ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP NORTH CENTRAL (ATHABASCA AND FORT McMURRAY DISTRICTS) INSTRUMENTATION MONITORING - SPRING 2025

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:	31-May-2025	**Previous Monitoring**	16-Sep-2024
Instruments Read By:	Mr. Niraj Regmi, G.I.T and Mr. Godfred Etiendem, of Thurber		

Instruments Read During This Site Visit			
Slope Inclinometers (SIs): SI12-1, SI12-2 and SI12-4	**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:			

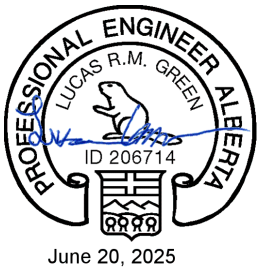
Discussion	
Zones of New Movement:	None
Interpretation of Monitoring Results:	Slope inclinometer SI12-4 has continued to show no discernible movement since initialization. SI12-1 showed a rate of movement of 7.5 mm/yr over 1.8 m to 5.5 m depth since the fall of 2024 readings. SI12-2 showed a rate of movement of 11.9 mm/yr over 9.8 m to 12.3 m depth since the fall of 2024 readings. Pneumatic piezometers PN12-2A, PN12-3B, PN12-4A, and PN12-8 showed increases in groundwater level of 0.06 m, 0.17 m, 0.26 m, and 0.56 m, respectively, since the fall of 2024 readings. Pneumatic piezometers PN12-2B, PN12-4B and PN12-6 showed decreases in groundwater levels of 0.06 m, 0.11 m, and 0.03 m since the fall of 2024 readings. Standpipe piezometers SP1, SP12-10 and SP12-11 showed decreases in groundwater levels of 0.30 m, 0.03 m, 0.10 m since the

	fall of 2024 readings. SP2 showed an increase in groundwater level of 0.25 m since the fall 2024 reading and registered the highest groundwater level recorded since its initialization. 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 2025. SI12-9 was found sheared off during the fall 2024 monitoring event, and SI12-2 will likely get sheared off soon. Consideration should be given to replacing SI12-2 and SI12-9 in the near future to continue monitoring the landslide movement rates at this site.
Instrumentation Repairs:	No instrument repairs are required at this time.
Additional Comments:	

Attachments:	• Table NC071-1 Spring 2025 – HWY 663:04 Little Pine Creek, Slope Inclinometer Instrumentation Reading Summary • Table NC071-2 Spring 2025 – HWY 663:04 Little Pine Creek, Pneumatic Piezometer Instrumentation Reading Summary • Table NC071-3 Spring 2025 – HWY 663:04 Little Pine Creek, Standpipe Piezometer Instrumentation Reading Summary • Statement of Limitations and Conditions • APPENDIX A – NC071-1 SPRING 2025 o Field Inspector's report o Site Plan Showing Approximate Instrument Locations (Drawing No. 32122-NC071) o SI Reading Plots o 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



June 20, 2025

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE:
RM APEGA ID #: 91085
DATE: June 20, 2025
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Lucas Green, P.Eng.
Geotechnical Engineer

Table NC071-1 Spring 2025 – Hwy 663:04 Little Pine Creek Slope Inclinometer Instrumentation Reading Summary

Date Monitored: May 31, 2025

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	63.5 over 1.8 m to 5.5 m depth in 230° direction	26.0 in September 2015	Operational	September 16, 2024	5.3	7.5	5.5
SI12-2	December 8, 2012	132.0 over 9.8 m to 12.3 m depth in 203° direction	31.0 in October 10, 2021	Operational	September 16, 2024	8.4	11.9	-6.1
SI12-3	*December 12, 2012*	*47.5 over 11.3 m to 13.1 m depth in 179° direction*	*14.1 in September 2020*	*Sheared at 13.4 m*	*June 14, 2024*	*N/A*	*N/A*	*N/A*
SI12-4	December 12, 2012	No discernible movement	N/A	Operational	September 16, 2024	N/A	N/A	N/A
SI12-9	*December 9, 2012*	*54.6 over 6.8 m to 8.6 m depth in 202° direction*	*23.9 in September 2015*	*Sheared at 8.5 m*	*June 14, 2024*	*N/A*	*N/A*	*N/A*
		6.6 over 17.2 m to 19.6 m depth in 202° direction	*1.6 in May 2016*			*N/A*	*N/A*	*N/A*

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 2025 – Hwy 663:04 Little Pine Creek Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: May 31, 2025

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	89.9	6.75	6.81	0.06
PN12-2B	December 7, 2012	19.9	583.3	Active	10.48 in June 2022	90.7	10.68	10.62	-0.06
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	137.4	1.24	1.41	0.17

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 Continued… Spring 2025 – Hwy 663:04 Little Pine Creek Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: May 31, 2025

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	61.5	3.11	3.37	0.26
PN12-4B	December 12, 2012	20.6	565.1	Active	4.76 in June 2020	150.3	5.25	5.14	-0.11
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	32.1	8.73	8.70	-0.03
PN12-8	December 2, 2012	5.3	588.9	Active	-0.53 in June 2024	55.0	-0.28*	0.28	0.56
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 2025 – Hwy 663:04 Little Pine Creek Standpipe Piezometer Instrumentation Reading Summary

Date Monitored: May 31, 2025

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	7.19	6.89	-0.30
SP2	December 1979	11.3	576.5	Operational	1.84 on May 31, 2025	1.84	2.09	0.25
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	0.70 on September 16, 2024	0.73	0.70	-0.03
SP12-11	December 12, 2012	15.2	556.2	Operational	7.58 on June 4, 2022	8.02	7.92	-0.10

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.

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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.

