ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP NORTH CENTRAL (ATHABASCA AND FORT McMURRAY DISTRICTS) INSTRUMENTATION MONITORING- SPRING 2024

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
NC071	HWY 663:04 C1 6.987	Little Pine Creek Slide	663:04	Km 7.0
Legal Description: 4-14-65-22 W4		**UTM Co-ordinates**		
		12U E 355844	N 6054601	

Current Monitoring:	14-June-2024	**Previous Monitoring**	06-Oct-2023
Instruments Read By:	Mr. Niraj Regmi, G.I.T and Mr. Nixson Mationg, of Thurber		

Instruments Read During This Site Visit

Slope Inclinometers (SIs): SI12-1 to SI12-4, and SI12-9	**Pneumatic Piezometers (PN):** PN12 1B, 12-2A, 12-2B, 12-3B, 12-4A, 12-4B, 12-6, and 12-8	**Vibration Wire Piezometers (VW):** N/A	**Standpipe Piezometers (SP):** SP1, SP2, SP12-10, and SP12-11
Load Cell (LC): N/A	**Strain Gauges:** N/A	**SAAs:** N/A	**Others:**

Readout Equipment Used

Slope Inclinometers: RST Digital Inclinometer probe with a 2 ft. wheelbase and a RST Pocket PC readout	**Pneumatic Piezometers:** RST C108 pneumatic piezometer reader	**Vibration Wire Piezometers:**	**Standpipe Piezometers:** DGSI dipmeter
Load Cell:	**Strain Gauges:**	**SAAs:**	**Others:**

Notes:

- A site plan showing instrument locations is included in Appendix A.
- SIs plots with A and B directions are presented in Appendix A and summarized in Table NC071-1, attached. Where movement was recorded, the resultant (plot X) and the rate of movement plot are also included.
- Pneumatic and standpipe piezometer plots are included in Appendix A.
- Pneumatic piezometer readings are summarized in Table NC071-2, attached.
- Standpipe Piezometer readings are summarized in Table NC071-3, attached.

Discussion

Zones of New Movement:	None
Interpretation of Monitoring Results:	Slope inclinometer SI12-4 has continued to show no discernible movement since initialization. It was noted that the SI probe was hard to pull near the shear zones in SI12-2, and SI12-3 during the current readings, which likely indicates that the SIs are close to shearing off. During the fall of 2023 readings, it was reported that SI12-9 was blocked or sheared at approximately 7.7 m, as the probe was unable to be lowered past this depth. During the spring of 2024 readings, the probe was successfully lowered past this depth. Hence, SI12-9 was read during this monitoring event.

	SI12-1 showed a rate of movement of 3.7 mm/yr over 1.8 m to 5.5 m depth since the fall of 2023 readings. SI12-2 showed a rate of movement of 5.8 mm/yr over 9.8 m to 12.3 m depth since the fall of 2023 readings. SI12-3 showed a rate of movement of 5.1 mm/yr over 11.3 m to 13.1 m depth since the fall of 2023 readings. SI12-9 showed a rate of movement of 3.1 mm/yr over 6.8 m to 8.6 m depth, and 0.1 mm/yr over 17.2 m to 19.6 depth, since the spring of 2023 readings. Pneumatic piezometers PN12-2A, PN12-2B, PN12-3B, PN12-4A, PN12-4B, PN12-6 and PN12-8 showed increases in groundwater level of 0.57 m, 0.02 m, 0.01 m, 0.14 m, 0.15 m, 0.02 m, and 1.27 m, respectively, since the fall of 2023 readings. The current groundwater level measured in PN12-2A is the highest since the instrument was initialized. The groundwater level recorded in PN12-8 was 0.53 m above ground surface, indicating artesian conditions. Standpipe piezometer SP1 showed a decrease in groundwater level of 0.14 m, since the fall of 2023 readings. SP2, and SP12-10, and SP12-11 showed increases in groundwater level of 0.08 m, 0.33 m, and 0.67 m, respectively, since the fall of 2023 readings. The current groundwater levels measured in SP2 and SP12-10 are the highest since the instruments were initialized. Except for pneumatic piezometer PN12-2A, and standpipe piezometers SP2 and SP12-10, the groundwater levels measured in the pneumatic and standpipe piezometers are in line with historic groundwater readings at the site.
Future Work:	The instruments should be read again in the fall of 2024. SI12-2, SI12-3 and SI12-9 may get sheared off in the next couple of years and consideration should be given to replacing these instruments in the near future to continue monitoring the landslide movement at this site. PN12-1B has malfunctioned for two reading cycles in a row and should be removed from future readings.
Instrumentation Repairs:	No instrument repairs are required at this time.
Additional Comments:	

Attachments:	• Table NC071-1 Spring 2024 – HWY 663:04 Little Pine Creek, Slope Inclinometer Instrumentation Reading Summary
	• Table NC071-2 Spring 2024 – HWY 663:04 Little Pine Creek, Pneumatic Piezometer Instrumentation Reading Summary
	• Table NC071-3 Spring 2024 – HWY 663:04 Little Pine Creek, Standpipe Piezometer Instrumentation Reading Summary
	• Statement of Limitations and Conditions
	• APPENDIX A – NC071-1 SPRING 2024
	  ○ Field Inspector's report
	  ○ Site Plan Showing Approximate Instrument Locations (Drawing No. 32122-NC071)
	  ○ SI Reading Plots
	  ○ Figure NC071-1 (Piezometric Depths)

We trust this report meets your requirements at present. If you have any questions, please contact the undersigned at your convenience.

Yours very truly,
Thurber Engineering Ltd.
Tarek Abdelaziz, Ph.D., P. Eng.
Partner | Senior Geotechnical Engineer

PROFESSIONAL ENGINEER ALBERTA
LUCAS R.M. GREEN
ID 206714

2024-07-15
Lucas Green, P.Eng.
Geotechnical Engineer

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE: _____
RM APEGA ID #: 91085
DATE: July 15, 2024
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

THURBER ENGINEERING LTD.

Table NC071-1 Spring 2024 – Hwy 663:04 Little Pine Creek Slope Inclinometer Instrumentation Reading Summary

Date Monitored: June 14, 2024

INSTRUMENT #	DATE INITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AND DEPTH OF MOVEMENT TO DATE (mm)	MAXIMUM RATE OF MOVEMENT (mm/yr)	CURRENT STATUS OF SI	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)
SI12-1	December 8, 2012	57.7 over 1.8 m to 5.5 m depth in 230° direction	26.0 in September 2015	Operational	October 6, 2023	2.5	3.7	3.8
SI12-2	December 8, 2012	118.9 over 9.8 m to 12.3 m depth in 203º direction	31.0 in October 10, 2021	Operational	October 6, 2023	4.0	5.8	-5.4
SI12-3	December 12, 2012	47.5 over 11.3 m to 13.1 m depth in 179º direction	14.1 in September 2020	Operational	October 6, 2023	3.6	5.1	-1.7
SI12-4	December 12, 2012	No discernible movement	N/A	Operational	October 6, 2023	N/A	N/A	N/A
SI12-9	December 9, 2012	54.6 over 6.8 m to 8.6 m depth in 202º direction	23.9 in September 2015	Operational	June 3, 2023	3.2	3.1	-0.5
		6.6 over 17.2 m to 19.6 m depth in 202º direction	1.6 in May 2016			0.1	0.1	-0.7

Drawing 32122-NC071 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

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Table NC071-2 Spring 2024 – Hwy 663:04 Little Pine Creek Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: June 14, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED GROUNDWATER LEVEL BGS (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER LEVEL BGS (m)	PREVIOUS GROUNDWATER LEVEL BGS (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN12-1A	*December 12, 2012*	*15.0*	*589.4*	*Malfunctioning*	4.12 in February 2013	*N/A*	*N/A*	*4.12 (February 2013)*	*N/A*
PN12-1B	*December 12, 2012*	*25.0*	*589.4*	*Non-Operational*	*14.42 in September 2018*	*N/A*	*N/A*	*14.49 (June 3, 2023)*	*N/A*
PN12-2A	December 7, 2012	15.9	583.3	Active	6.74 in June 2024	90.0	6.74	7.31	0.57
PN12-2B	December 7, 2012	19.9	583.3	Active	10.48 in June 2022	92.7	10.48	10.50	0.02
PN12-3A	*December 12, 2012*	*11.0*	*573.9*	*Malfunctioning*	*2.06 in February 2013*	*N/A*	*N/A*	*3.19 (May 2017)*	*N/A*
PN12-3B	December 12, 2012	15.3	573.9	Active	0.92 in June 2022	138.9	1.09	1.10	0.01

Drawing 32122-NC071 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

Table NC071-2 Continued… Spring 2024 – Hwy 663:04 Little Pine Creek Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: June 14, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED GROUNDWATER LEVEL BGS (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER LEVEL BGS (m)	PREVIOUS GROUNDWATER LEVEL BGS (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN12-4A	December 12, 2012	9.4	565.1	Active	2.84 in May 2013	58.9	3.37	3.51	0.14
PN12-4B	December 12, 2012	20.6	565.1	Active	4.76 in June 2020	150.7	5.21	5.36	0.15
PN12-5	*December 5, 2012*	*20.0*	*590.5*	*Malfunctioning*	*13.32 in December 2012*	*N/A*	*N/A*	*19.93 (September 2018)*	*N/A*
PN12-6	December 5, 2012	12.0	585.6	Active	7.50 in May 2016	32.7	8.67	8.69	0.02
PN12-8	December 2, 2012	5.3	588.9	Active	-0.36 in May 2017	57.5	-0.53 *	0.74	1.27
PN12-9	*December 7, 2012*	*18.3*	*582.3*	*Malfunctioning*	*1.58 in February 2013*	*N/A*	*N/A*	*3.05 (September 2018)*	*N/A*

Drawing 32122-NC071 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

* Negative value represents artesian, above ground water level

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Table NC071-3 Spring 2024 – Hwy 663:04 Little Pine Creek Standpipe Piezometer Instrumentation Reading Summary

Date Monitored: June 14, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED GROUNDWATER LEVEL BGS (m)	CURRENT GROUNDWATER DEPTH BGS (m)	PREVIOUS GROUNDWATER DEPTH BGS (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SP1	December 1979	12.3	587.0	Operational	6.49 on June 29, 2021	7.11	6.97	-0.14
SP2	December 1979	11.3	576.5	Operational	1.95 on June 14, 2024	1.87	1.95	0.08
SP12-7	*December 8, 2012*	*19.8*	*578.3*	*Blocked at 1 m depth*	*4.95 on September 28, 2020*	*N/A*	*N/A*	*N/A*
SP12-10	December 12, 2012	19.8	571.6	Operational	0.78 on June 14, 2024	0.47	0.80	0.33
SP12-11	December 12, 2012	15.2	556.2	Operational	7.58 on June 4, 2022	7.71	8.38	0.67

Drawing 32122-NC071 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

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STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

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5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.

d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

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ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP (CON0022163)
NORTH CENTRAL (ATHABASCA AND FORT McMURRAY DISTRICTS)
INSTRUMENTATION MONITORING RESULTS

SPRING 2024

APPENDIX A
DATA PRESENTATION AND SITE PLANS

SITE NC071: HWY 663:04 LITTLE PINE CREEK

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
INSTRUMENTATION MONITORING FIELD SUMMARY (NC071)
SPRING 2024

Location:	Little Pine Creek Slide (HWY 663:04 C1 6.987)	**Readout:**	RST PN C108 Unit 4/DGSI Dipmeter
File Number:	32122	**Casing Diameter:**	2.75"
Probe:	RST SI SET 8R	**Temp:**	14
Cable:	RST SI SET 8R	**Read by:**	NKR/NRM

