ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP
PEACE REGION – (PEACE RIVER DISTRICT)
SPRING 2024

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
PH059	Station 34+770 to 35+680	Peace River East Hill	2:60	Km 34.8 to 35.7
Legal Description:		**UTM Co-ordinates**		
6-28-83-21 W5		11U E 484136.86	N 6231088.27	

Current Monitoring:	19-May-2024	**Previous Monitoring**	09-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): SI-67 SI-69 SI-75 SI-81	**Pneumatic Piezometers (PN):** N/A	**Vibration Wire Piezometers (VW):** N/A	**Standpipe Piezometers (SP):** SP 003 SP-004
Load Cell (LC): N/A	**Strain Gauges:** N/A	**SAAs:** N/A	**Others:**

Readout Equipment Used			
Slope Inclinometers: **T**wo RST Digital Inclinometer probes with 2 ft. wheelbases and RST Pocket PC readouts	**Pneumatic Piezometers:**	**Vibration Wire Piezometers:**	**Standpipe Piezometers:** Heron dipmeter
Load Cell:	**Strain Gauges:**	**SAAs:**	**Others:**
Note:			

Discussion	
Zones of New Movement:	None
Interpretation of Monitoring Results:	Slope indicator SI-67 is located upslope of the highway and SI-69, 75 and 81 are all located downslope of the highway. SI-67 showed no discernible movement although there are many zones of very subtle movement at significant depth. SI-69 showed no discernible movement although there are many zones of very subtle movement at significant depth. SI-75 showed a rate of movement of 3.8 mm/yr over 0.0 m to 5.4 m depth since the fall of 2023 readings. This represents a decrease in rate of movement of 14.6 mm/yr since the fall of 2023 readings. An overall accelerated movement rate has been present since the spring of 2023 readings (7 mm/yr after spring 2023 versus 2 mm/yr between about spring 2007 to spring 2023). SI-81 showed rates of movement of 0.6 mm/yr and 3.0 mm/yr over 1.9 m to 6.1 m depth and 6.1 m to 9.2 m depth, respectively, since the fall of 2023 readings. The movement rate over 6.1 m to 9.2 m depth decreased by 4.6 mm/yr since the fall of 2023 readings.

	Standpipe piezometers SP-003 and SP-004 showed decreases in groundwater level of 0.16 m and 0.17 m, respectively, since the fall of 2023 readings.
Future Work:	The instruments should be read again in the fall of 2024
Instrumentation Repairs:	No instrument repairs are required at this time.
Additional Comments:	

Attachments:	▪ Table PH059-1: Spring 2024 – Peace River East Hill Site # 2 Slope Inclinometer Instrumentation Reading Summary ▪ Table PH059-2: Spring 2024 – Peace River East Hill Site # 2 Pneumatic Piezometer Instrumentation Reading Summary ▪ Table PH059-3: Spring 2024 – Peace River East Hill Site # 2 Standpipe Piezometer Instrumentation Reading Summary ▪ Statement of Limitations and Conditions ▪ APPENDIX A - PH059 SPRING 2024 □ Field Inspector's report □ Site Plan Showing Approximate Instrument Locations (Drawing No. 32121 PH059) □ SI Reading Plots □ Figure PH059-1 (Piezometric Readings)

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.
Roger Skirrow, M.Sc., P. Eng.
Senior Geotechnical Engineer

PROFESSIONAL ENGINEER ALBERTA
BRUCE W. NESTOR
ID 161284
2024-07-15

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE: Don Proudfoot
RM APEGA ID #: 51674
DATE: July 15, 2024
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Bruce Nestor, P.Eng.
Geotechnical Engineer

Table PH059-1: Spring 2024 – Peace River East Hill Site # 2 Slope Inclinometer Instrumentation Reading Summary

Date Monitored: May 19, 2024

INSTRUMENT #	DATE INITIALIZED	TOTAL CUMULATIVE RESULTANT MOVEMENT AT NOTED DEPTH SINCE INITIAL READING (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)
SI-67	Sept. 24, 1996	No discernible movement	N/A	Operational	October 9, 2023	N/A	N/A	N/A
SI-69	Oct. 2, 1996	No discernible movement	N/A	Operational	October 9, 2023	N/A	N/A	N/A
SI-75	Oct. 2, 1996	68.5 mm over 0 m to 5.4 m depth in 208° direction	33.7 mm/yr In Nov. 1996	Operational	October 9, 2023	2.3	3.8	-14.6
SI-76	*Oct. 2, 1996*	*Not Known*	*Not Known*	*Discontinued*	*May 20, 2004*	*N/A*	*N/A*	*N/A*
SI-81	Oct. 2, 1996	97.3 mm over 1.9 m to 6.1 m depth in 191° direction	34.9 mm/yr in September 1997	Operational	October 9, 2023	0.4	0.6	-0.3
		78.4 mm over 6.1 m to 9.2 m depth in 179° direction	16.9 mm/yr in September 1997			1.9	3.0	-4.6
SI-82	*Oct. 2, 1996*	*59.5 mm over 11 m to 14 m depth in 220° direction*	*19.6 mm/yr between Nov. 1996 and Oct. 1997*	*Sheared at 11.7 mBGS*	*September 30, 2012*	*N/A*	*N/A*	*N/A*

Drawing 32121-PH059 in Appendix A provides a sketch of the approximate locations of the monitoring instrumentation for this site.