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

SPRING 2025

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 2025

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

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	31-May-25	0.91	94 to 2	183	-314	329	533	-535	8R/8R	2.75	
SI12-2	6054552	355828	31-May-25	0.85	84 to 2	175	16	-47	85	-75	8R/8R	2.75	About to shear at 33ft, use dummy probe
SI12-4	6054381	355753	31-May-25	0.75	80 to 2	187	171	-160	35	-31	8R/8R	2.75	

PNEUMATIC PIEZOMETER (PN) READINGS

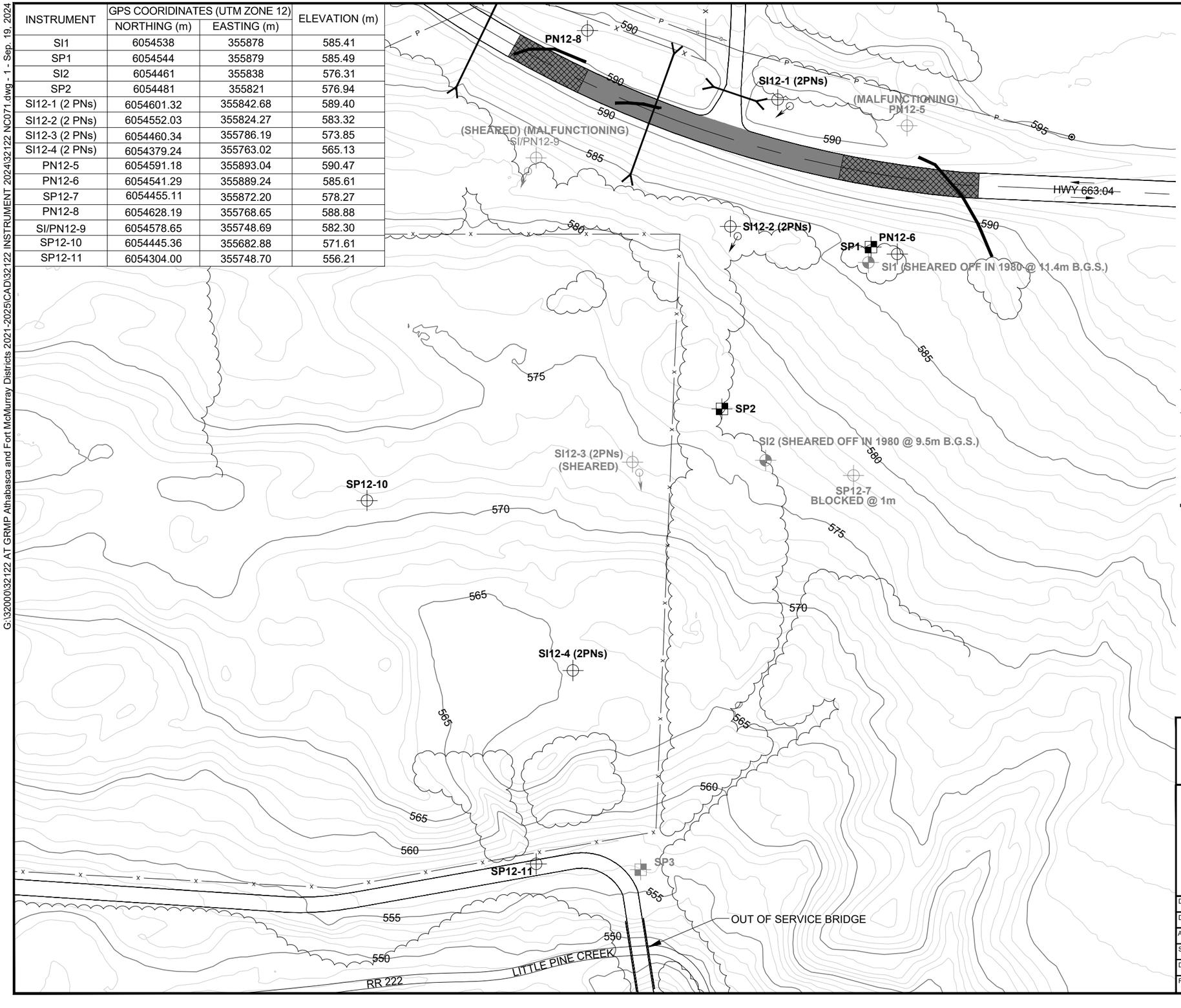
PN #	Serial	GPS Location (UTM 12)		Location	Date	Reading (kPa)	Comments
		Northing	Easting				
PN12-2A	35015	6054552	355828	Attached to SI12-2	31-May-25	89.9	
PN12-2B	35008	6054552	355828	Attached to SI12-2	31-May-25	90.7	
PN12-3B	35007	6054465	355789	Attached to SI12-3	31-May-25	137.4	
PN12-4A	35014	6054381	355753	Attached to SI12-4	31-May-25	61.5	
PN12-4B	35009	6054381	355753	Attached to SI12-4	31-May-25	150.3	Water return
PN12-6	35018	6054544	355889	PN12-6	31-May-25	32.1	
PN12-8	35017	6054628	355765	PN12-8	31-May-25	55	

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	31-May-25	0.81	8.0	
SP2	6054476	355820	31-May-25	1.02	2.86	TD = 11.3m
SP12-10	6054454	355673	31-May-25	0.57	1.3	
SP12-11	6054310	355747	31-May-25	0.77	8.79	

INSPECTOR REPORT

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	SEPTEMBER 2024
FILE No.	32122

THURBER ENGINEERING LTD.