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 12)		Date	Stickup (m)	Readings Depth from top of **casing** (ft)	Azimuth of A+ Groove degree	Current Bottom Depth Readings				Probe/ Reel #	Size (")	Remarks
	Northing	Easting					A+	A-	B+	B-			
SI12-1	6054601	355844	14-Jun-24	0.91	94 to 2	183	-313	325	533	-533	8R/8R	2.75	
SI12-2	6054552	355828	14-Jun-24	0.85	84 to 2	175	16	-46	81	-99	8R/8R	2.75	About to shear at 33ft, use dummy probe
SI12-3	6054465	355789	14-Jun-24	0.63	68 to 2	180	61	-46	-318	322	8R/8R	2.75	About to shear at 35ft, use dummy probe
SI12-4	6054381	355753	14-Jun-24	0.75	80 to 2	187	172	-160	30	33	8R/8R	2.75	
SI12-9*	6054576	355750	14-Jun-24	0.8	84 to 2	180	-8	-18	-105	104	8R/8R	2.75	About to shear at 24 and 28ft, use dummy prob

PNEUMATIC PIEZOMETER (PN) READINGS

PN #	Serial	GPS Location (UTM 12)		Location	Date	Reading (kPa)	Comments
		Northing	Easting				
PN12-1B	35011	6054601	355844	Attached to SI12-1	14-Jun-24	Fluctuating	Water Return, reading fluctuated between 90 to 130 kPa
PN12-2A	35015	6054552	355828	Attached to SI12-2	14-Jun-24	90	
PN12-2B	35008	6054552	355828	Attached to SI12-2	14-Jun-24	92.7	
PN12-3B	35007	6054465	355789	Attached to SI12-3	14-Jun-24	138.9	
PN12-4A	35014	6054381	355753	Attached to SI12-4	14-Jun-24	58.9	
PN12-4B	35009	6054381	355753	Attached to SI12-4	14-Jun-24	150.7	Water return
PN12-6	35018	6054544	355889	PN12-6	14-Jun-24	32.7	
PN12-8	35017	6054628	355765	PN12-8	14-Jun-24	57.5	

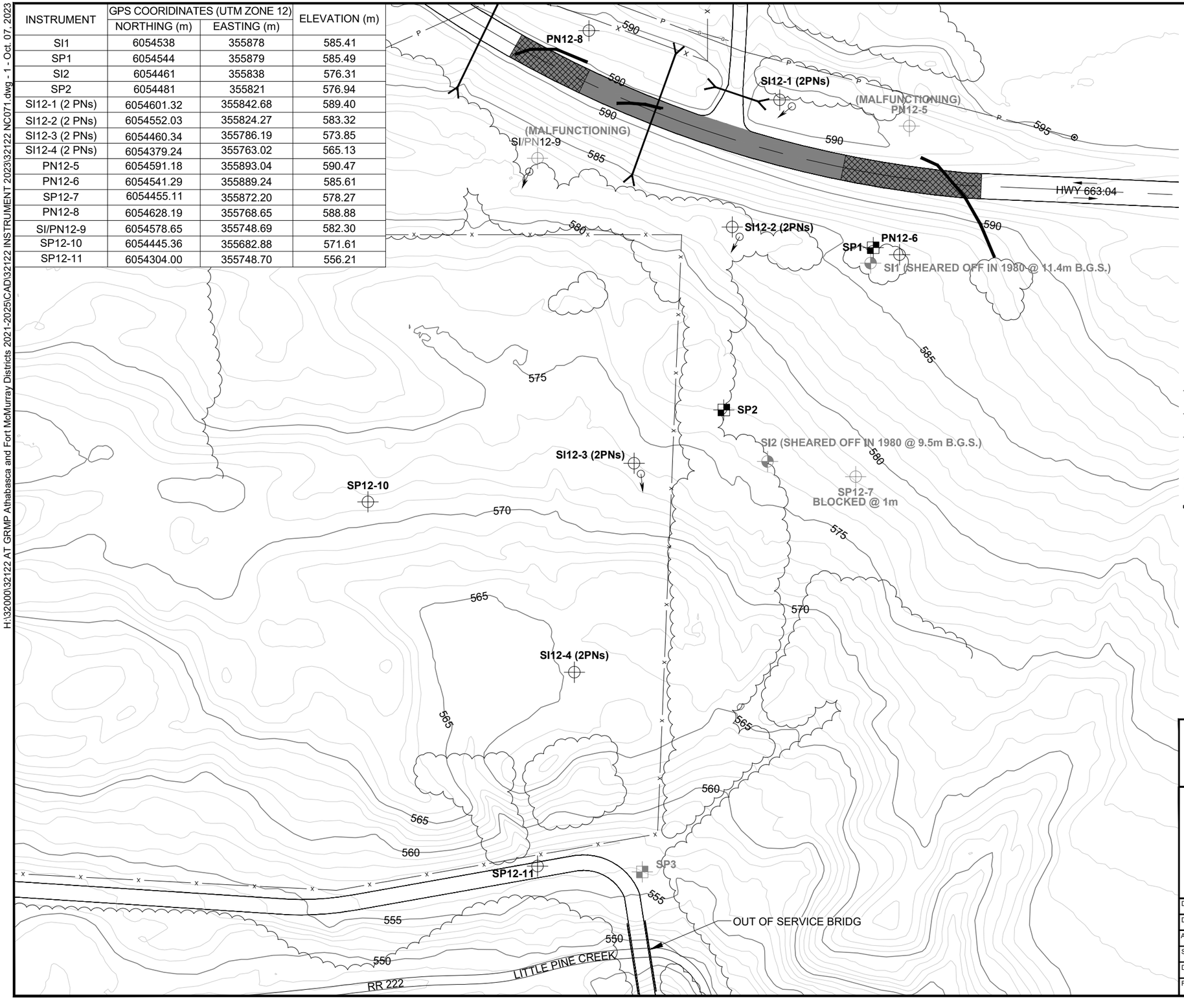
STANDPIPE PIEZOMETER (SP) READINGS

SP#	GPS Location (UTM 12)		Date	Stick-up (m)	Water level below top of pipe (m)	Comments
	Northing	Easting				
SP1	6054544	355892	14-Jun-24	0.81	7.92	
SP2	6054476	355820	14-Jun-24	1.02	2.89	TD = 11.3m
SP12-10	6054454	355673	14-Jun-24	0.57	1.04	
SP12-11	6054310	355747	14-Jun-24	0.77	8.48	

INSPECTOR REPORT

Rita /Allyn do not live on the property anymore, they have rented the place. Have to find the number to contact the renter for access (Contact - Rita/Allyn Nelson: 780-675-9295)	
PN12-1B	Water Return, reading fluctuated between 90 to 130 kPa

INSTRUMENT	GPS COORIDINATES (UTM ZONE 12)		ELEVATION (m)
	NORTHING (m)	EASTING (m)	
SI1	6054538	355878	585.41
SP1	6054544	355879	585.49
SI2	6054461	355838	576.31
SP2	6054481	355821	576.94
SI12-1 (2 PNs)	6054601.32	355842.68	589.40
SI12-2 (2 PNs)	6054552.03	355824.27	583.32
SI12-3 (2 PNs)	6054460.34	355786.19	573.85
SI12-4 (2 PNs)	6054379.24	355763.02	565.13
PN12-5	6054591.18	355893.04	590.47
PN12-6	6054541.29	355889.24	585.61
SP12-7	6054455.11	355872.20	578.27
PN12-8	6054628.19	355768.65	588.88
SI/PN12-9	6054578.65	355748.69	582.30
SP12-10	6054445.36	355682.88	571.61
SP12-11	6054304.00	355748.70	556.21



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LEGEND

- INSTRUMENTS INSTALLED IN 2012
- SI — SLOPE INCLINOMETER
- PN — PNEUMATIC PIEZOMETER
- SP — STANDPIPE PIEZOMETER
- SP — PREVIOUSLY INSTALLED STANDPIPE PIEZOMETER
- SI — PREVIOUSLY INSTALLED SLOPE INCLINOMETER
- ACP PATCH
- DISTRESSED AREA
- POWER POLE (APPROX.)
- P — OVERHEAD POWER LINE (APPROX.)
- G — GAS LINE (APPROX.)
- X — FENCE LINE (APPROX.)
- BUSH LINE (APPROX.)
- CULVERT (APPROX.)
- CRACKS
- DIRECTION OF MOVEMENT IN SLOPE INCLINOMETER

NOTES

1. CONTOUR INTERVAL = 1 m
2. SITE CONTOURS ARE BASED ON LIDAR DATA.
3. THIS SITE WAS NOT SURVEYED AND LANDSLIDE FEATURES WERE PICKED UP USING A HAND HELD GPS UNIT.

0 20 40 60 80 m
SCALE 1:1500

Alberta

NORTH CENTRAL
(ATHABASCA AND FORT MCMURRAY DISTRICTS)

NC071: HWY 663:04 LITTLE PINE CREEK
SITE PLAN SHOWING APPROXIMATE INSTRUMENT LOCATIONS

DWG No. 32122-NC071

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	TSA
SCALE	1:1500
DATE	OCTOBER 2023
FILE No.	32122

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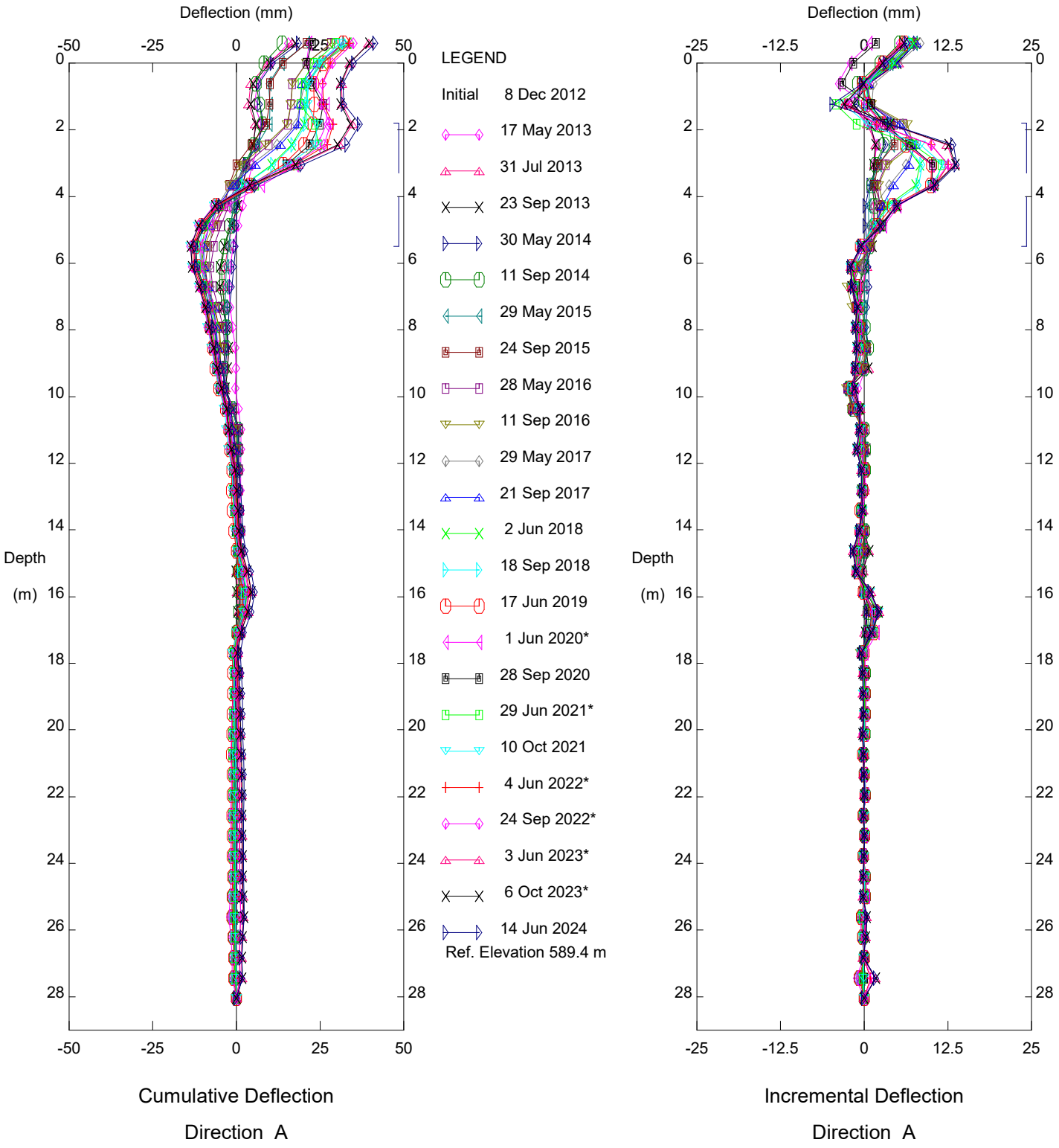