Table PH059-2: Spring 2024 – Peace River East Hill Site # 2 Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: Not Monitored

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER LEVEL BGS (m)	MEASURED PORE PRESSURE (kPa)	CURRENT WATER LEVEL BGS (m)	PREVIOUS WATER LEVEL BGS (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN-001 (26207)	*N/A*	*19.8*	*N/A*	*Damaged*	*13.50 on May 24, 2008*	*N/A*	*N/A*	*N/A*	*N/A*
PN-002 (26210)	*N/A*	*19.8*	*N/A*	*Destroyed*	*9.60 on Oct .3, 2002*	*N/A*	*N/A*	*N/A*	*N/A*
PN-004 (26205)	*N/A*	*20.6*	*N/A*	*Damaged*	*18.05 on Oct. 3, 2002*	*N/A*	*N/A*	*20.59 (October 13, 2021)*	*N/A*

Drawing 32121-PH059 in Appendix A provides a sketch of the approximate locations of the monitoring instrumentation for this site.

Notes:
PN - pneumatic piezometer.
BGS - below ground surface

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Table PH059-3: Spring 2024 – Peace River East Hill Site # 2 Standpipe Piezometer Instrumentation Reading Summary

Date Monitored: May 19, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER LEVEL BGS (m)	MEASURED WATER LEVEL BGS (m)	PREVIOUS READING (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SP-001	*N/A*	*N/A*	*N/A*	*Discontinued*	*N/A*	*N/A*	*N/A*	*N/A*
SP-002	*N/A*	*N/A*	*N/A*	*Discontinued*	*0.6 m on Oct. 1, 2003*	*N/A*	*N/A*	*N/A*
SP-003	N/A	19.42	N/A	Active	10.23 in June 2016	10.69	10.53	-0.16
SP-004	N/A	10.60	N/A	Active	3.76 in September 2014	5.23	5.06	-0.17

Drawing 32121-PH059 in Appendix A provides a sketch of the approximate locations of the monitoring instrumentation for this site

Notes:
SP - standpipe (for water level monitoring, 1” diameter PVC).
BGS - below ground surface.

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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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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.

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ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP (CON0022164)
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING RESULTS

SPRING 2024

APPENDIX A
DATA PRESENTATION

SITE PH059: HWY 2:60, PEACE RIVER EAST HILL
(SITE # 2, STATION 34+770 TO 35+680)

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (PH059)
SPRING 2024

Location:	Peace River East Hill (HWY 2:60 C1 35.241)	**Readout:**	RST PN C108 Unit 1/DGSI Dipmeter
File Number:	32121	**Casing:**	3.34 " Ø
Probe:	RST Set 5R & 8R	**Temp:**	9
Cable:	RST Set 5R & 8R	**Read by:**	NKR/NRM

SLOPE INCLINOMETER (SI) READINGS

Site#	SI#	GPS Location (UTM 11)		Date	Stickup (m)	Depth from top of casing(ft)	Magn. North A+ Groove	Current Bottom Depth Readings				Probe/ Reel #	Size (")	Remarks
		Easting (m)	Northing (m)					A+	A-	B+	B-			
2	SI-67	484136.86	6231088.27	19-May-24	0.55	150 to 2	210	-231	239	1099	-1105	8R/8R	3.34	
	SI-69	484090.16	6231034.68	19-May-24	0.45	148 to 2	187	584	-573	578	-595	5R/5R	3.34	
	SI-75	484042.68	6231057.12	19-May-24	0.37	148 to 2	192	938	-925	-129	108	5R/5R	3.34	
	SI-81	484000.42	6231079.54	19-May-24	0.56	148 to 2	175	42	-32	-36	12	5R/5R	3.34	

STANDPIPE PIEZOMETER READINGS

SP#	GPS Location (UTM 11)		Date	Stick-up (m)	Reading below top of casing (m)	Bottom Pipe Depth (below top of casing (m)
	Easting (m)	Northing (m)				
SP-003	484042.59	6231031.19	19-May-24	0.97	11.66	20.12
SP-004	483976.22	6230977.57	19-May-24	0.7	5.93	11.40

