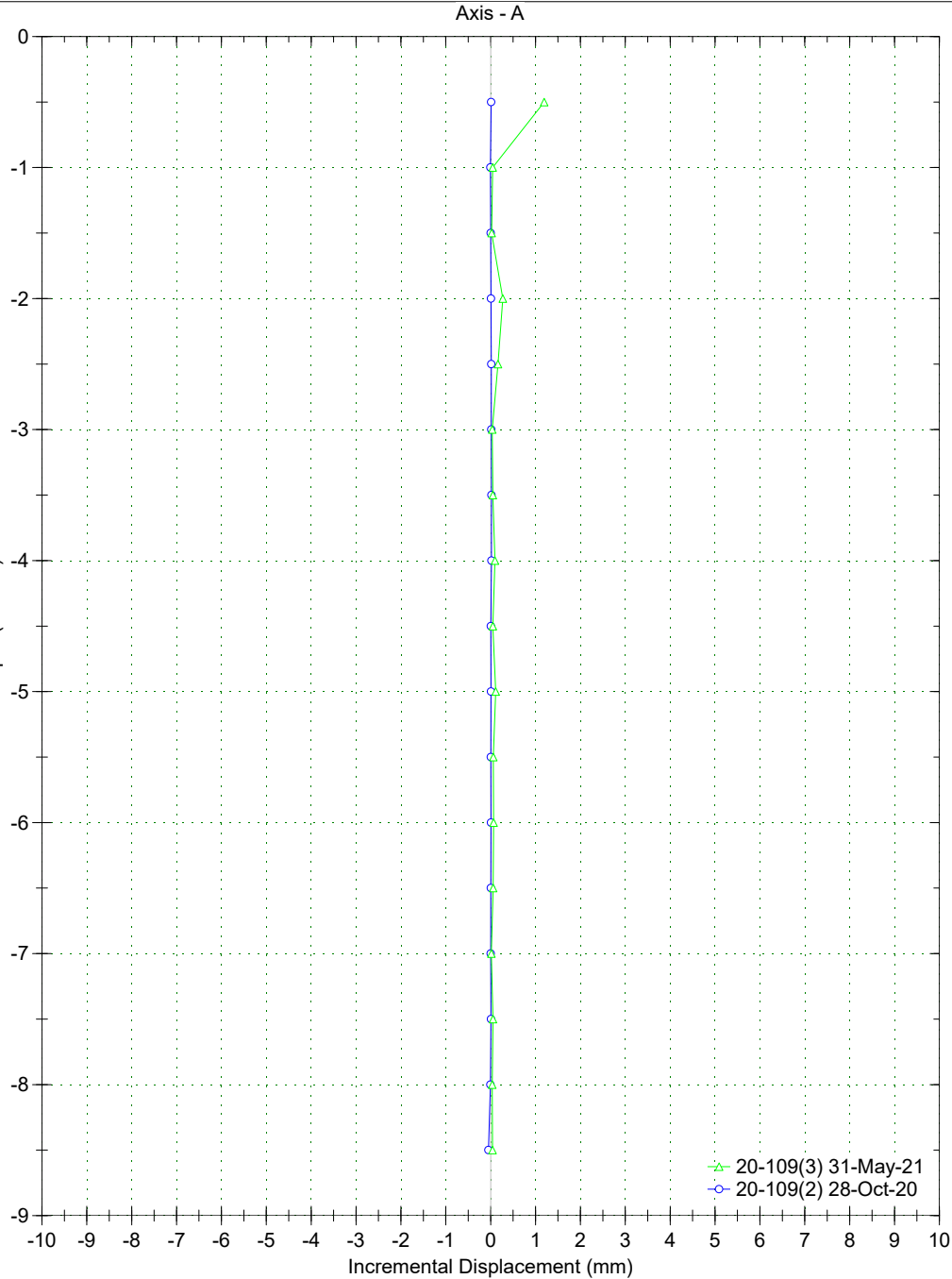
Spiral Correction : N/A
Collar Elevation : :494.40 meters
Reading Depth : 14.5 meters
A+ Groove Azimuth :
Base Reading : 2020 Aug 13 12:59
Applied Azimuth : 0.0 degrees



Spiral Correction : N/A
Collar Elevation : 0.00 meters
Reading Depth : 8.5 meters
A+ Groove Azimuth :
Base Reading : 2020 Oct 28 16:29
Applied Azimuth : 0.0 degrees