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-1

Alberta Transportation

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

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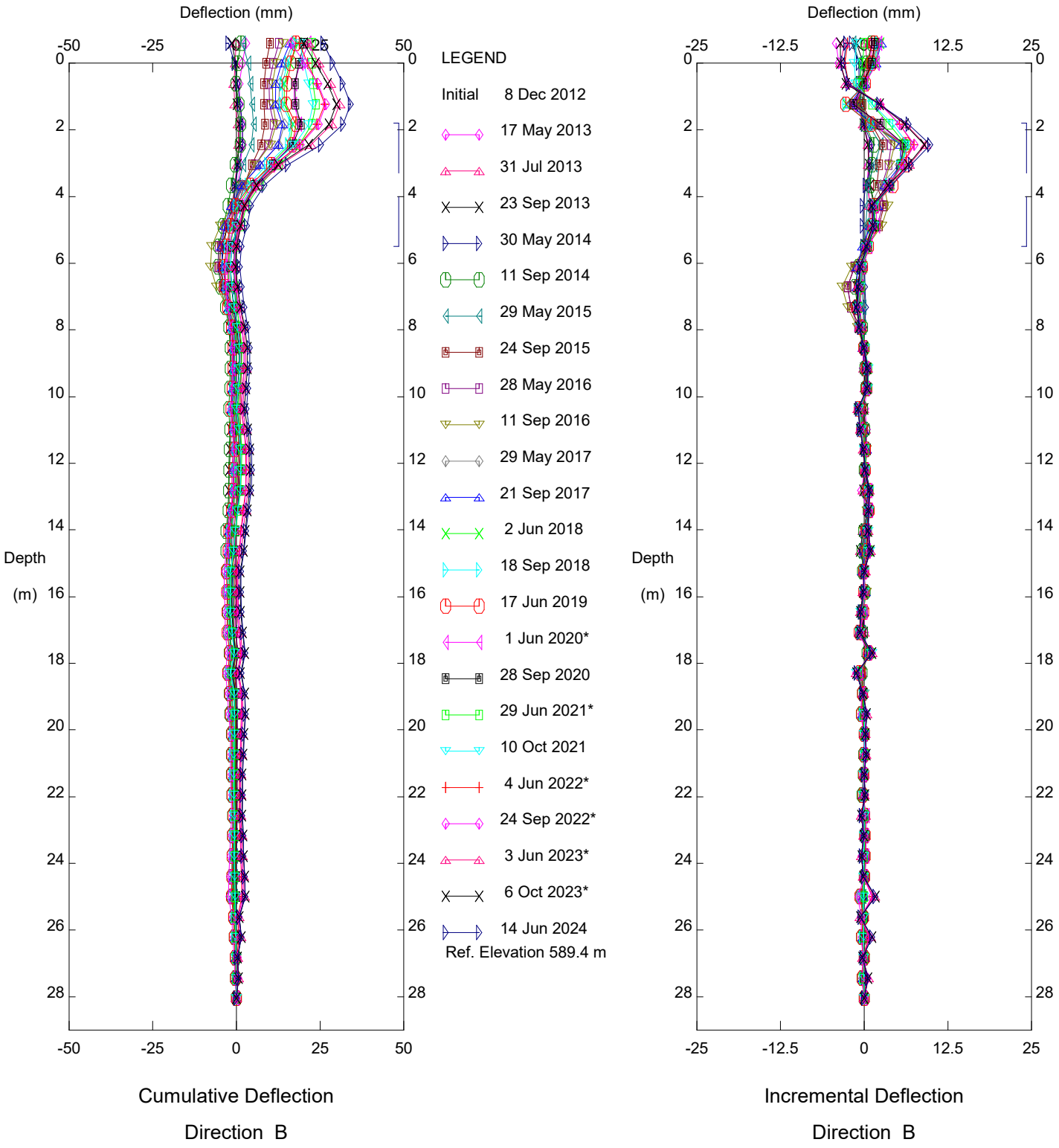
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-1

Alberta Transportation

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

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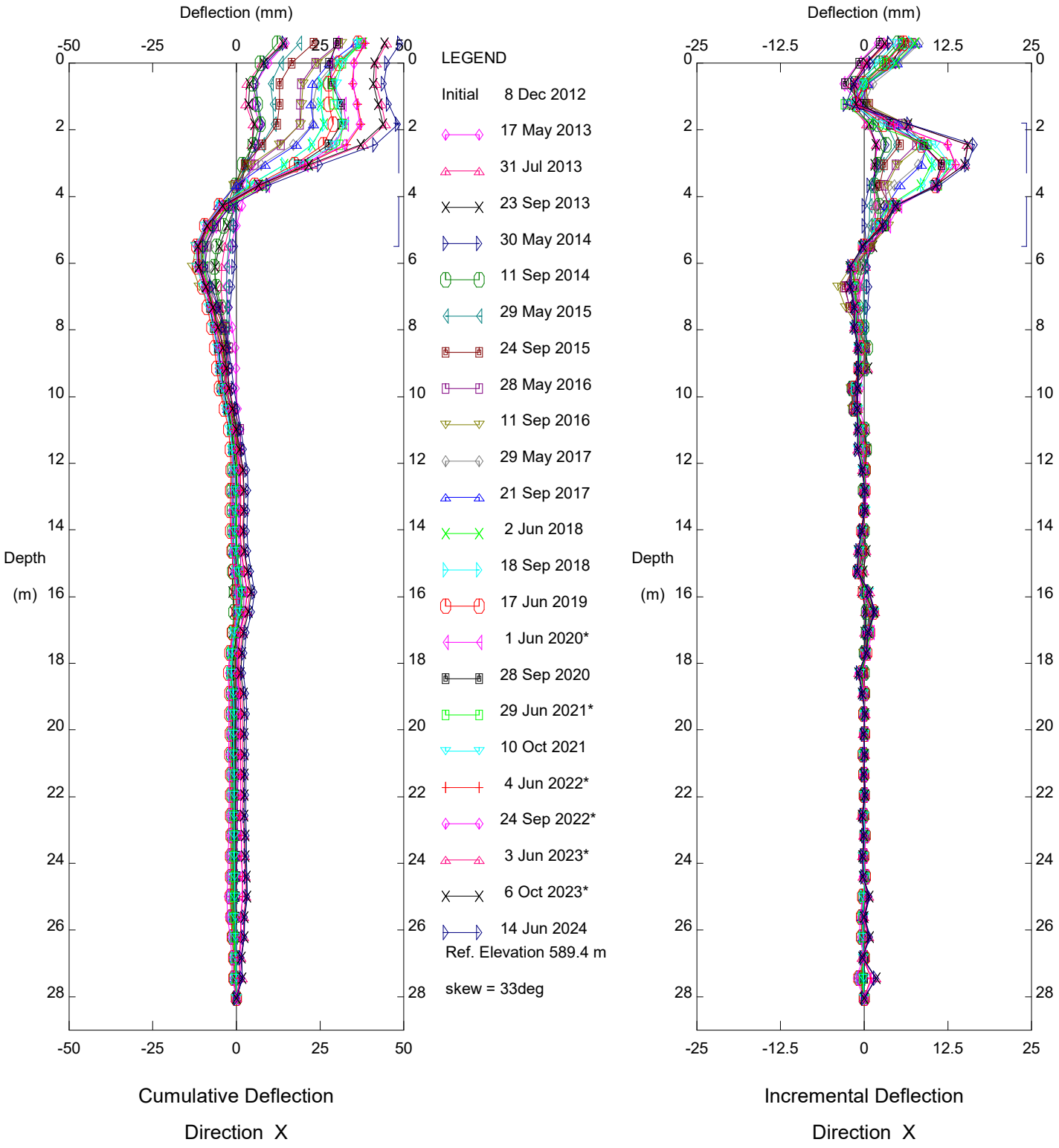