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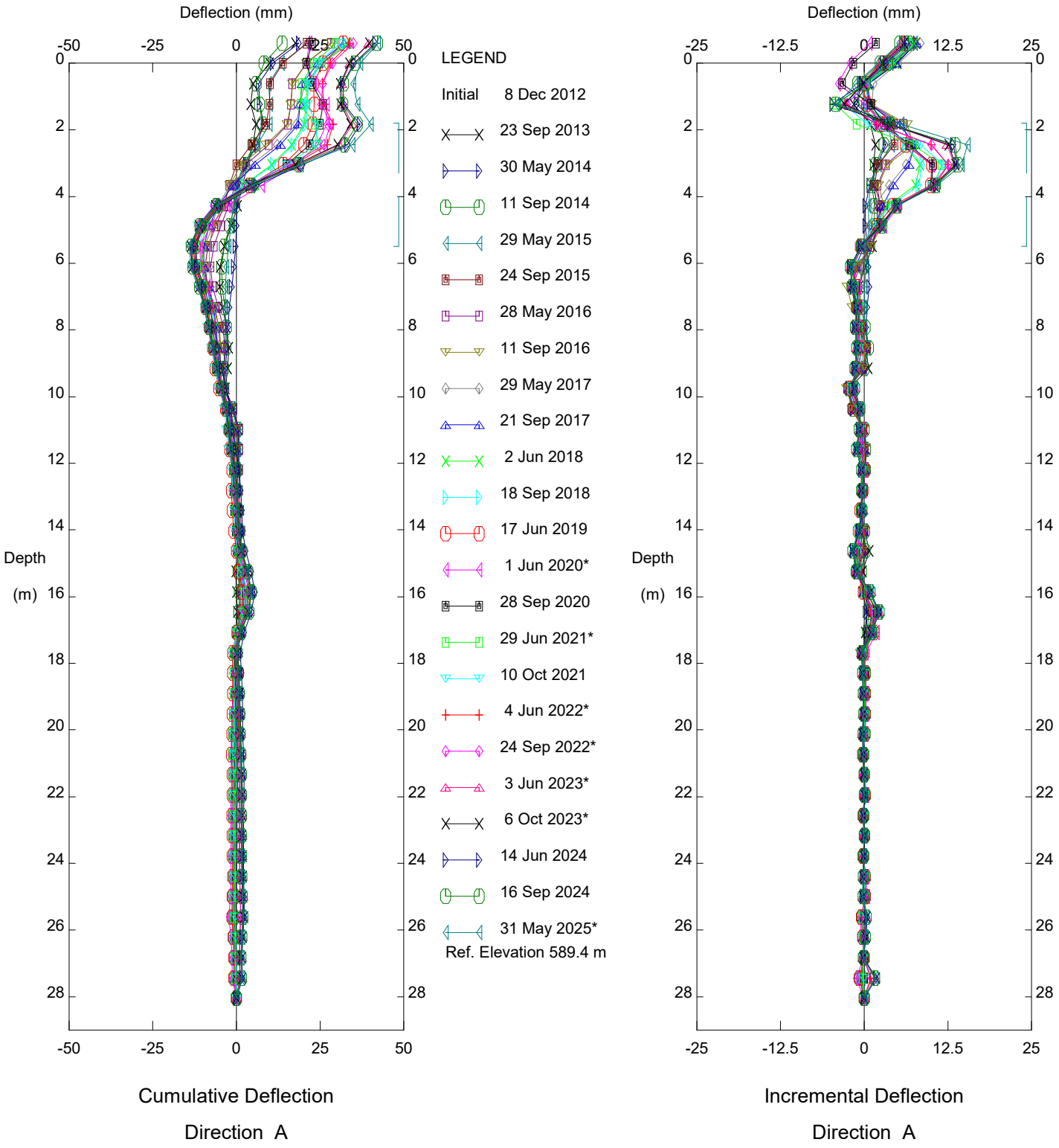

Cumulative Deflection

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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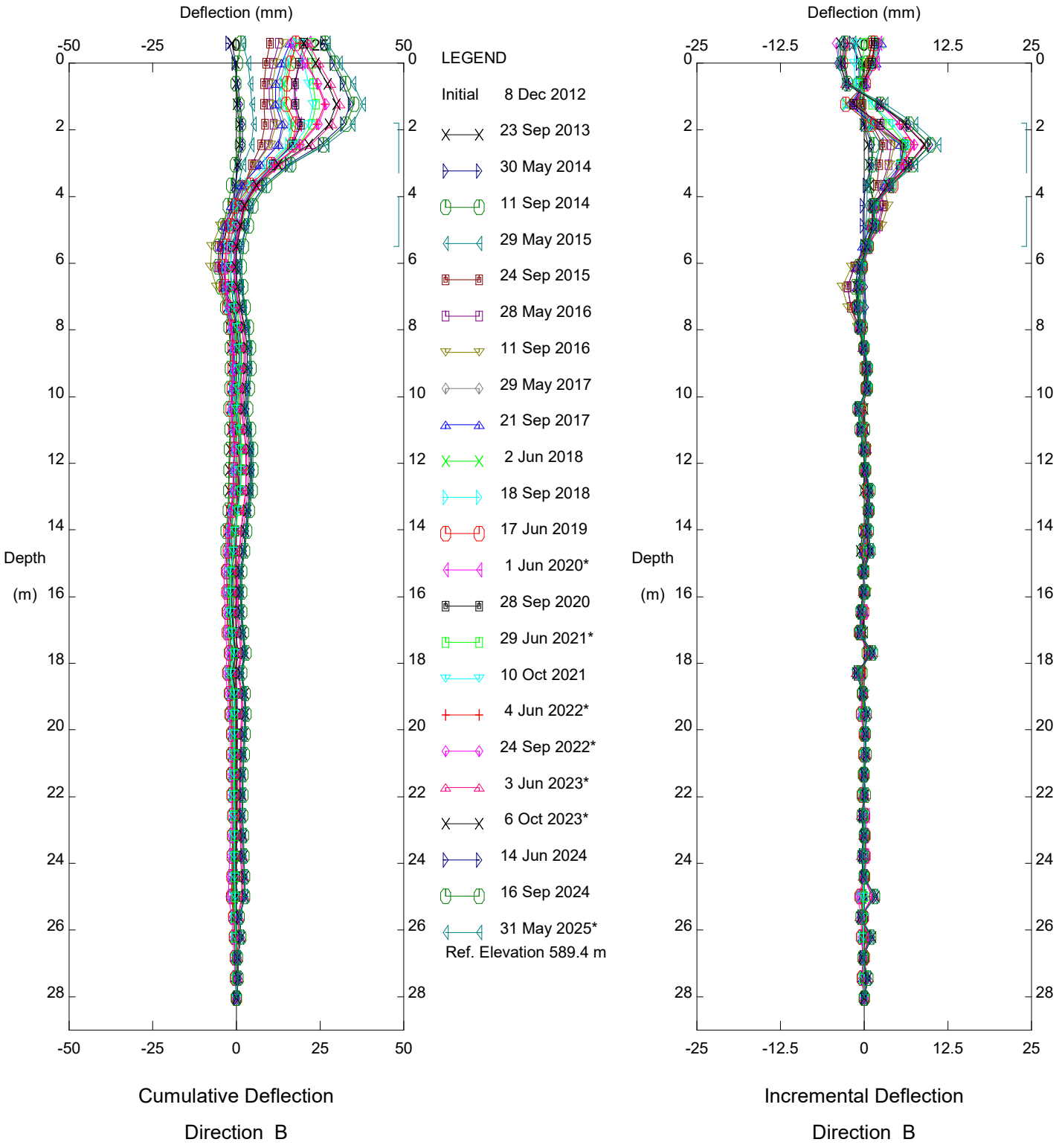