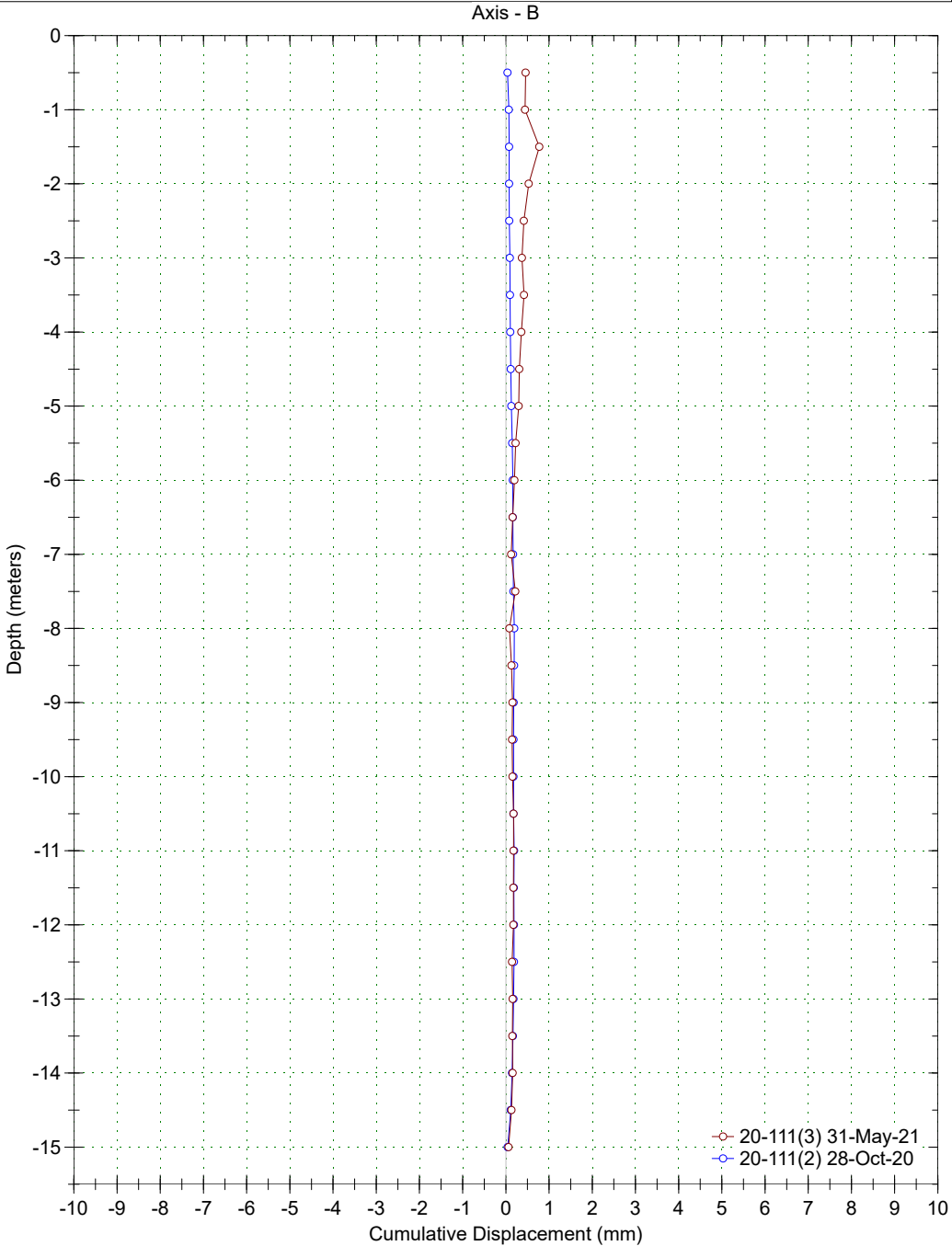
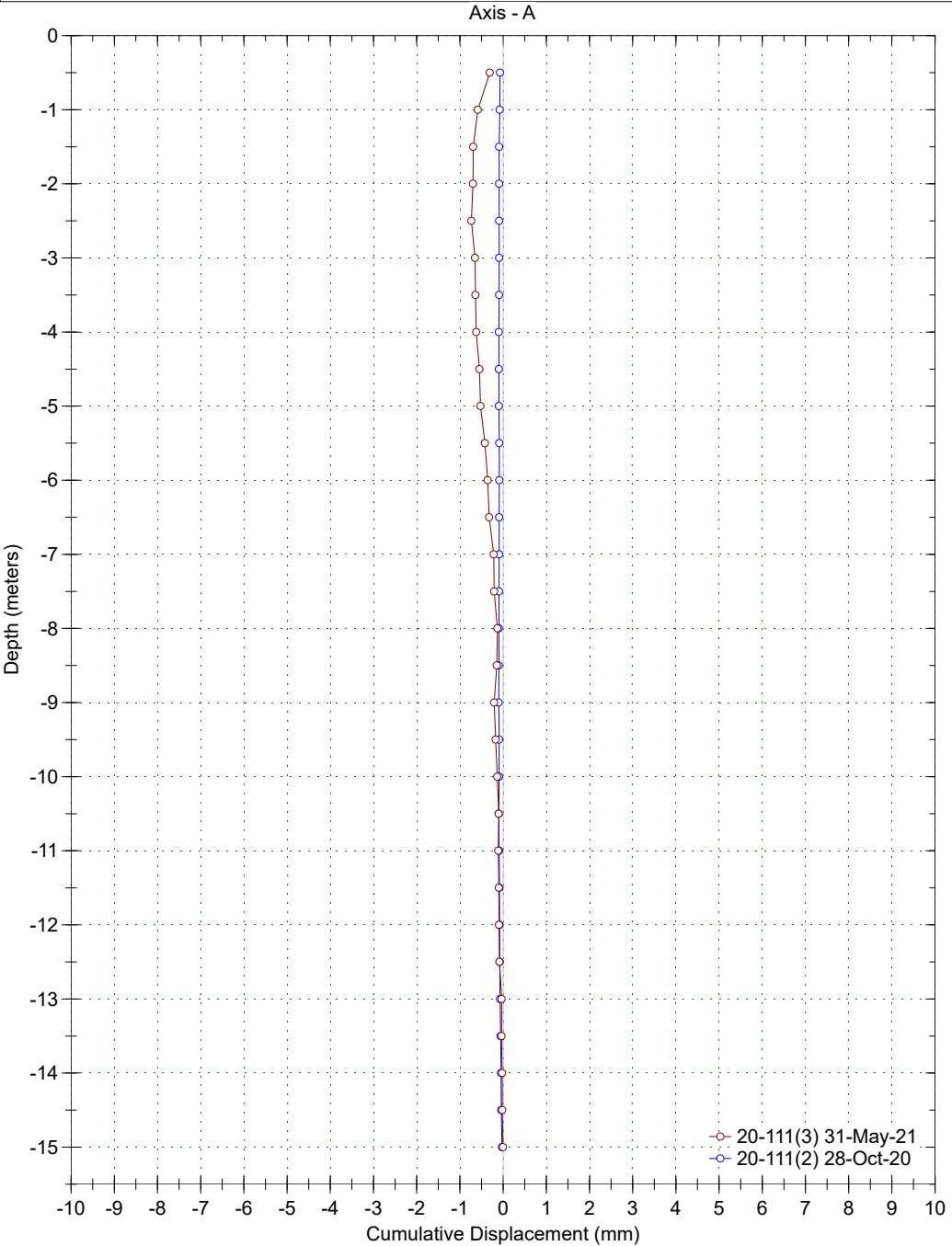
Borehole : 20-109
Project : Nutana Slope
Location :
Northing : 5775622
Easting : 385977
Collar :