DAILY INSPECTOR REPORT

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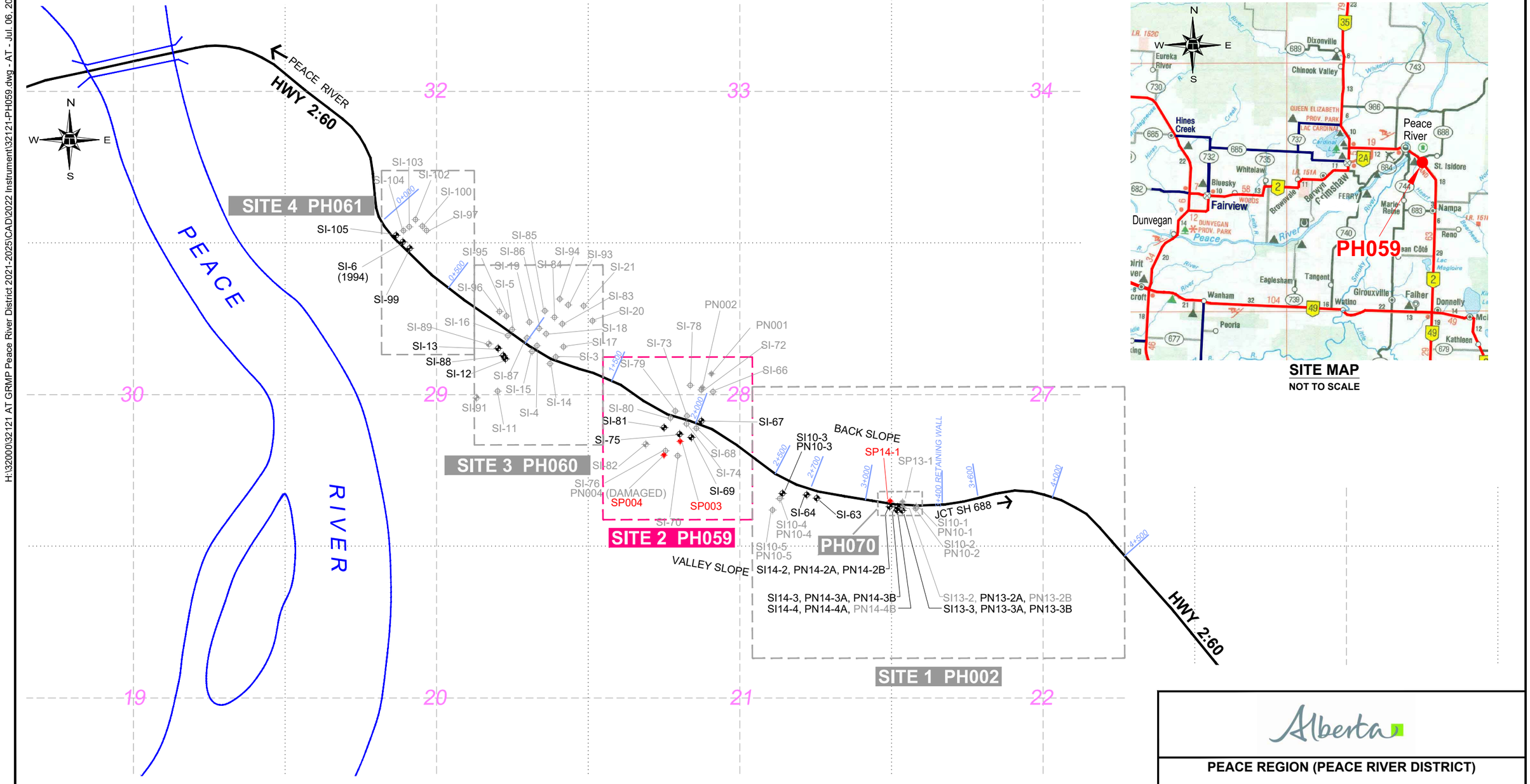

SITE PLAN
1:20,000 (APPROX.)

SITE MAP
NOT TO SCALE

LEGEND :

- SLOPE INCLINOMETER *(currently using)*
- SP STANDPIPE PIEZOMETER
- PN PNEUMATIC PIEZOMETER
- SLOPE INCLINOMETER *(not in use)*
- PNEUMATIC PIEZOMETER *(not in use)*

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PEACE REGION (PEACE RIVER DISTRICT)

PH059: PEACE RIVER EAST HILL SITE #2 (STATION 1+450 TO STATION 2+350) INSTRUMENTATION READINGS

DWG No. 32121-PH059

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	AS SHOWN
DATE	JULY 2022
FILE No.	32121