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

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

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

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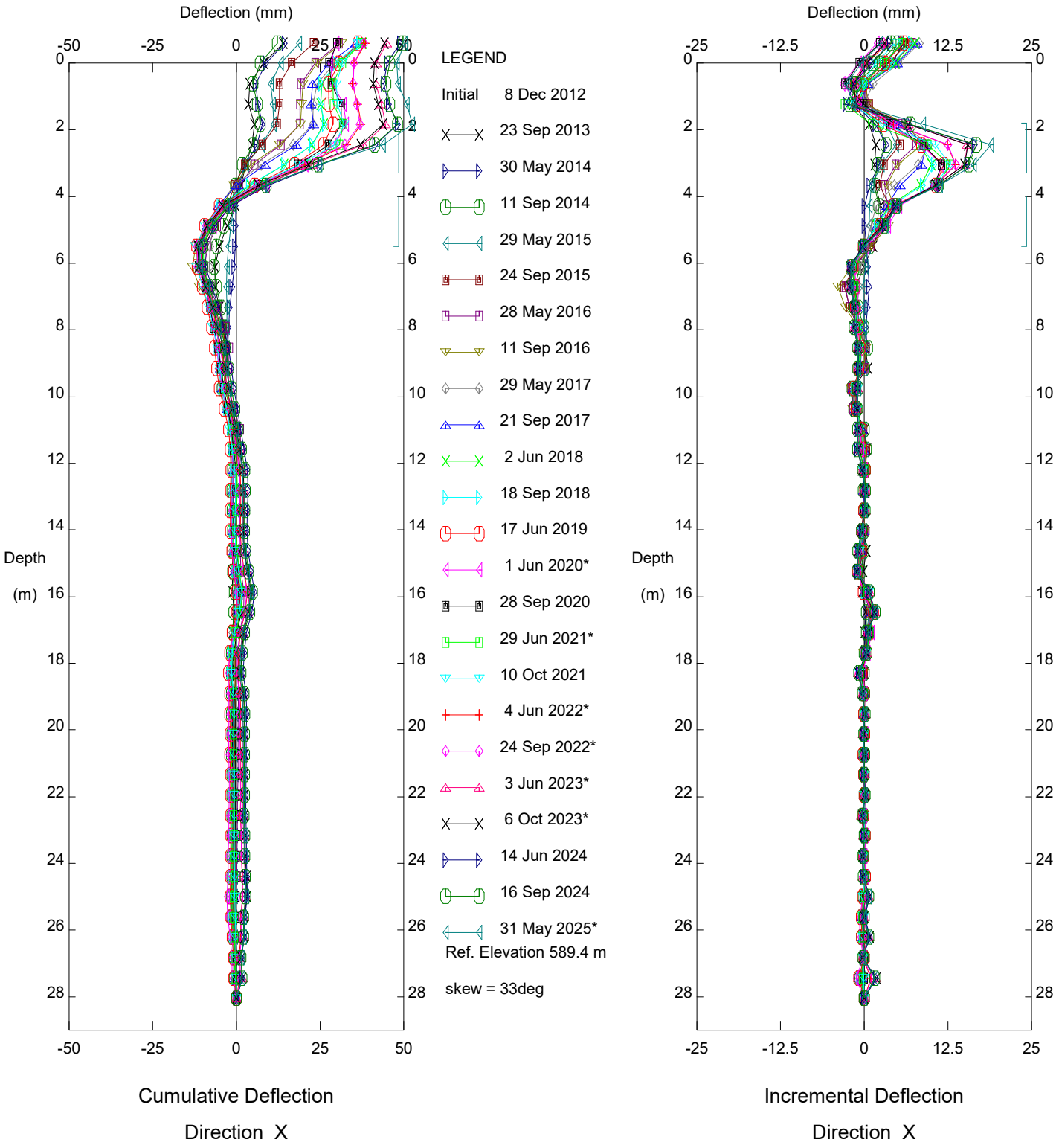

Cumulative Deflection

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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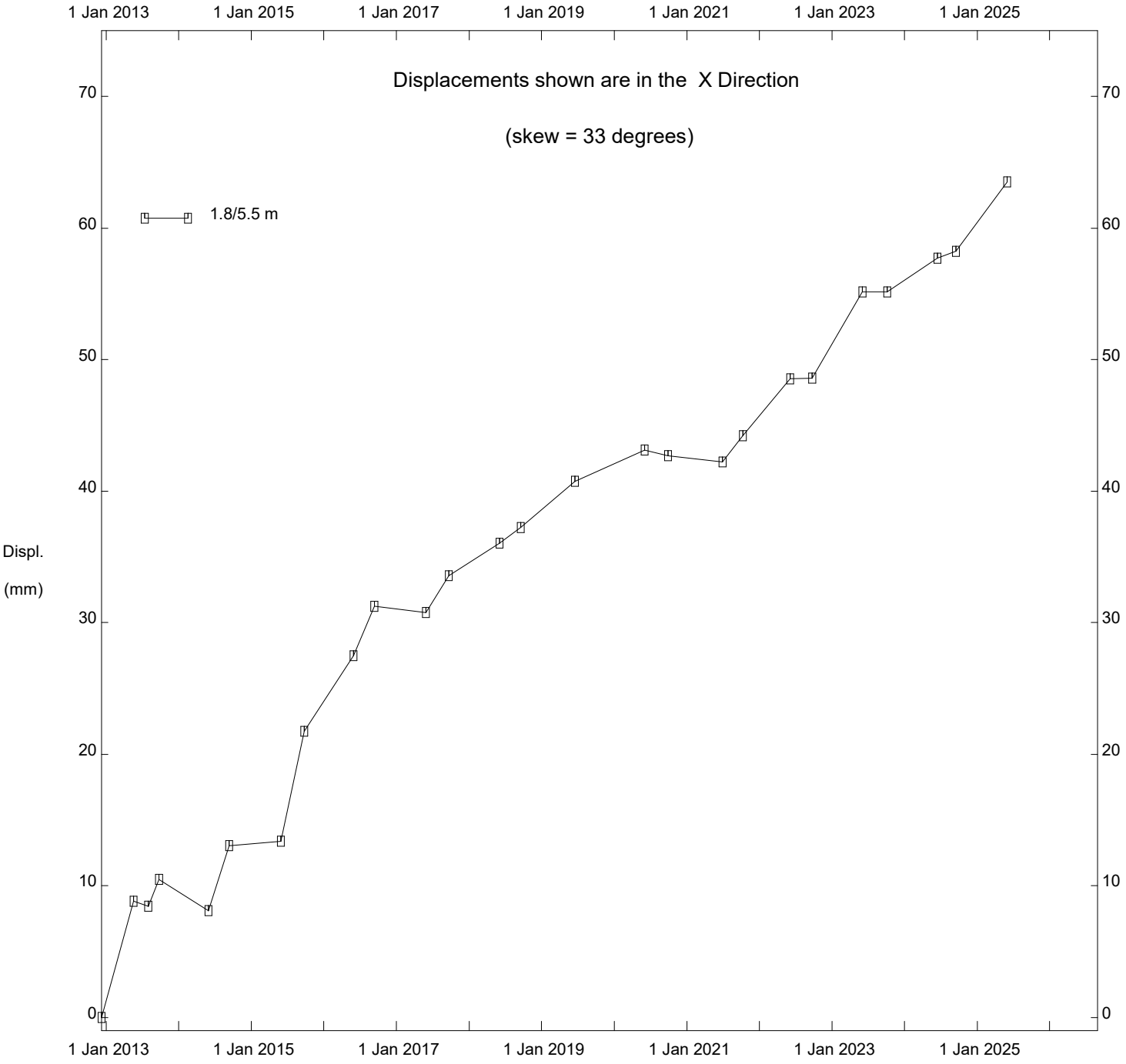