Spiral Correction : N/A
Collar Elevation : 0.00 meters
Reading Depth : 8.5 meters
A+ Groove Azimuth :
Base Reading : 2020 Oct 28 16:29
Applied Azimuth : 0.0 degrees



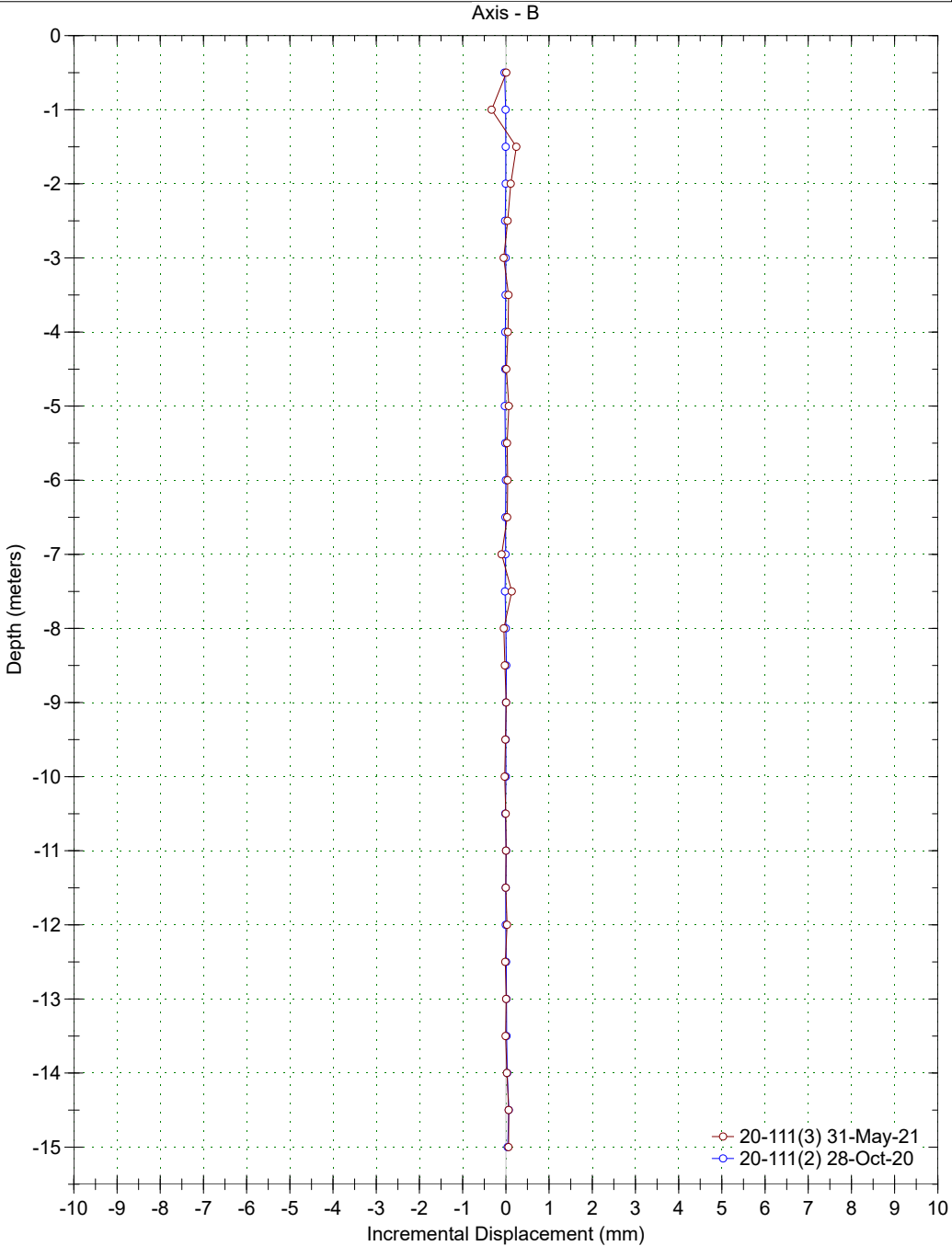
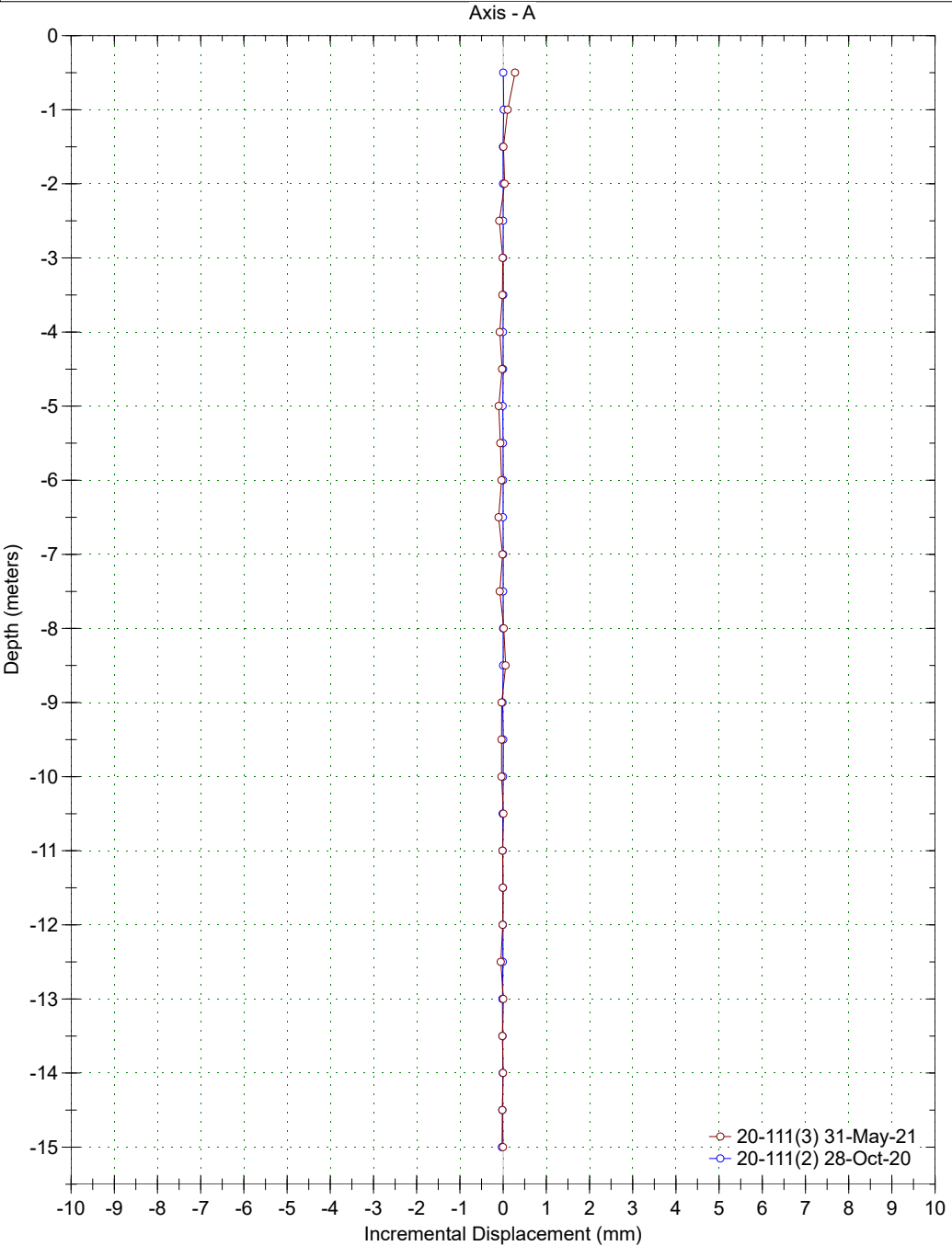
Borehole : 20-111
Project : Nutana Slope
Location :
Northing : 5775568
Easting : 385953
Collar :