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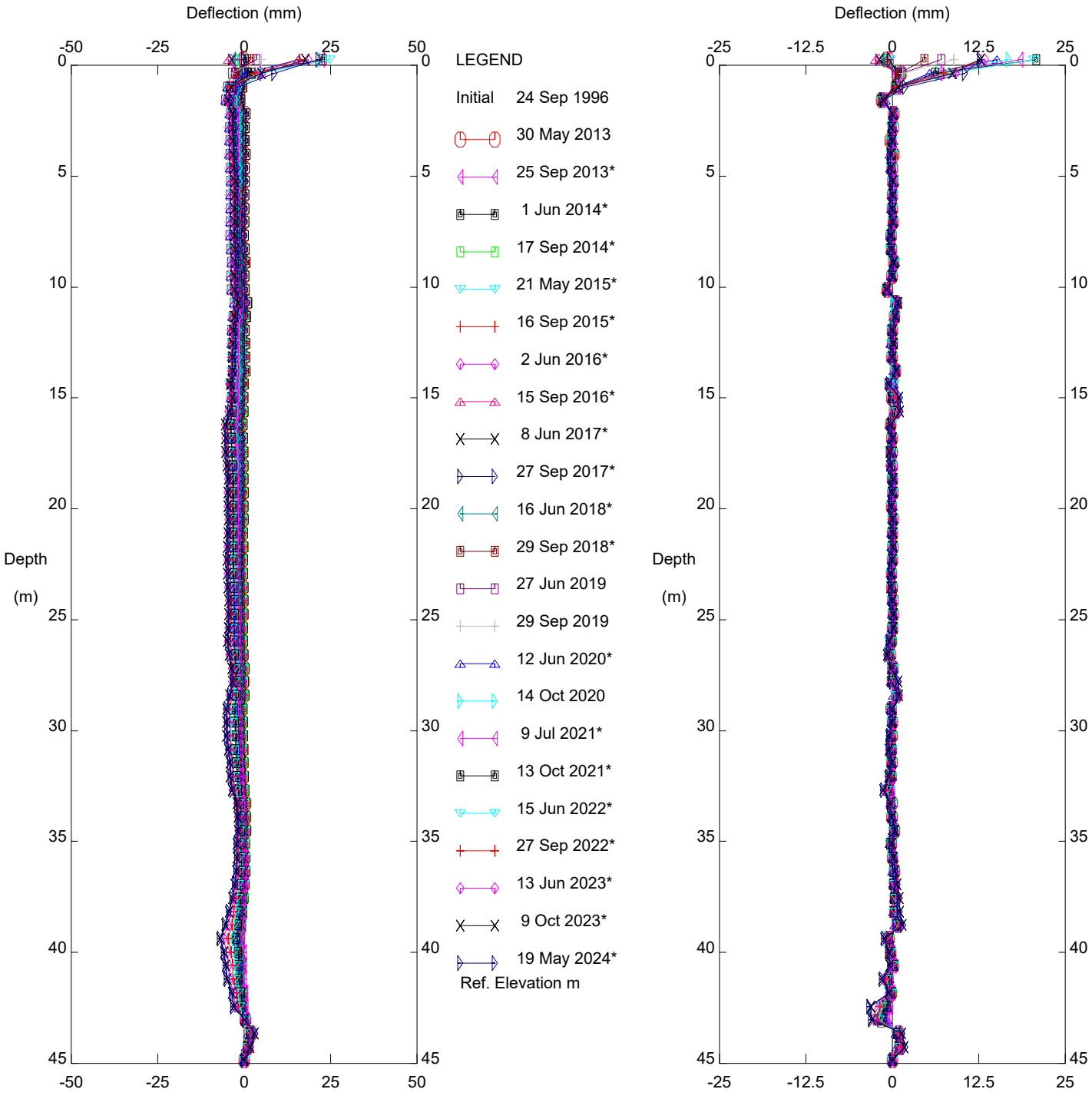

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

(PH059) PEACE RIVER EAST HILL -SITE 2, Inclinometer SI-67

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

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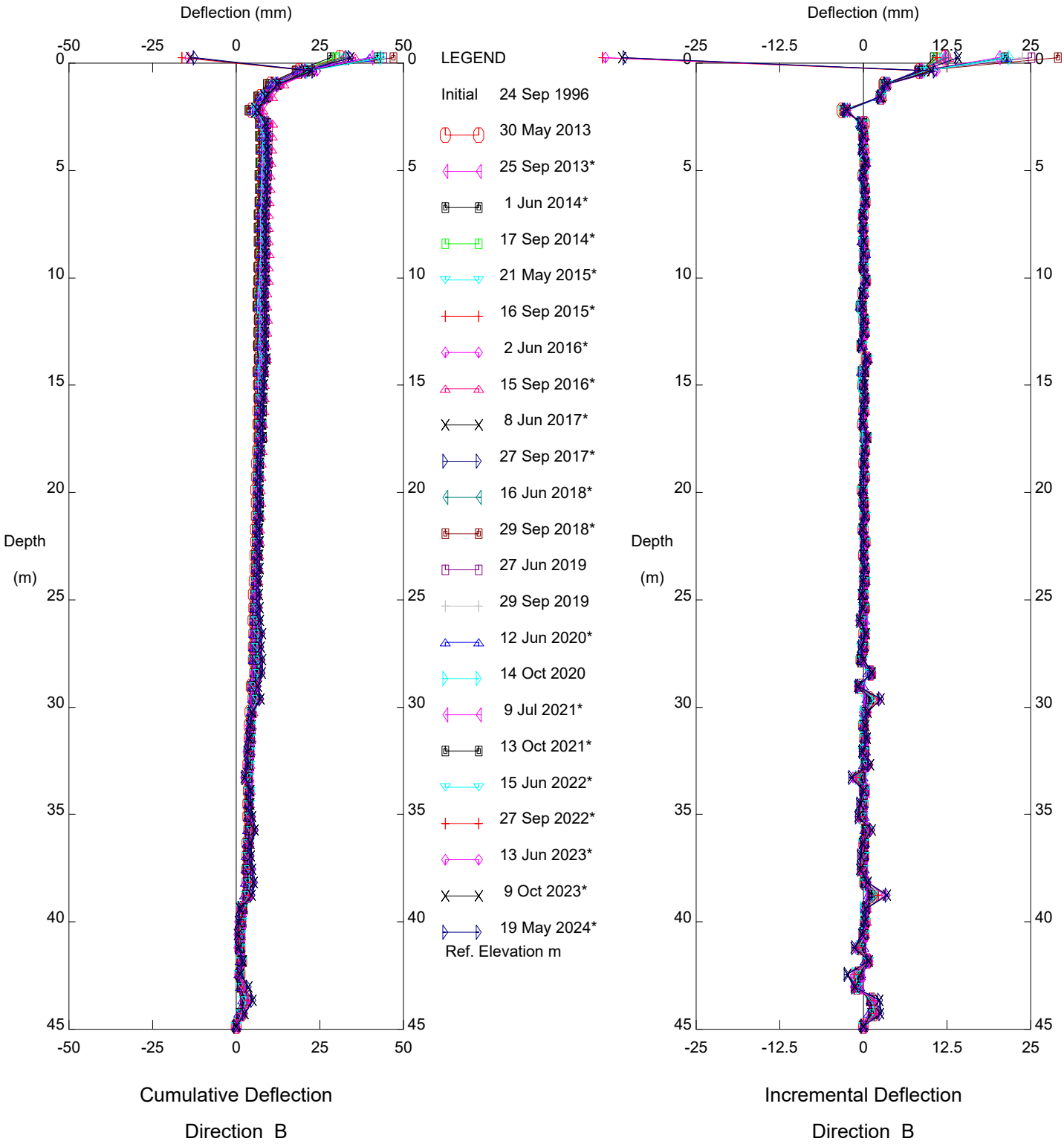