Cumulative Deflection

Direction X

Incremental Deflection

Direction X

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-1

Alberta Transportation

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

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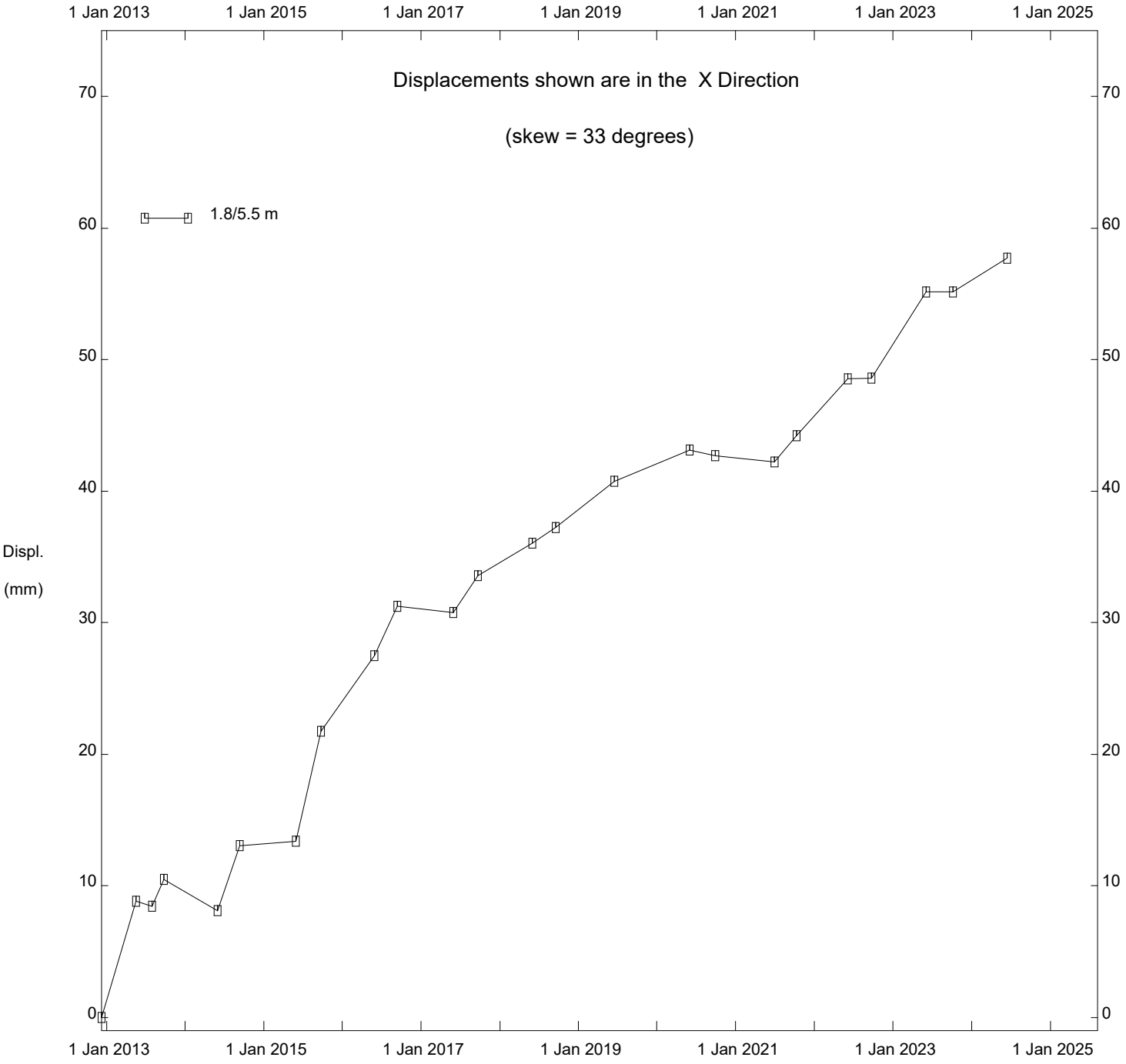
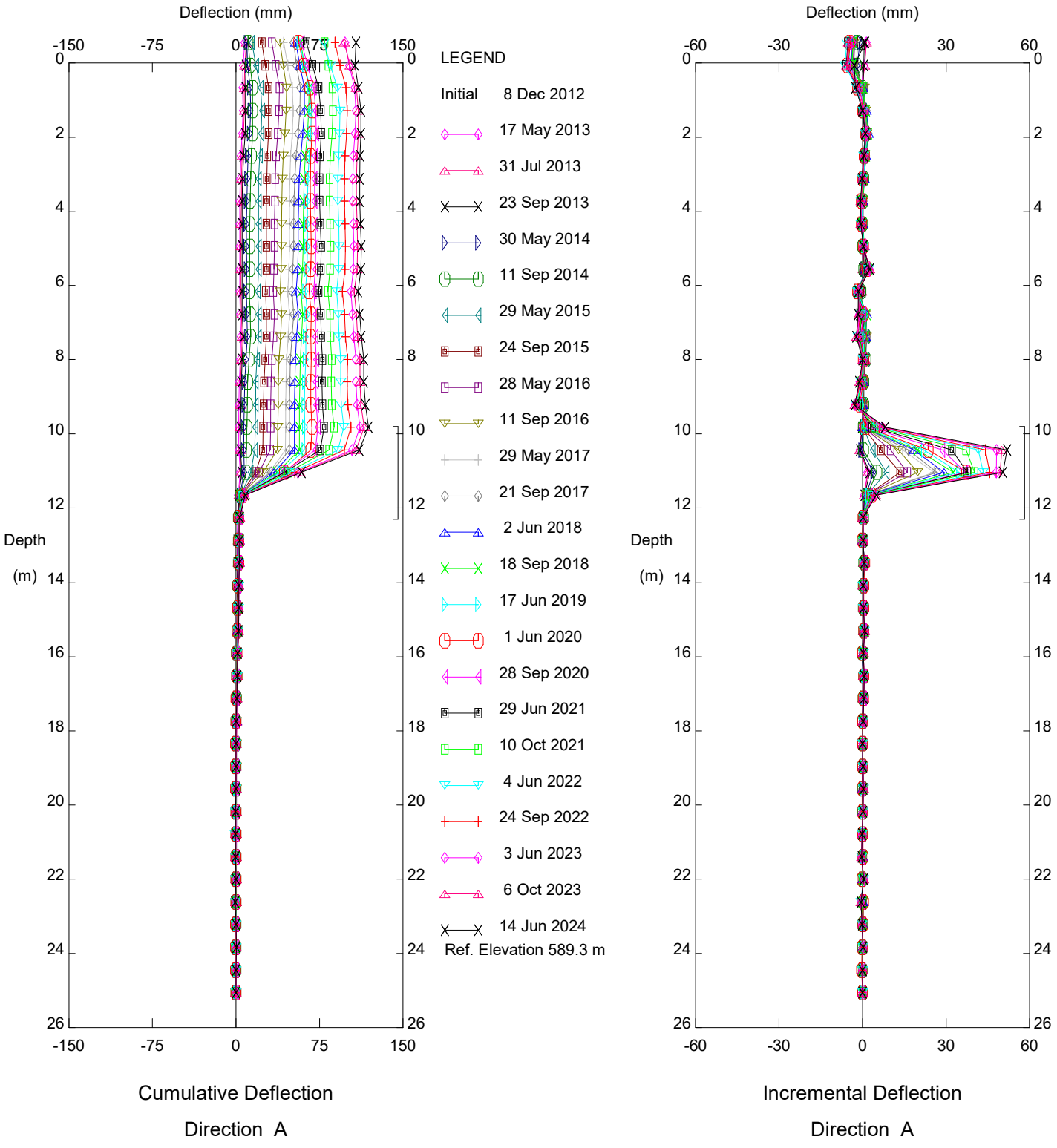
Thurber Engineering Ltd.



Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-1

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

Hwy 663 04 Little Pine Creek, Inclinometer SI12-2

Alberta Transportation

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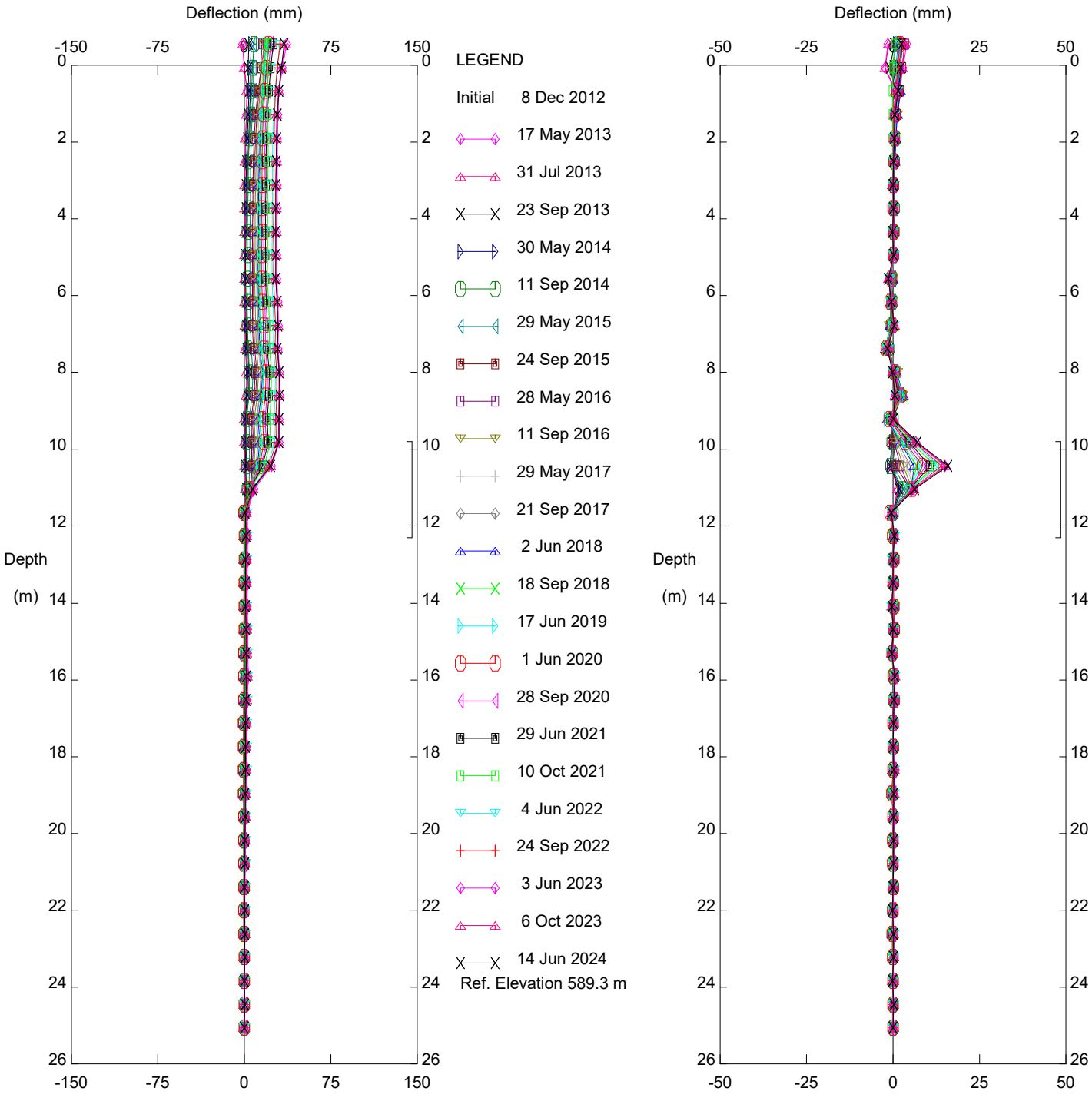