Spiral Correction : N/A
Collar Elevation : 0.00 meters
Reading Depth : 15.0 meters
A+ Groove Azimuth :
Base Reading : 2020 Oct 28 15:01
Applied Azimuth : 0.0 degrees

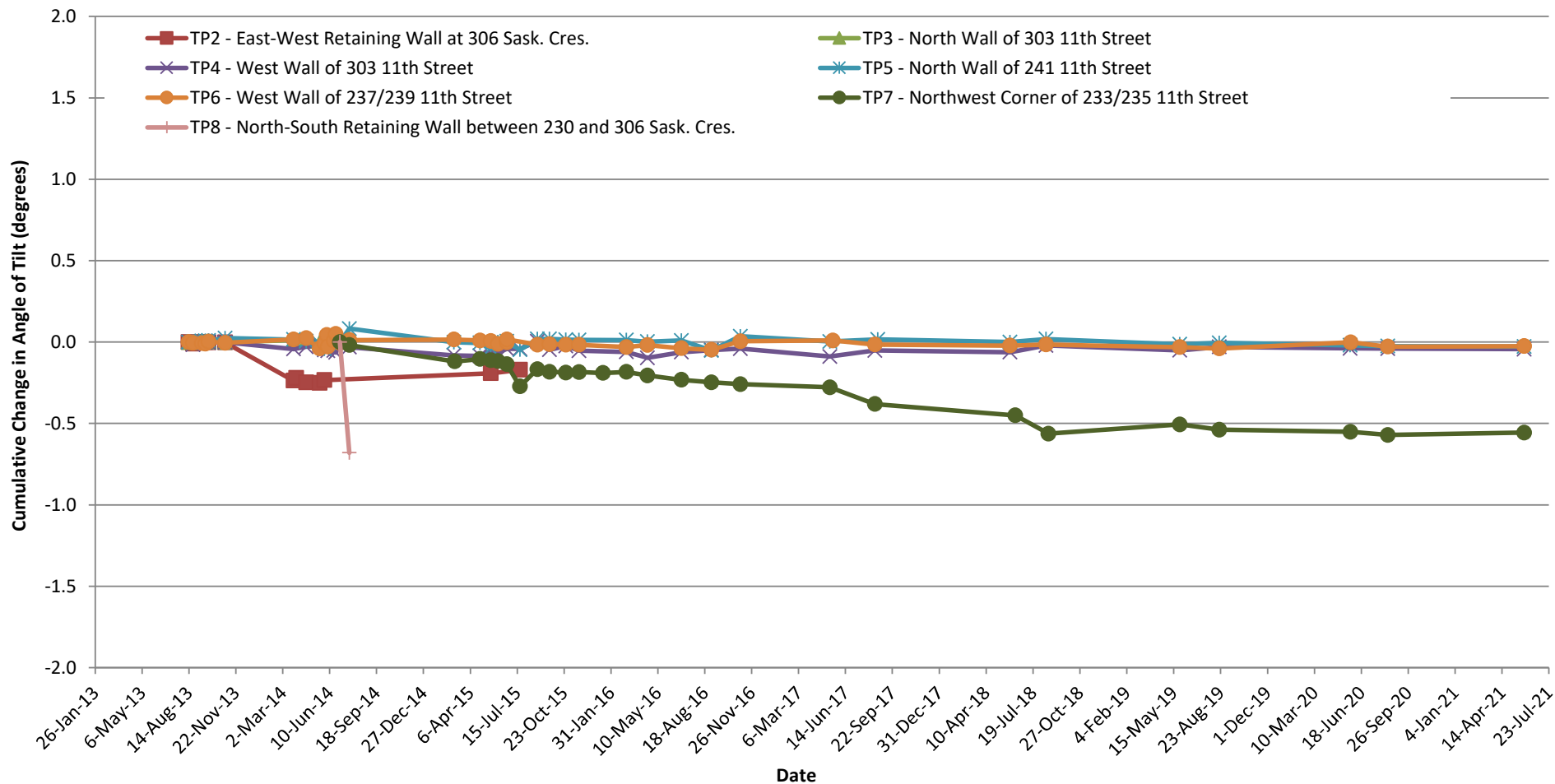


Borehole : 20-111
Project : Nutana Slope
Location :
Northing : 5775568
Easting : 385953
Collar :

Spiral Correction : N/A
Collar Elevation : 0.00 meters
Reading Depth : 15.0 meters
A+ Groove Azimuth :
Base Reading : 2020 Oct 28 15:01
Applied Azimuth : 0.0 degrees



TILT PLATES



Notes:

- 1) Positive changes in tilt indicate tilting toward the monitoring structure.
- 2) TP1, located on the retaining wall between 230 and 306 Sask. Cres., is not monitored for health and safety reasons; monitoring results for this tilt plate show a change in angle of tilt of approximately 9 degrees between August 2013 and June 2014.
- 3) TP3 and TP8 are destroyed, and TP2 is buried.

DRAFT

PROJECT

City of
Saskatoon

NUTANA
SLOPE INSTABILITY

TITLE

RESULTS OF TILT MONITORING

May 2021 Monitoring

GOLDER
MEMBER OF WSP

PROJECT20138294

FILE No.