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

(PH059) PEACE RIVER EAST HILL -SITE 2, Inclinometer SI-67

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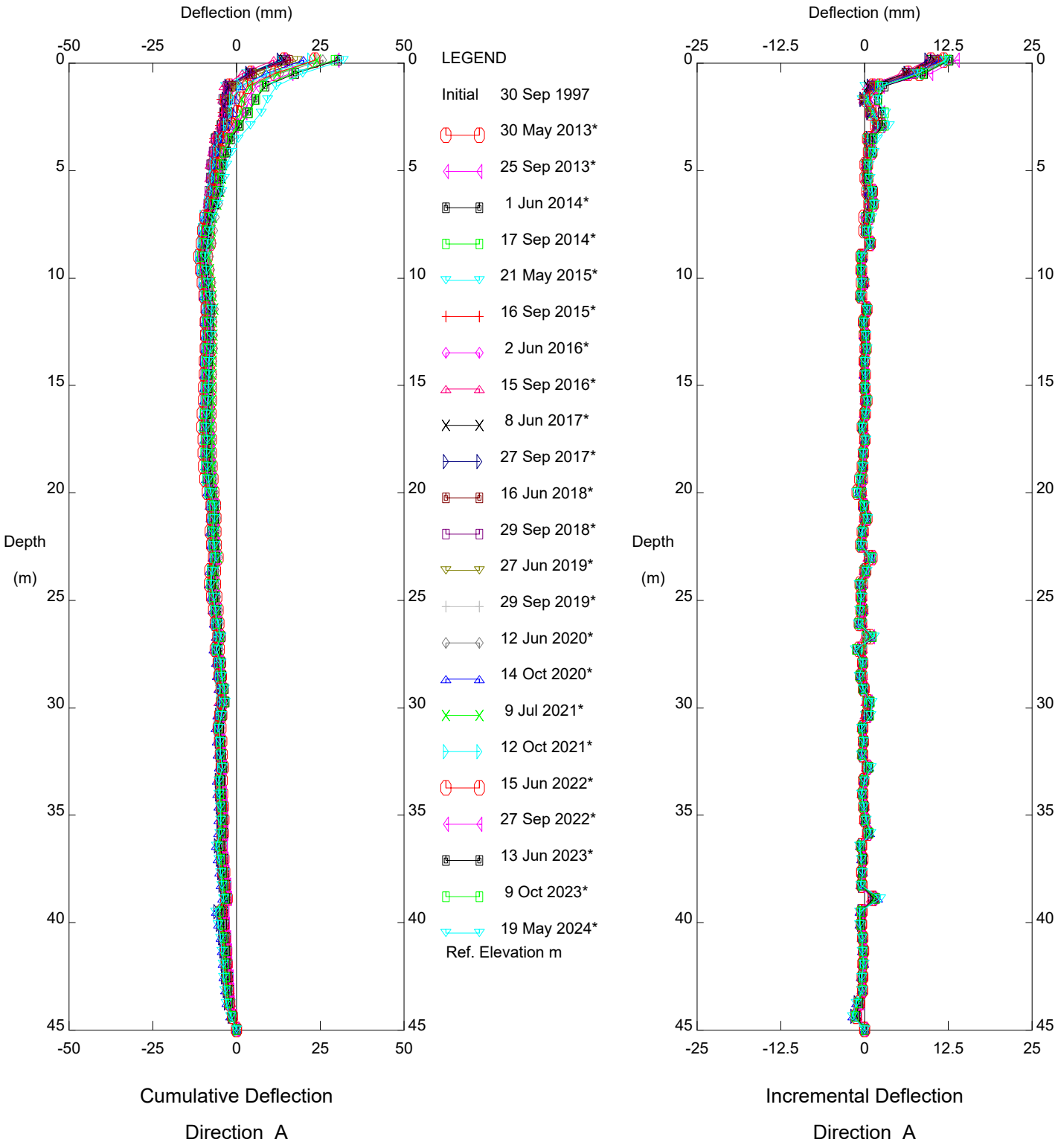