Hwy 663 04 Little Pine Creek [Colinton], Inclinometer SI12-1

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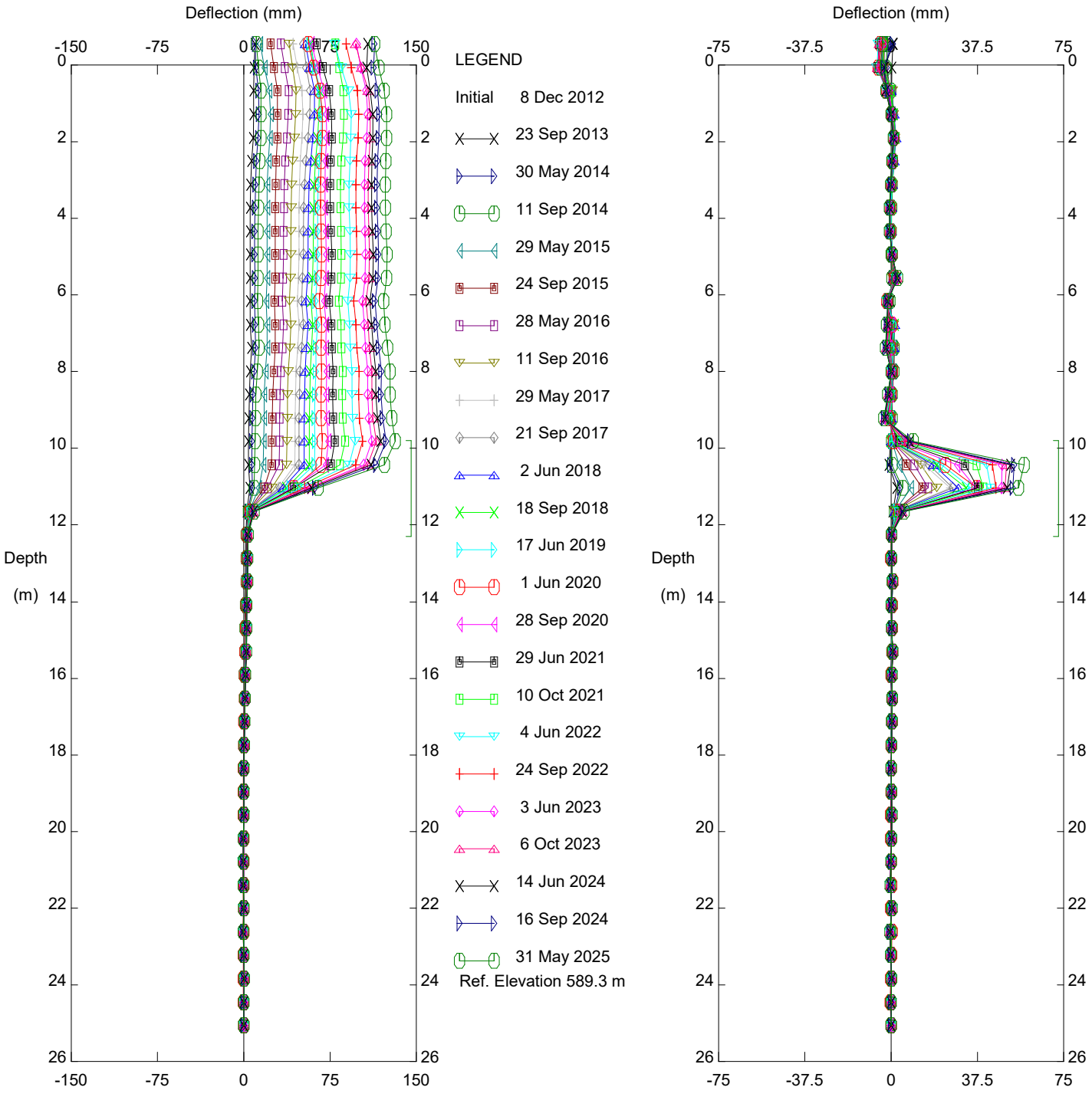