DESIGN

SCALE

N/A

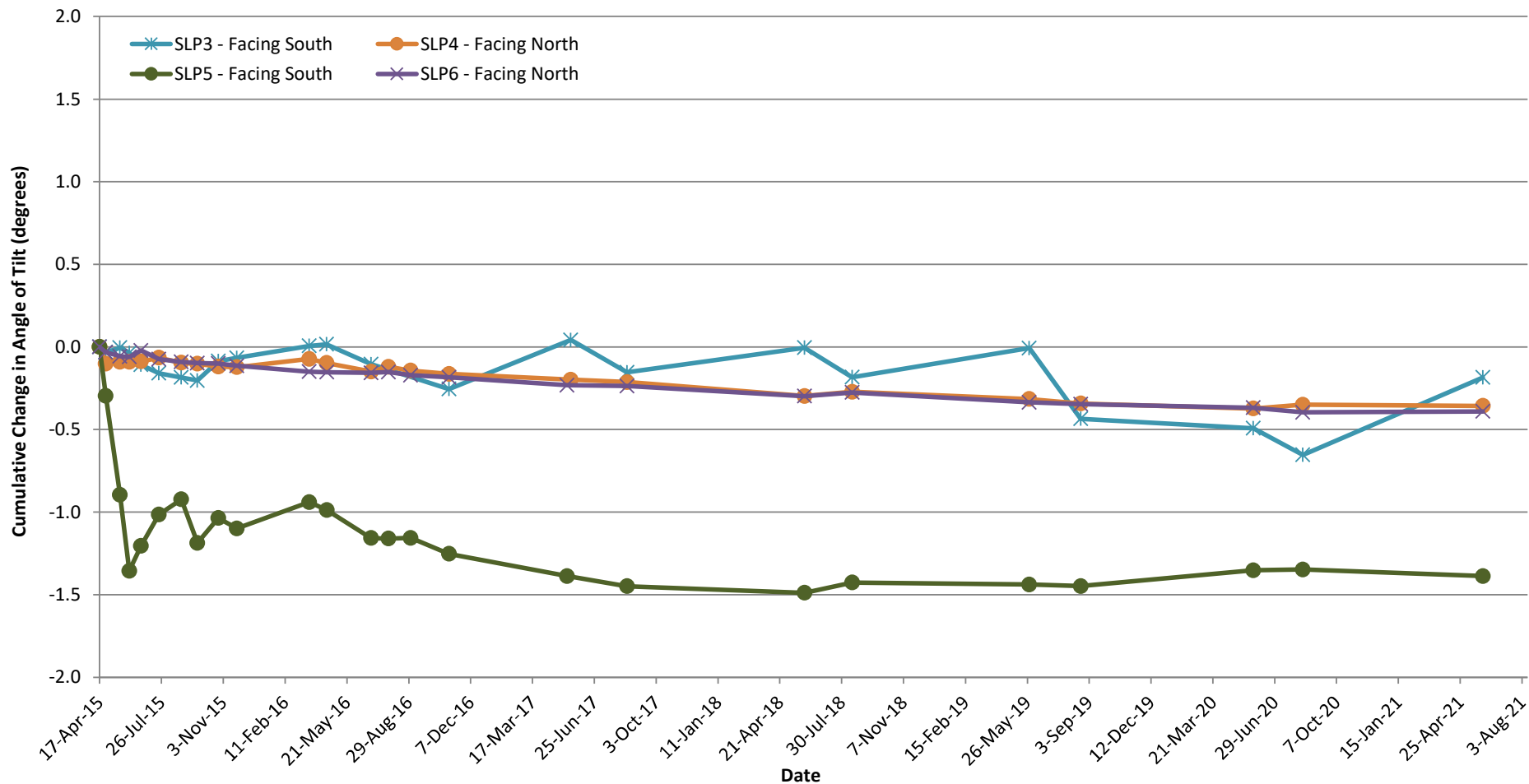
REV.

CADD

CHECK

REVIEW

FIGURE: 4



Notes:
1) Positive changes in tilt indicate tilting toward the monitoring structure.

DRAFT

PROJECT

City of
Saskatoon

NUTANA
SLOPE INSTABILITY

TITLE

RESULTS OF TILT MONITORING

May 2021 Monitoring

GOLDER
MEMBER OF WSP

PROJECT	20138294	FILE No.
DESIGN		SCALE N/A REV.
CADD		
CHECK		
REVIEW		

FIGURE: 5

SITE PHOTOGRAPHS



Photograph 1: Looking west down the back alley at the East Failure (May 31, 2021)



Photograph 2: Looking west down the back alley at the West Failure (May 31, 2021)