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

(PH059) PEACE RIVER EAST HILL -SITE 2, Inclinometer SI-69

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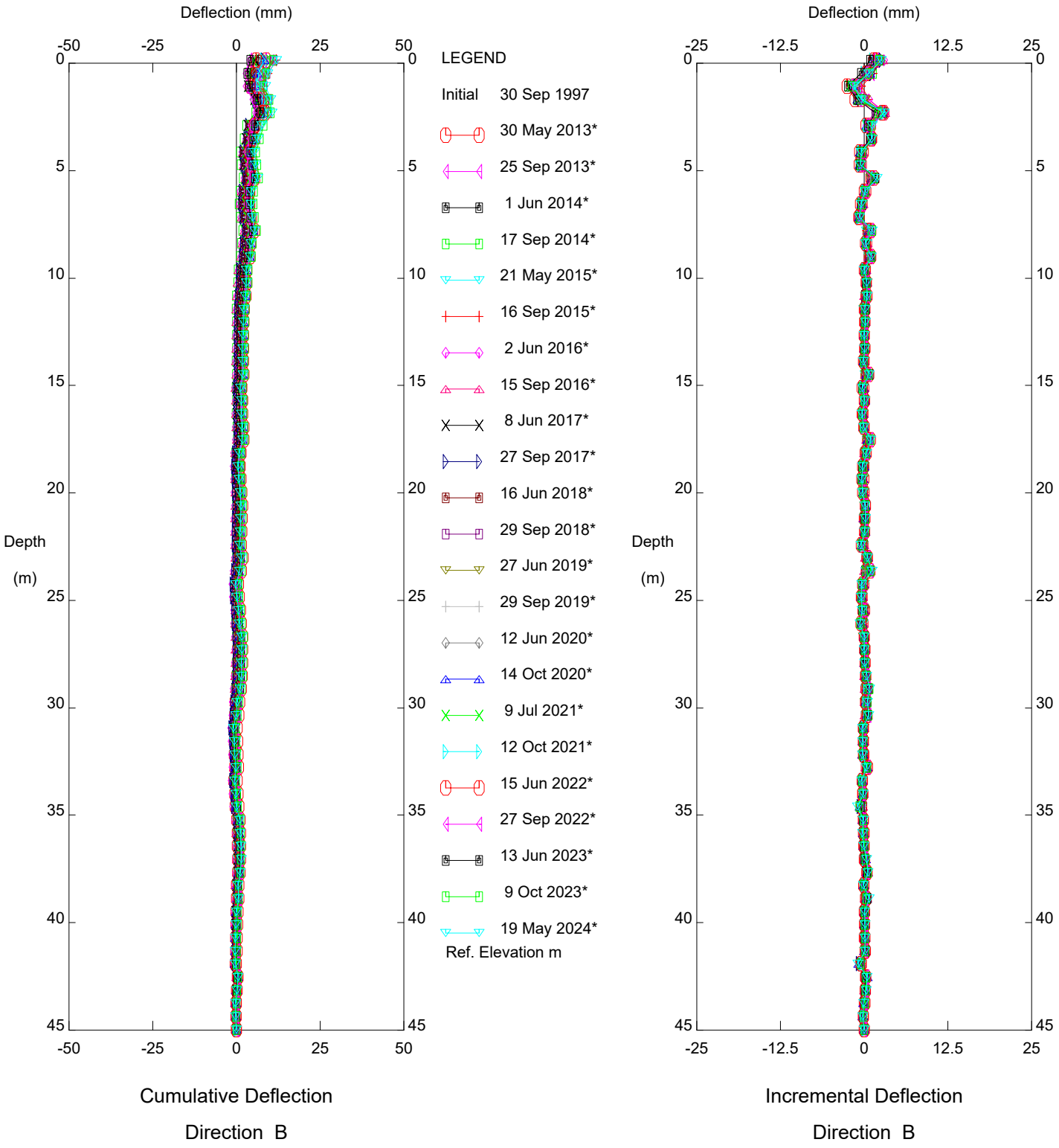