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

Hwy 663 04 Little Pine Creek, Inclinometer SI12-2

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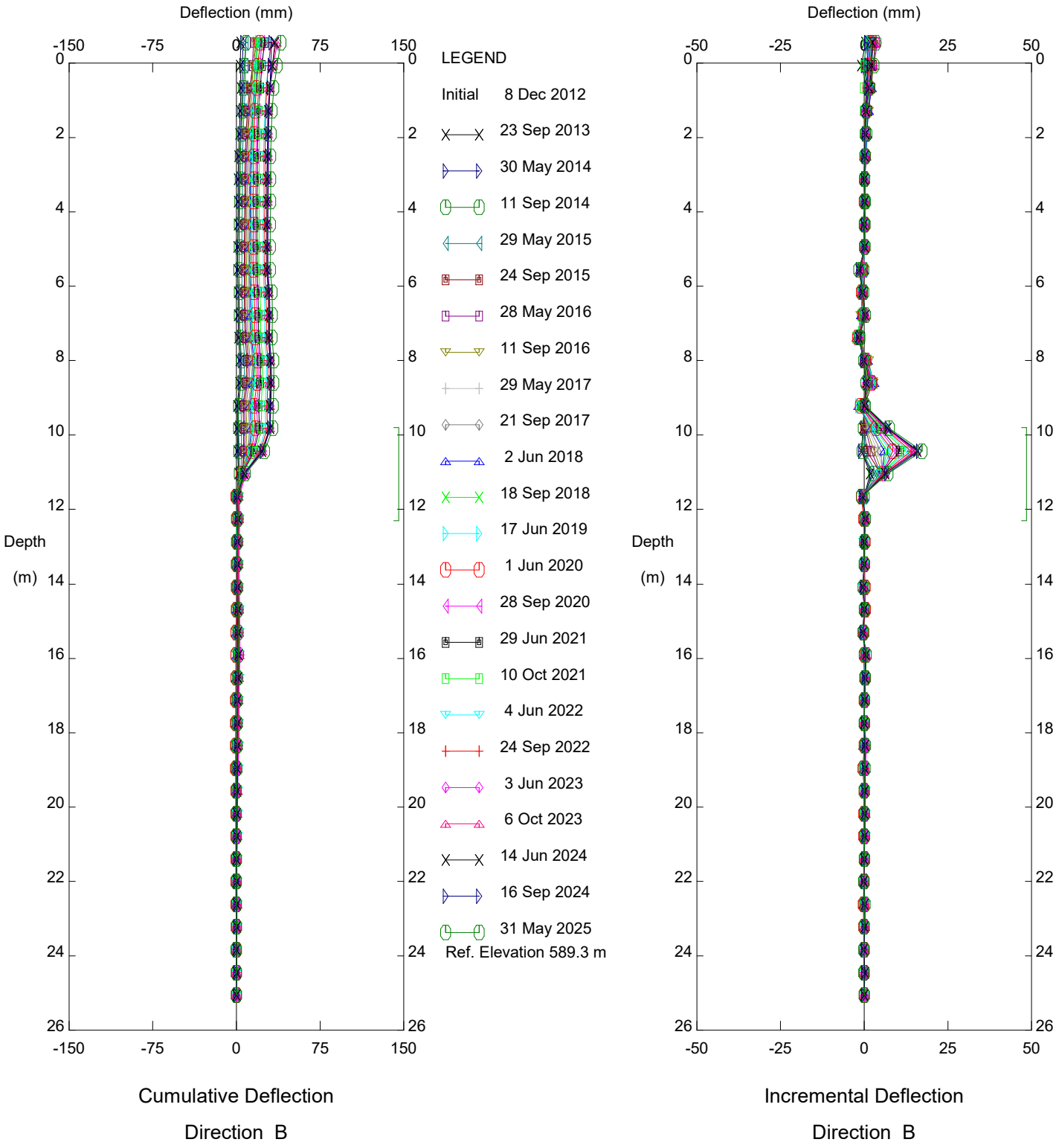

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Hwy 663 04 Little Pine Creek, Inclinometer SI12-2

Alberta Transportation

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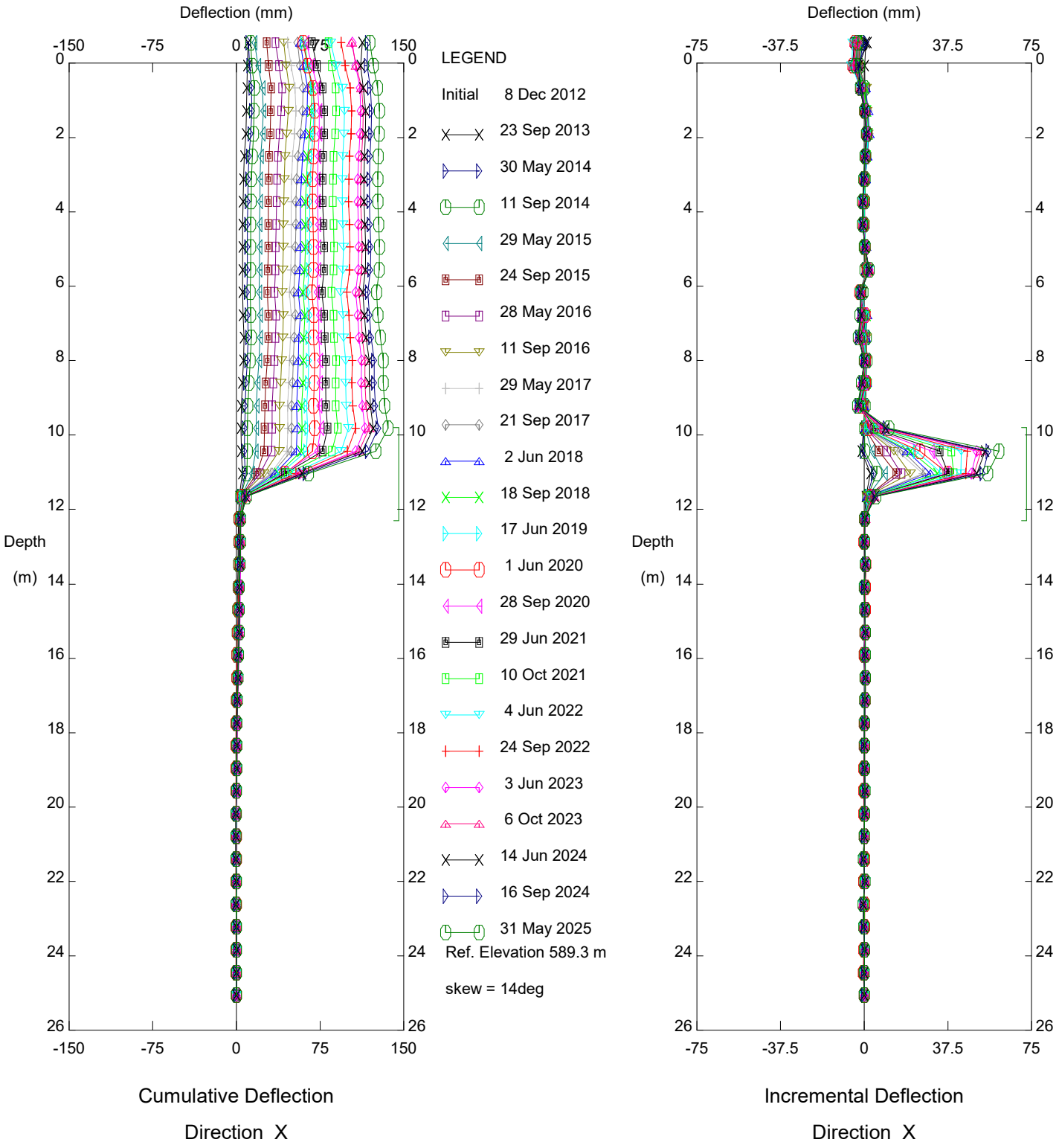
Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