Cumulative Deflection

Direction B

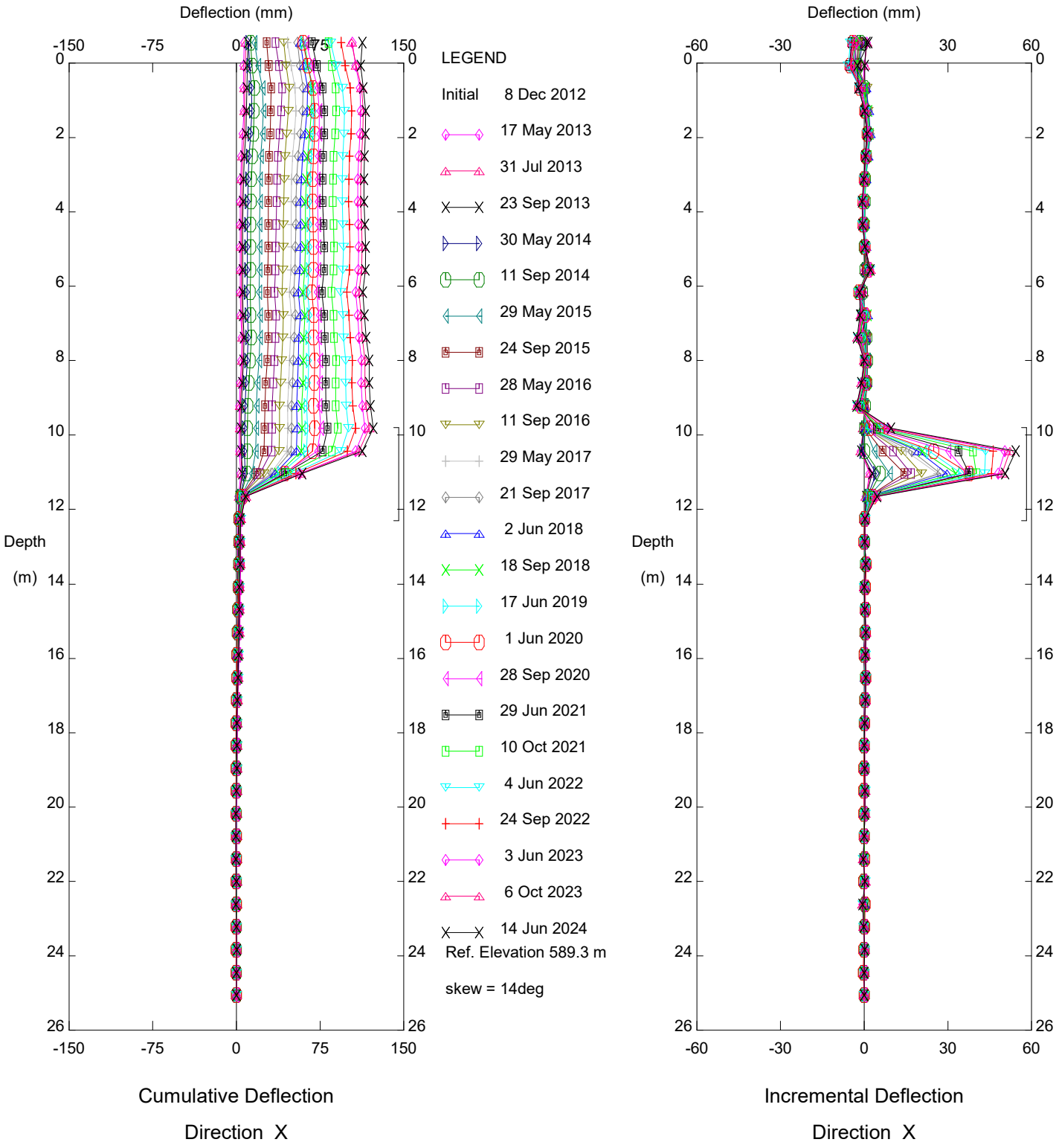
Incremental Deflection

Direction B

Hwy 663 04 Little Pine Creek, Inclinometer SI12-2

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

Hwy 663 04 Little Pine Creek, Inclinometer SI12-2

Alberta Transportation

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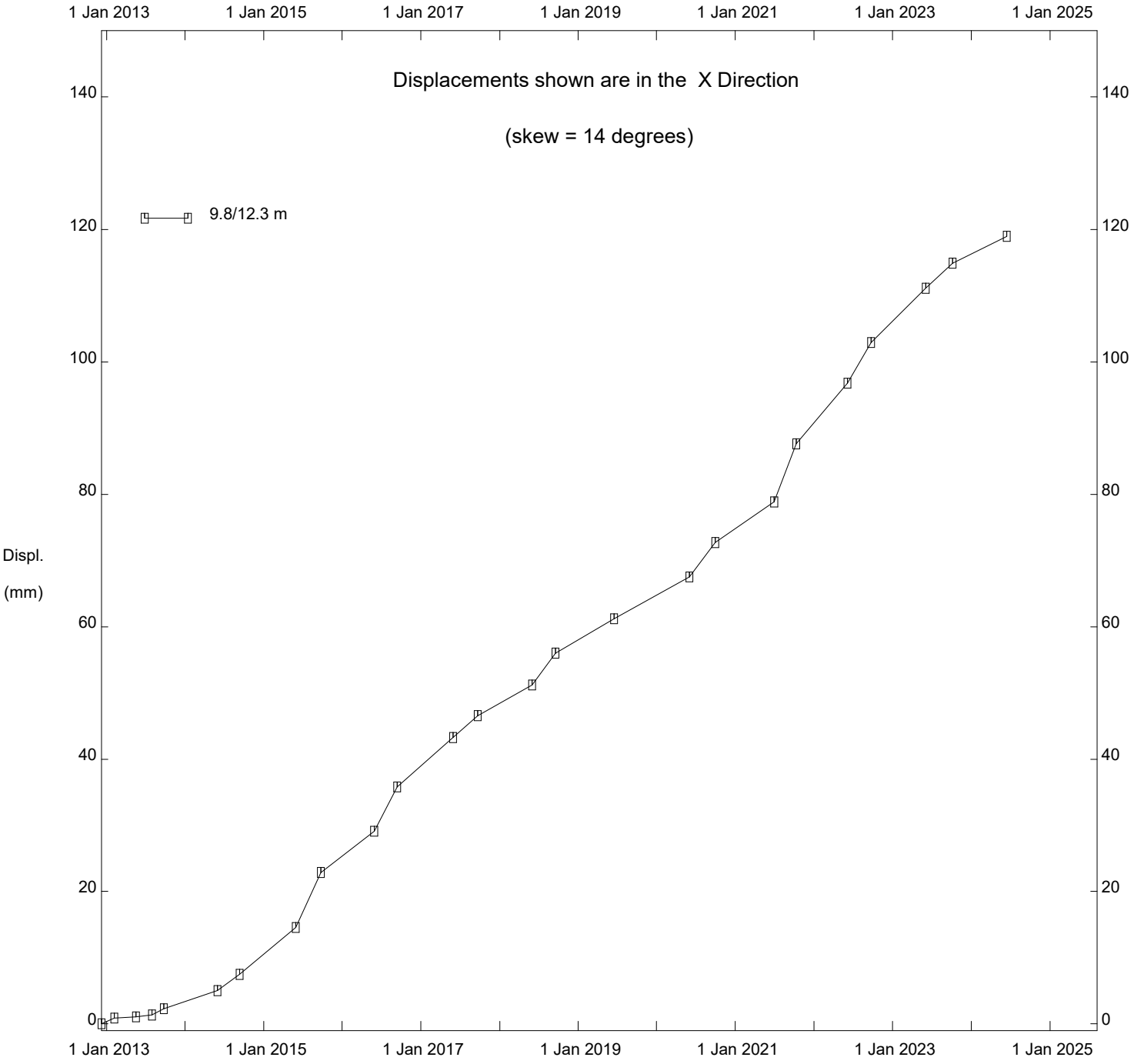
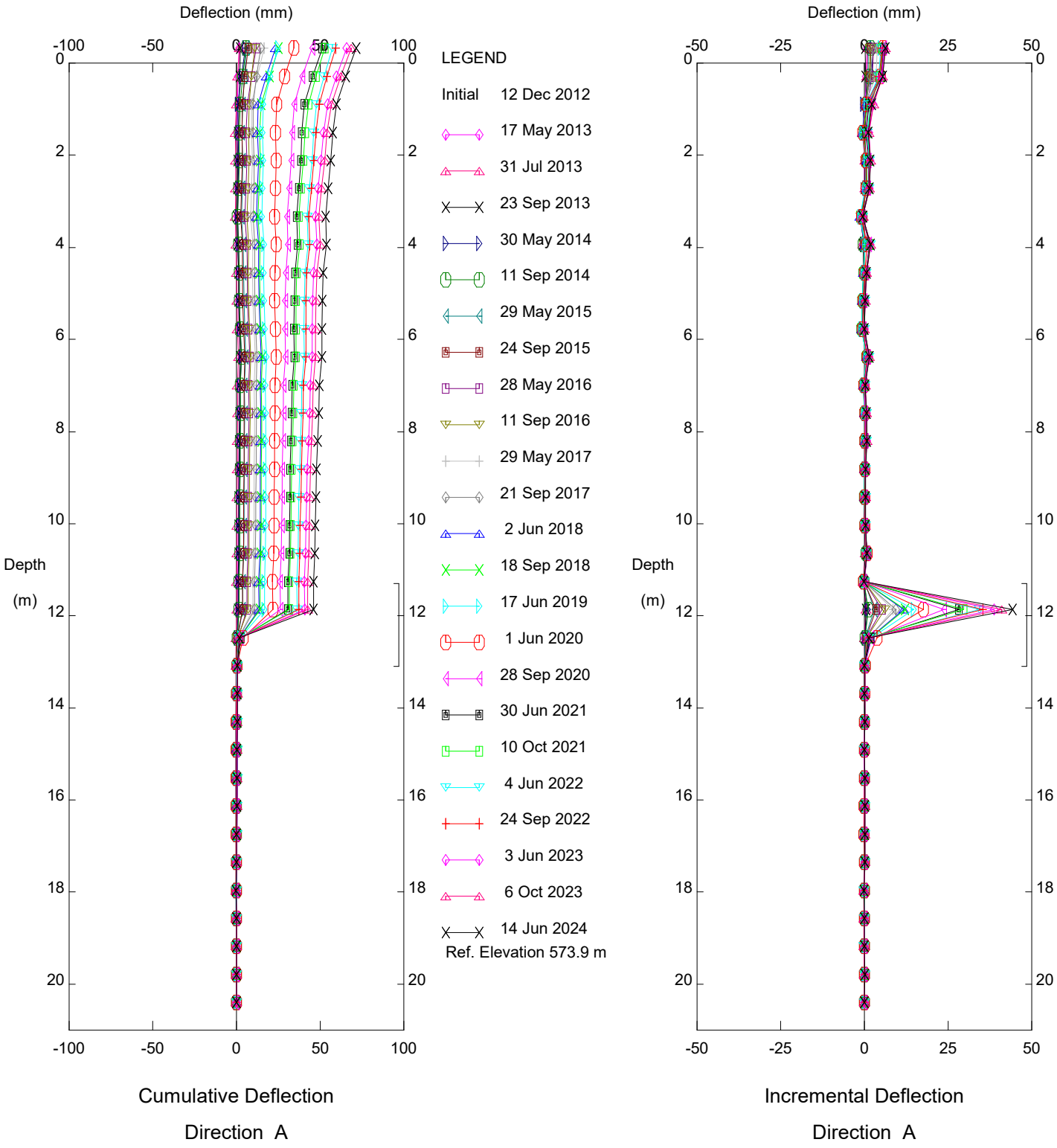