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

(PH059) PEACE RIVER EAST HILL -SITE 2, Inclinometer SI-69

Alberta Transportation

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

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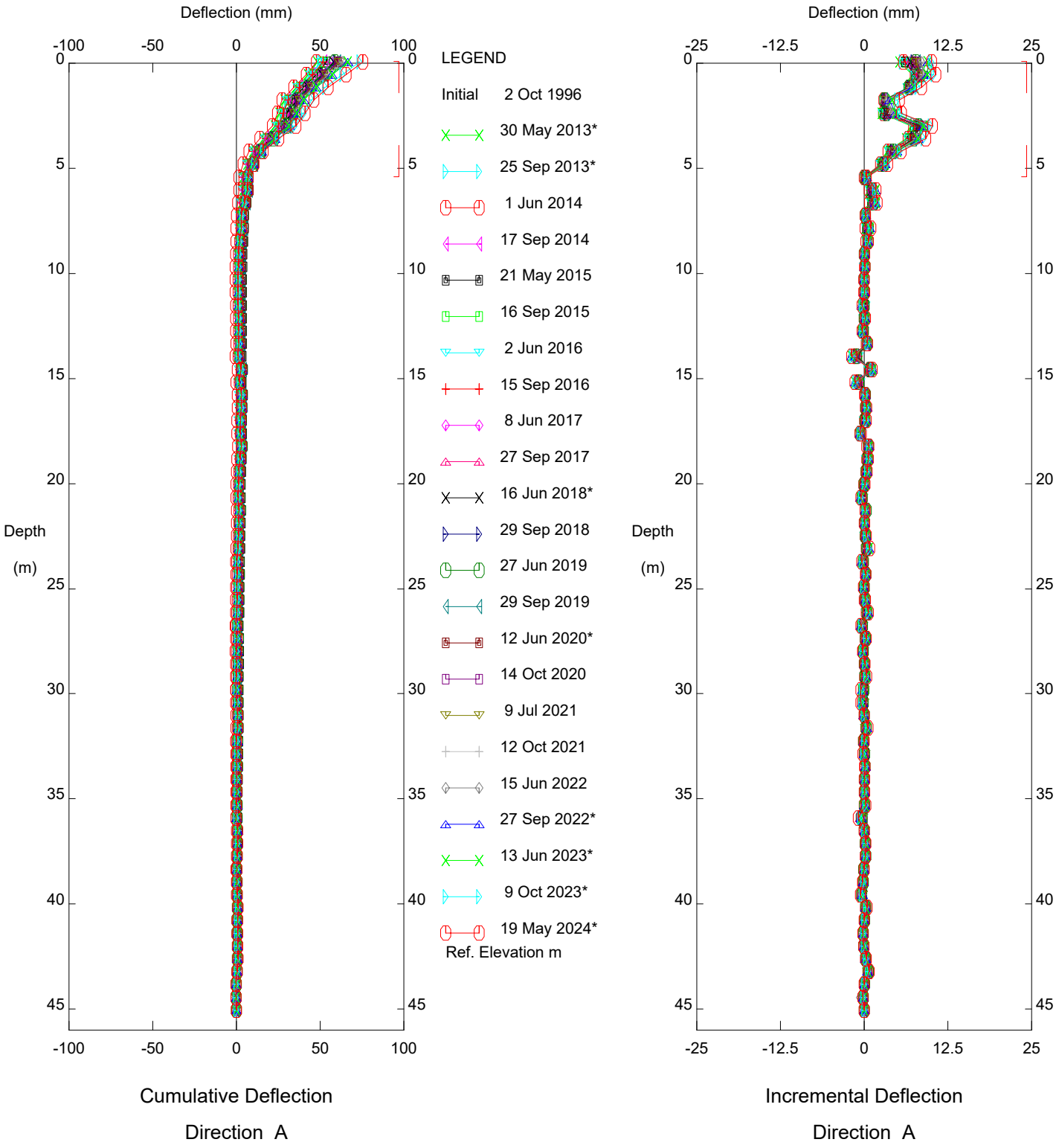

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

(PH059) PEACE RIVER EAST HILL -SITE 2, Inclinometer SI-75

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

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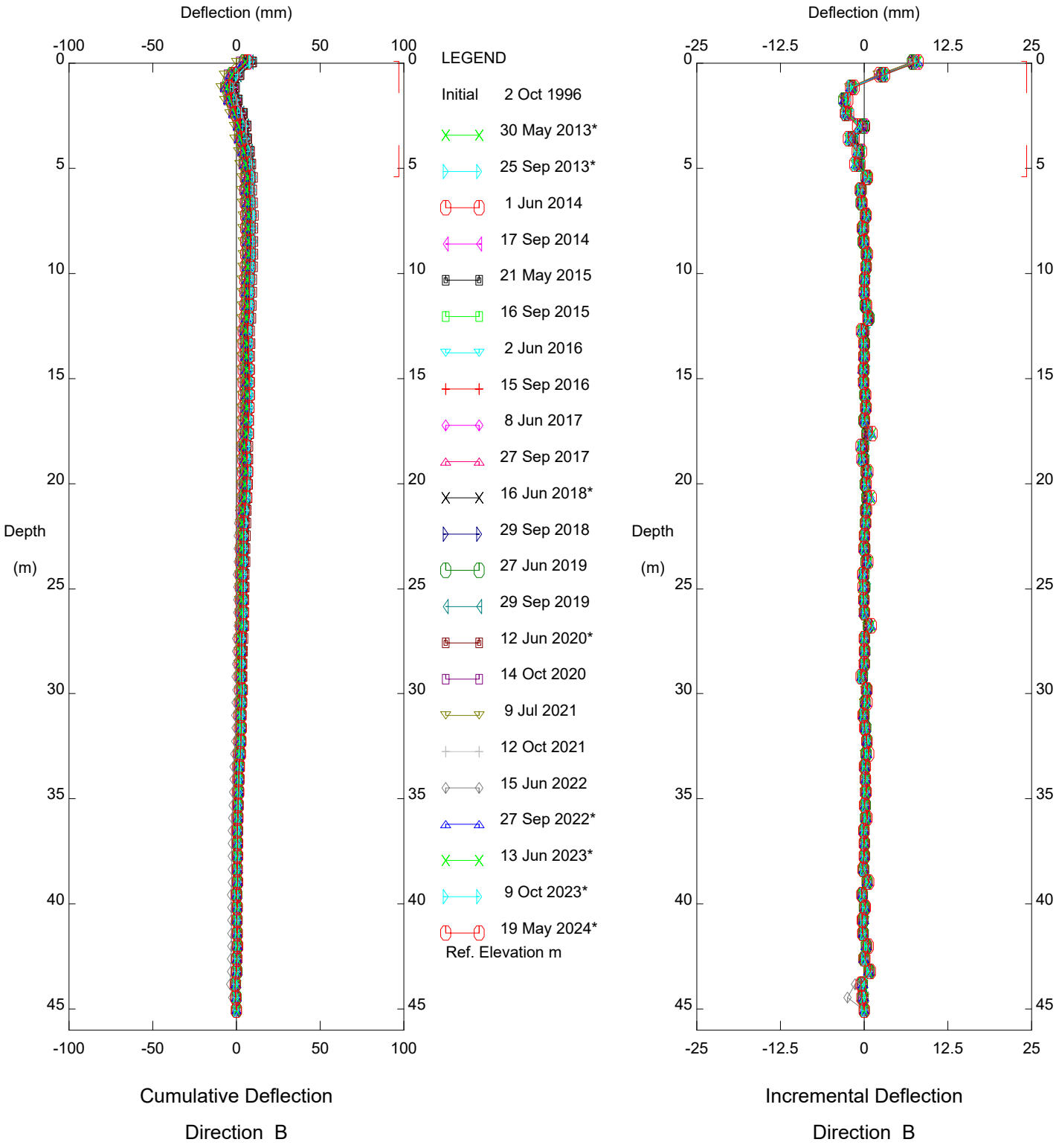