Hwy 663 04 Little Pine Creek, Inclinometer SI12-2

Alberta Transportation

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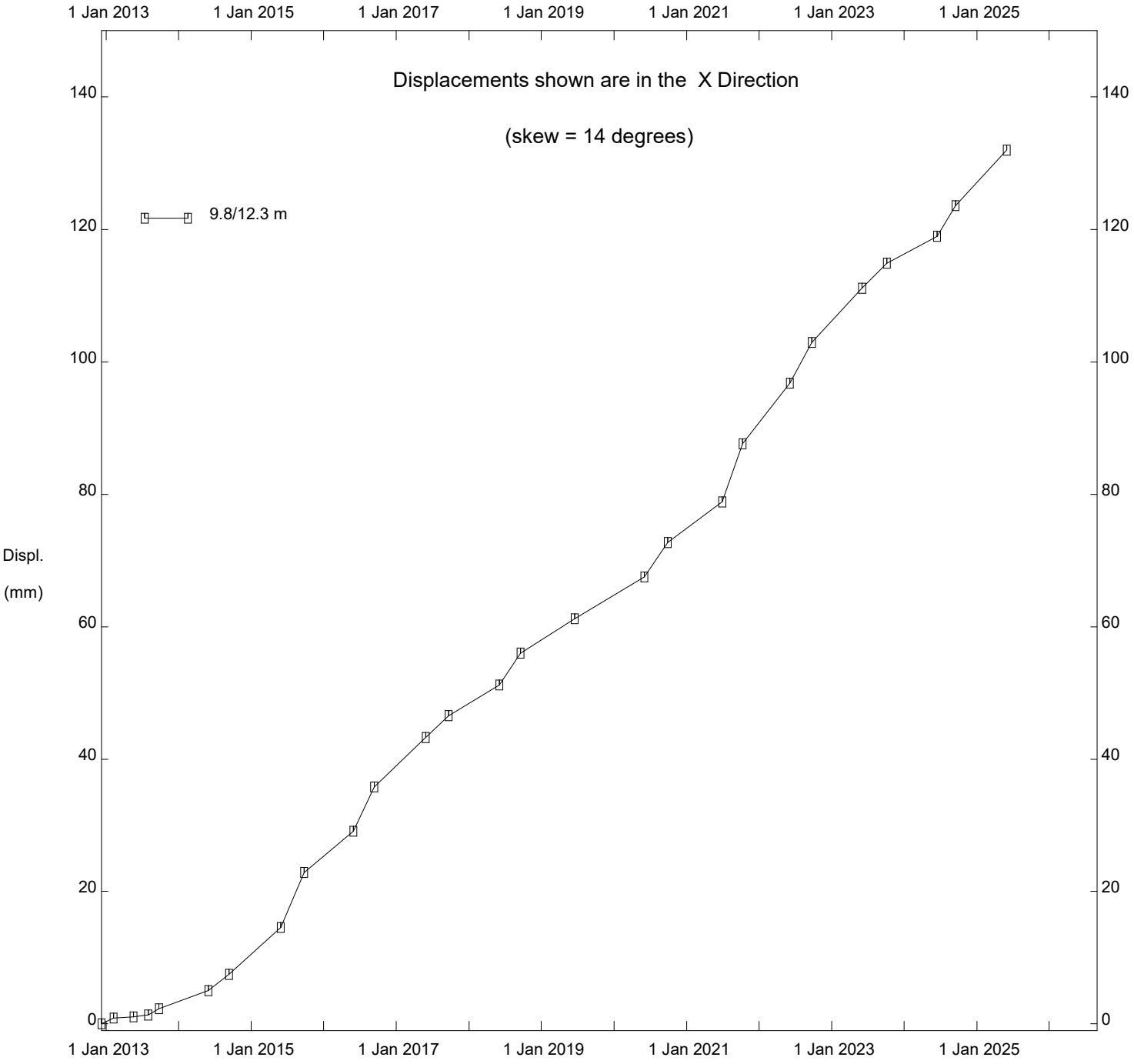
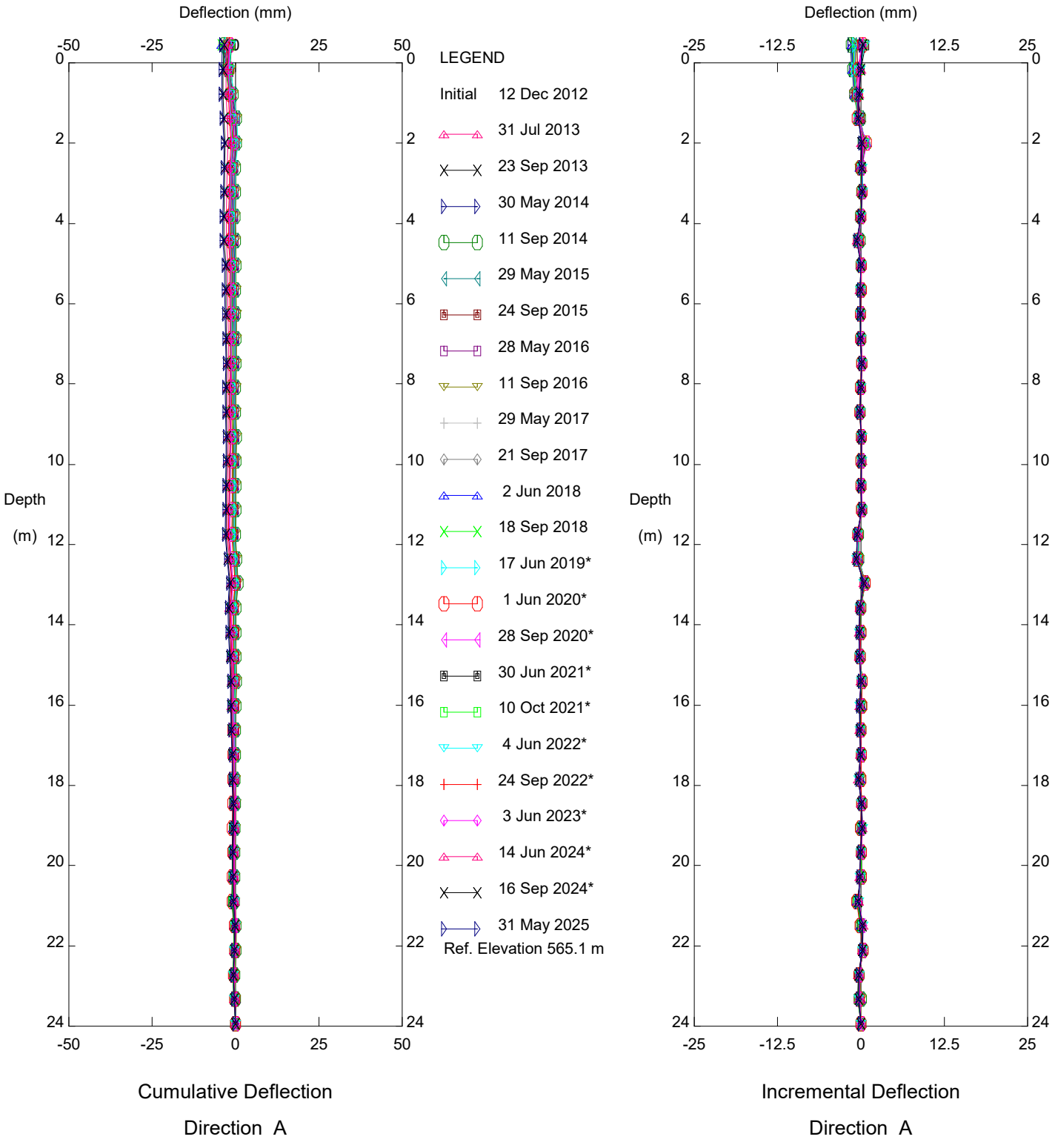