Hwy 663 04 Little Pine Creek, Inclinometer SI12-2

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-3

Alberta Transportation

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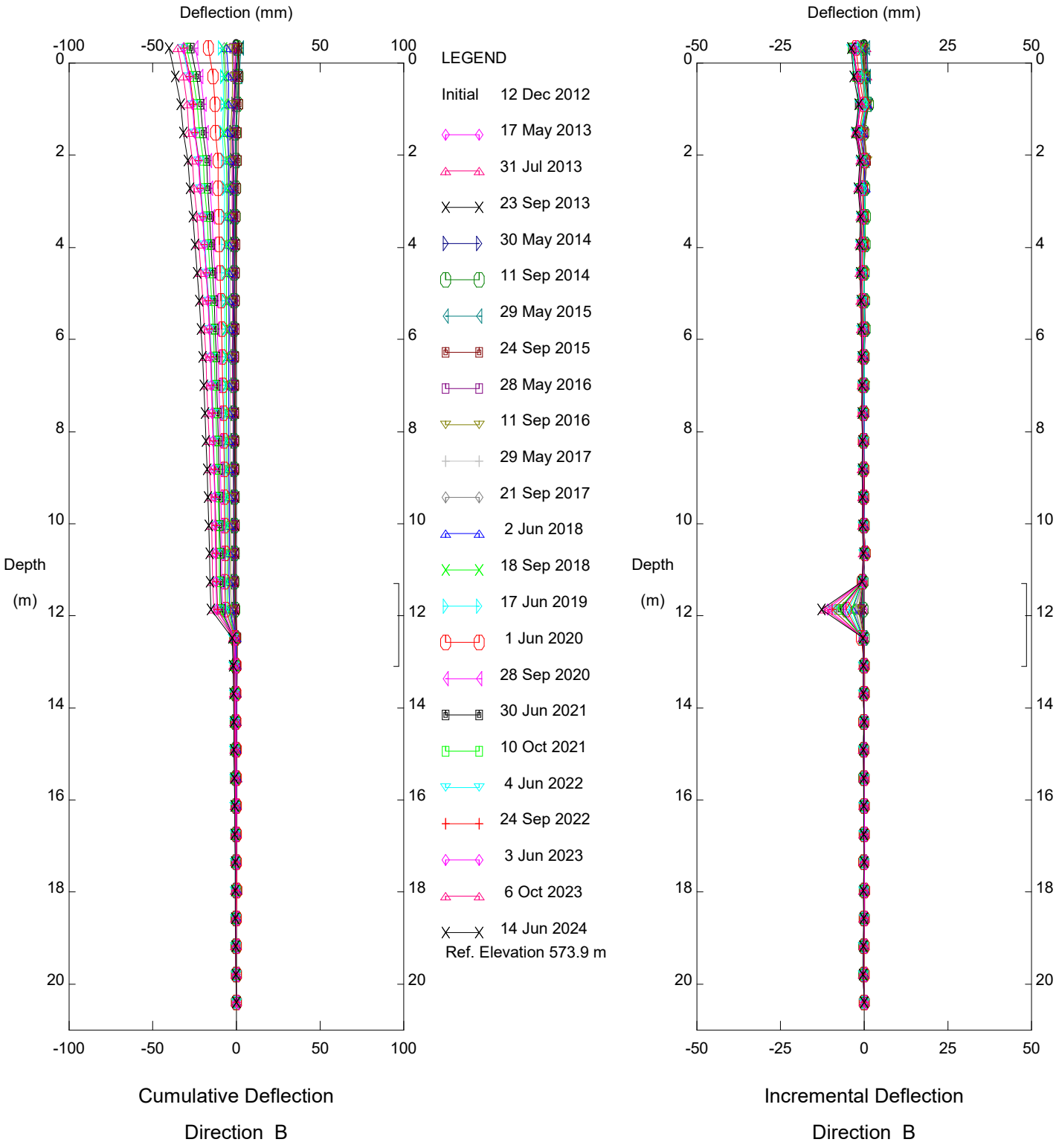

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-3

Alberta Transportation

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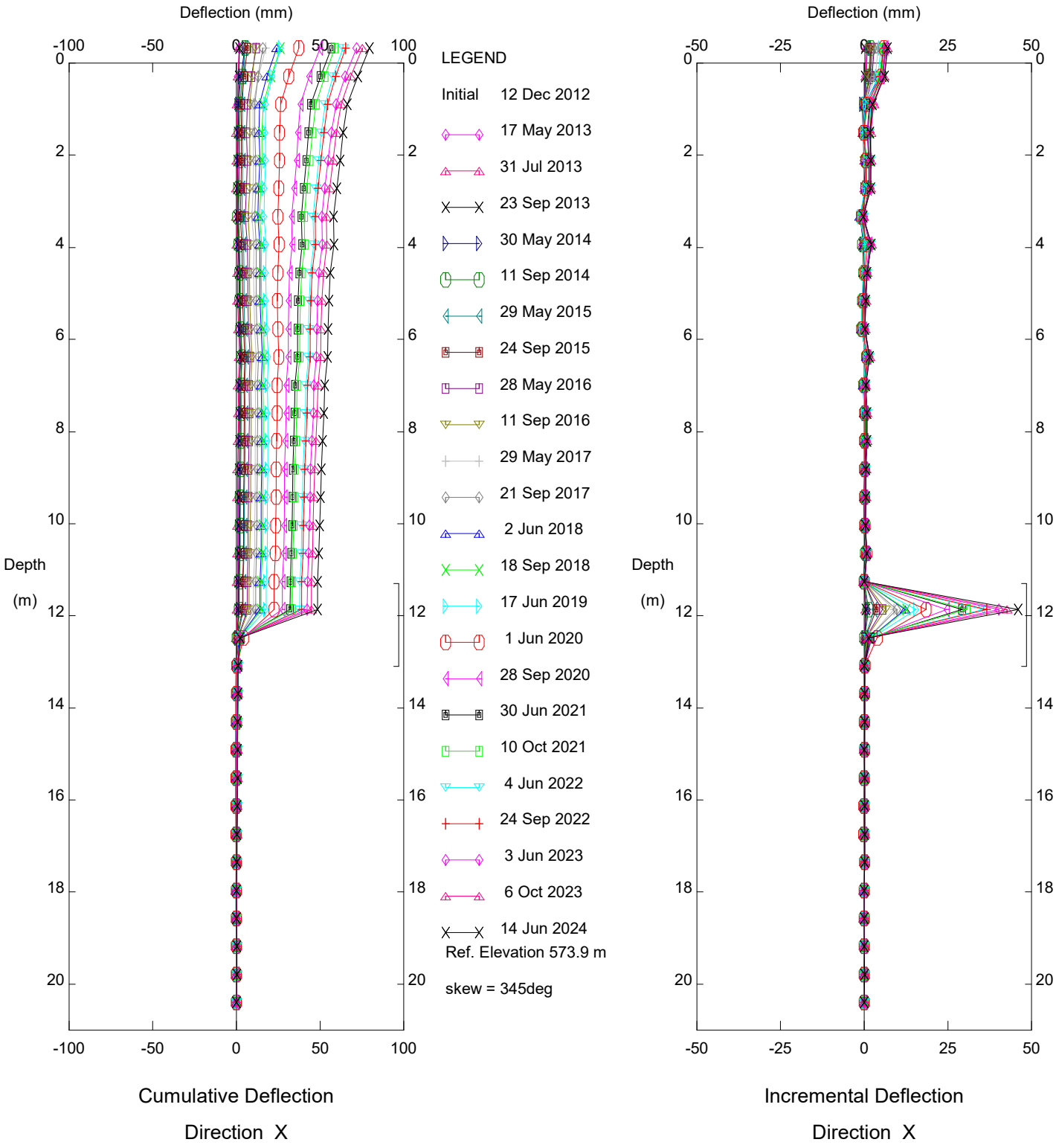

Cumulative Deflection

Direction X

Incremental Deflection

Direction X

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-3

Alberta Transportation

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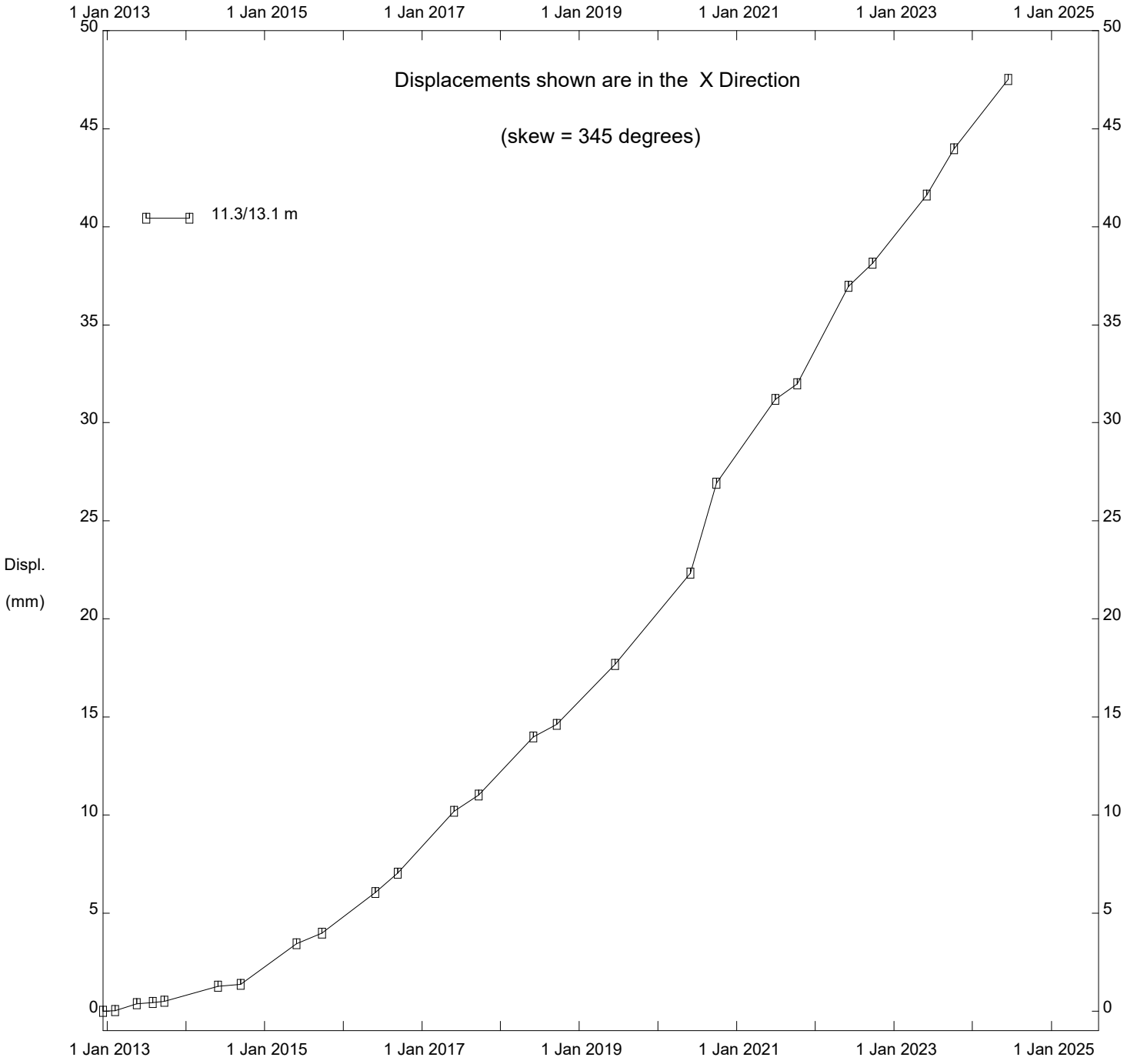
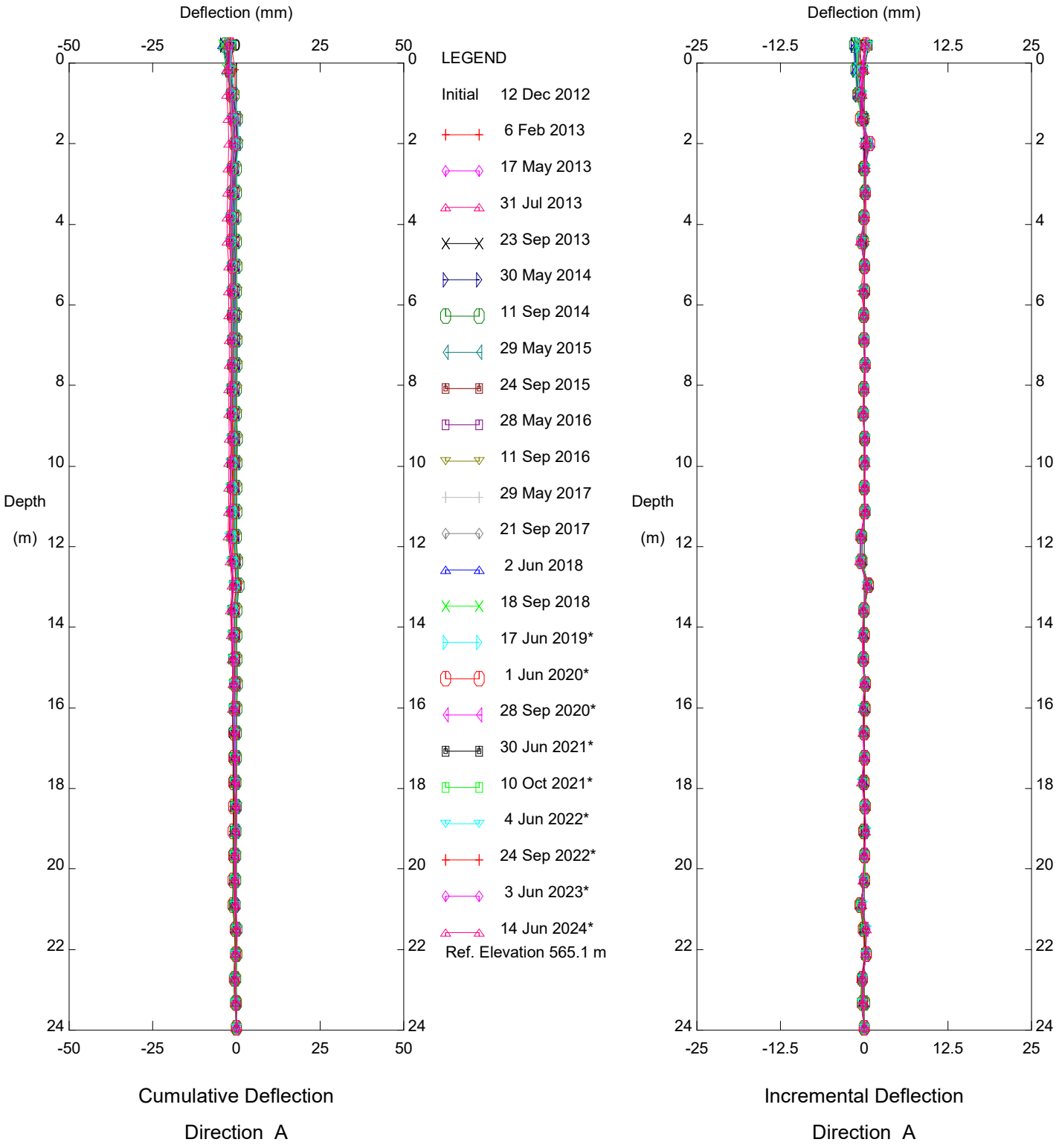


Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-3

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-4

Alberta Transportation

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

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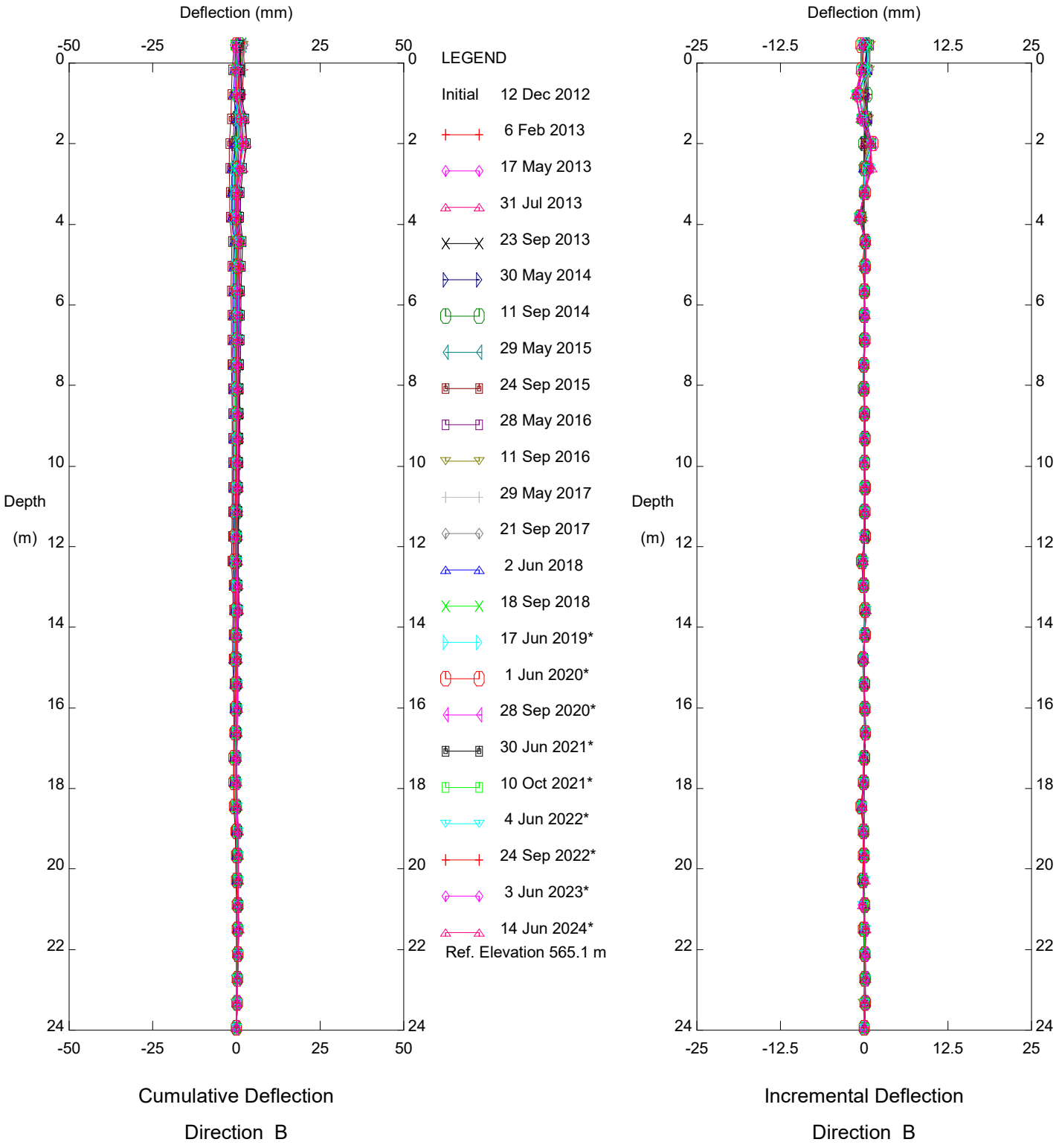
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-4

Alberta Transportation

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

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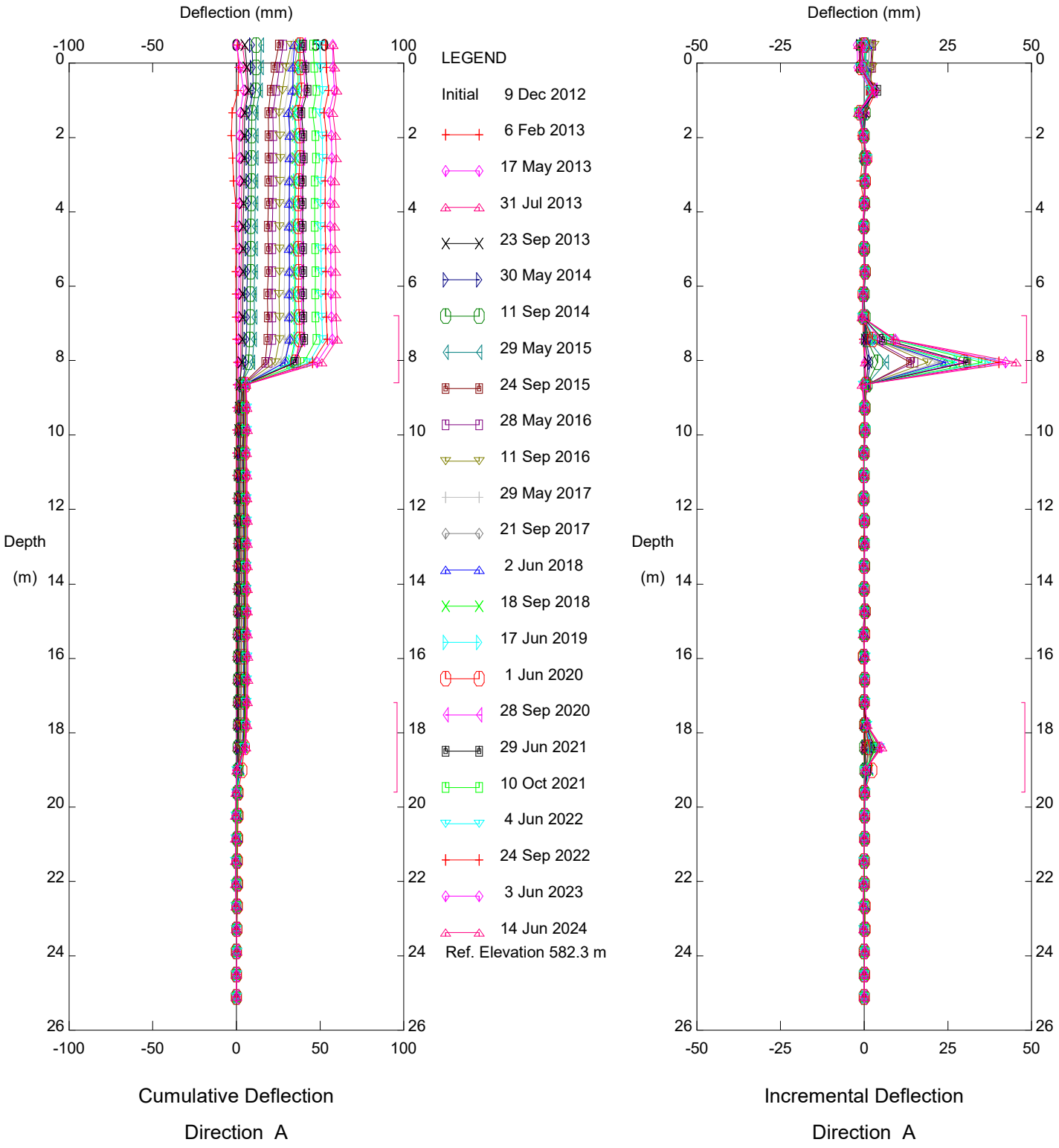