Hwy 663 04 Little Pine Creek, Inclinometer SI12-2

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

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

Alberta Transportation

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

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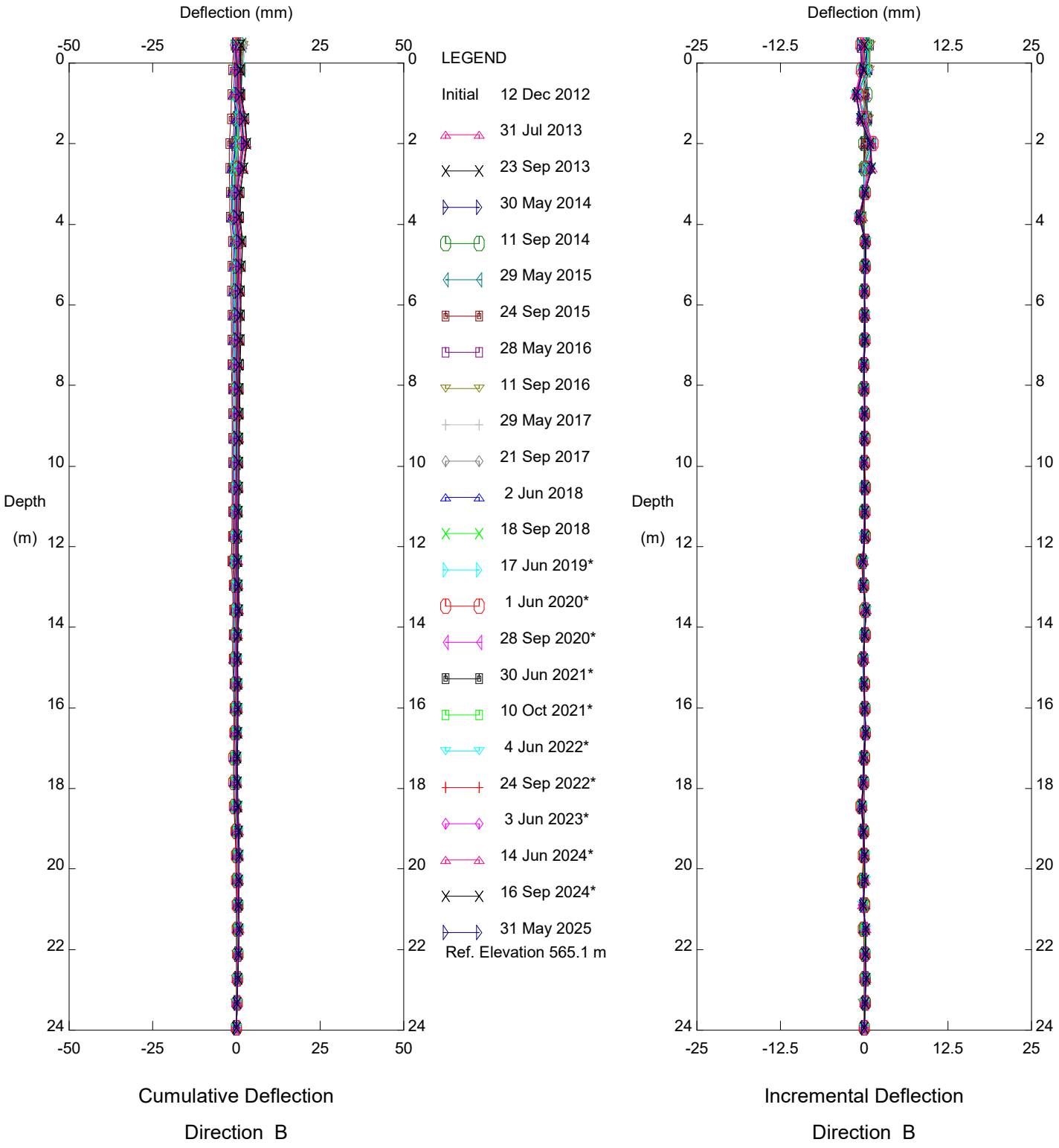
Thurber Engineering Ltd.



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