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-9

Alberta Transportation

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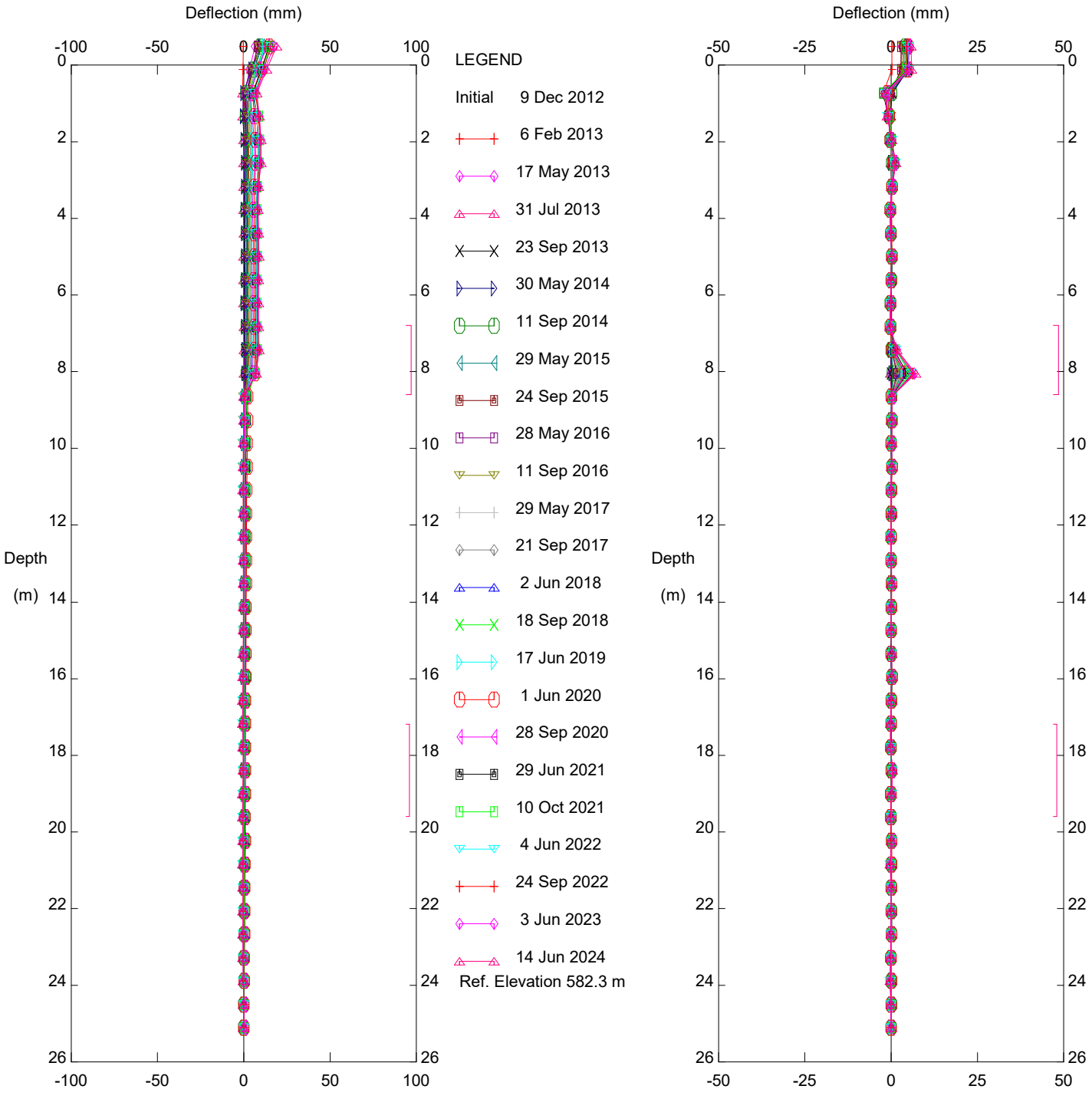
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-9

Alberta Transportation

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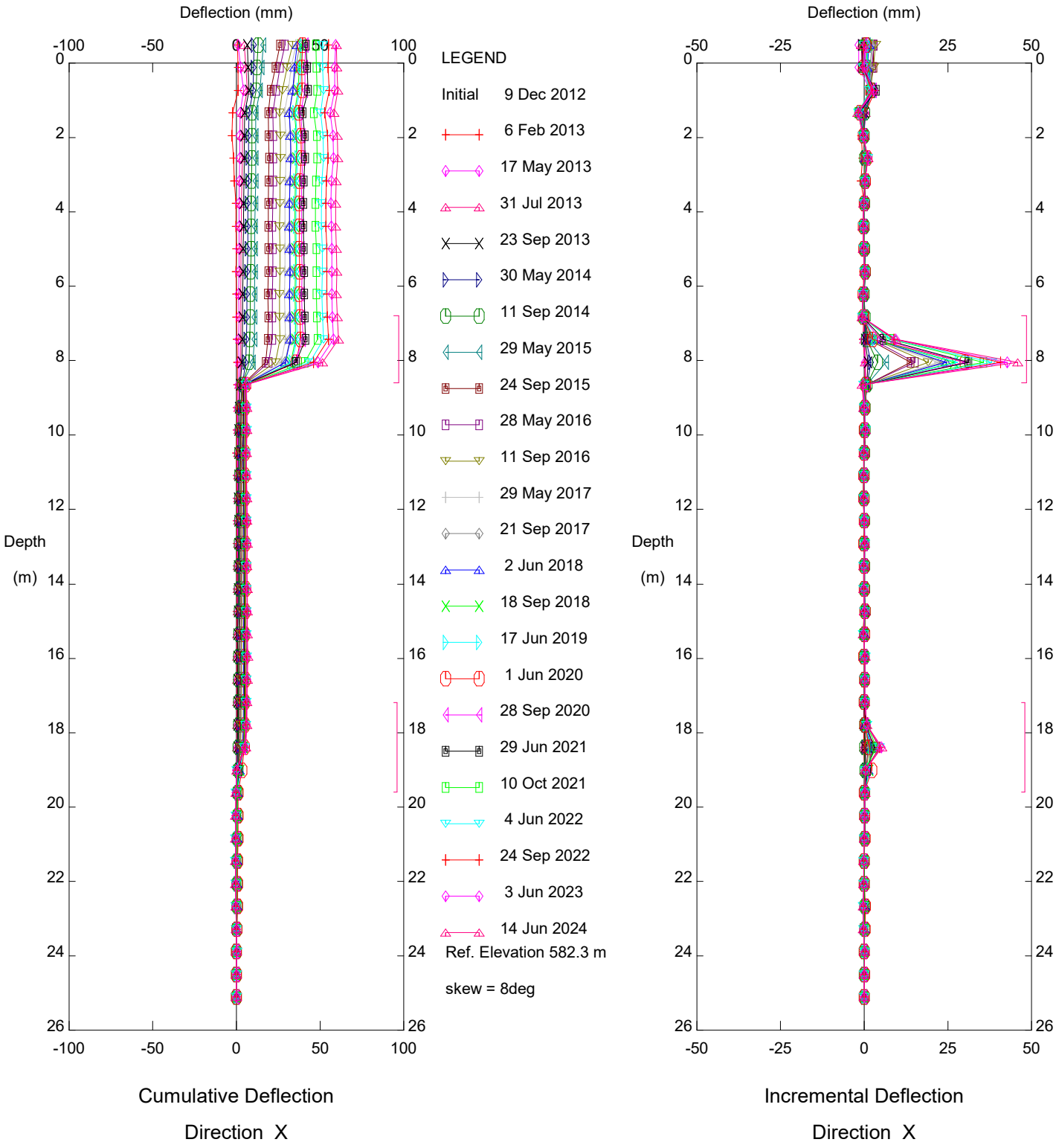

Cumulative Deflection

Direction X

Incremental Deflection

Direction X

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-9

Alberta Transportation

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\Section C\2024A-Spring\SI Readings\NC071\SI12-9.gtl

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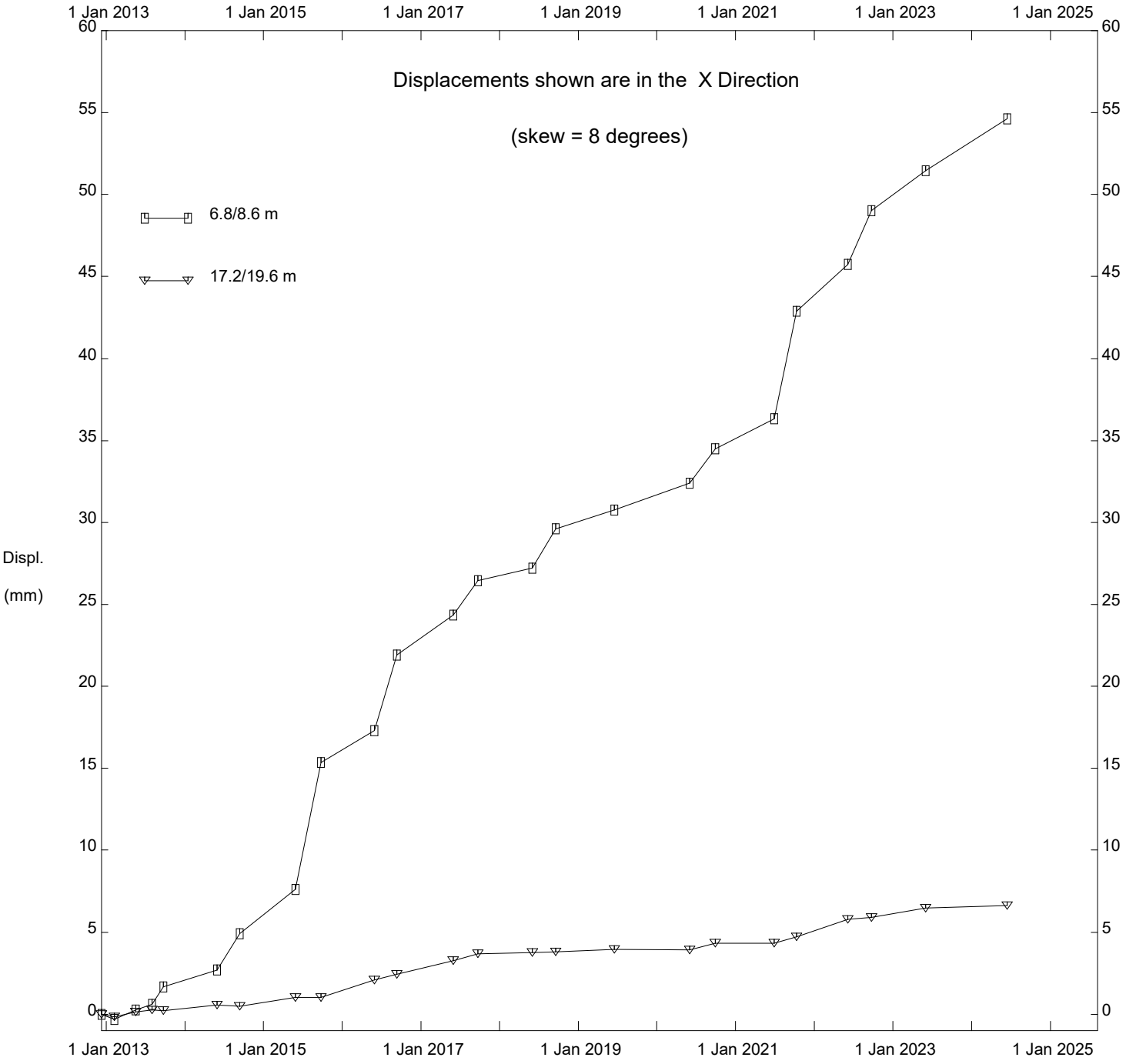

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-9

Alberta Transportation

FIGURE NC071-1
PIEZOMETER DATA FOR HWY 663:04, LITTLE PINE CREEK