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

(PH059) PEACE RIVER EAST HILL -SITE 2, Inclinometer SI-75

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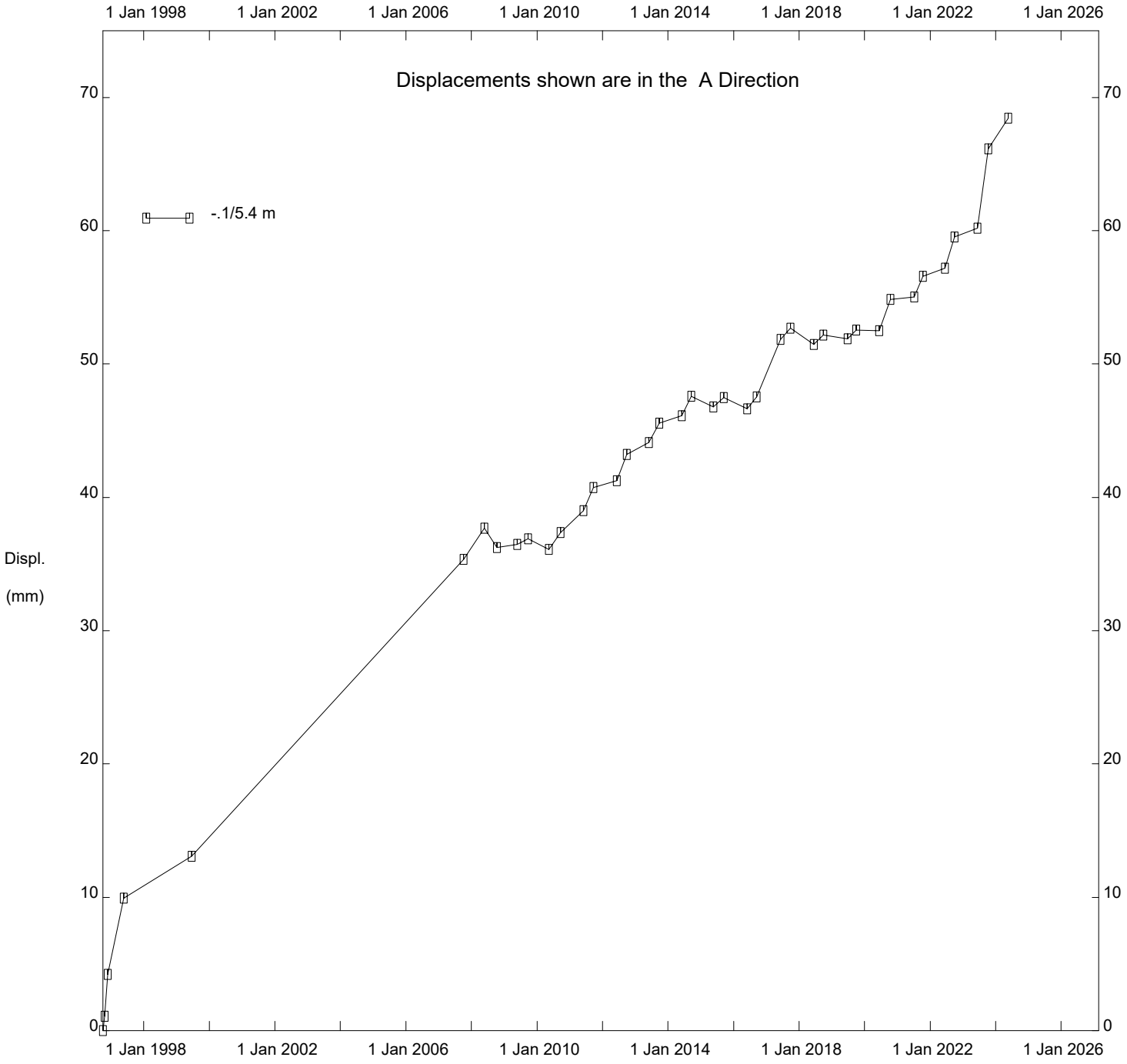

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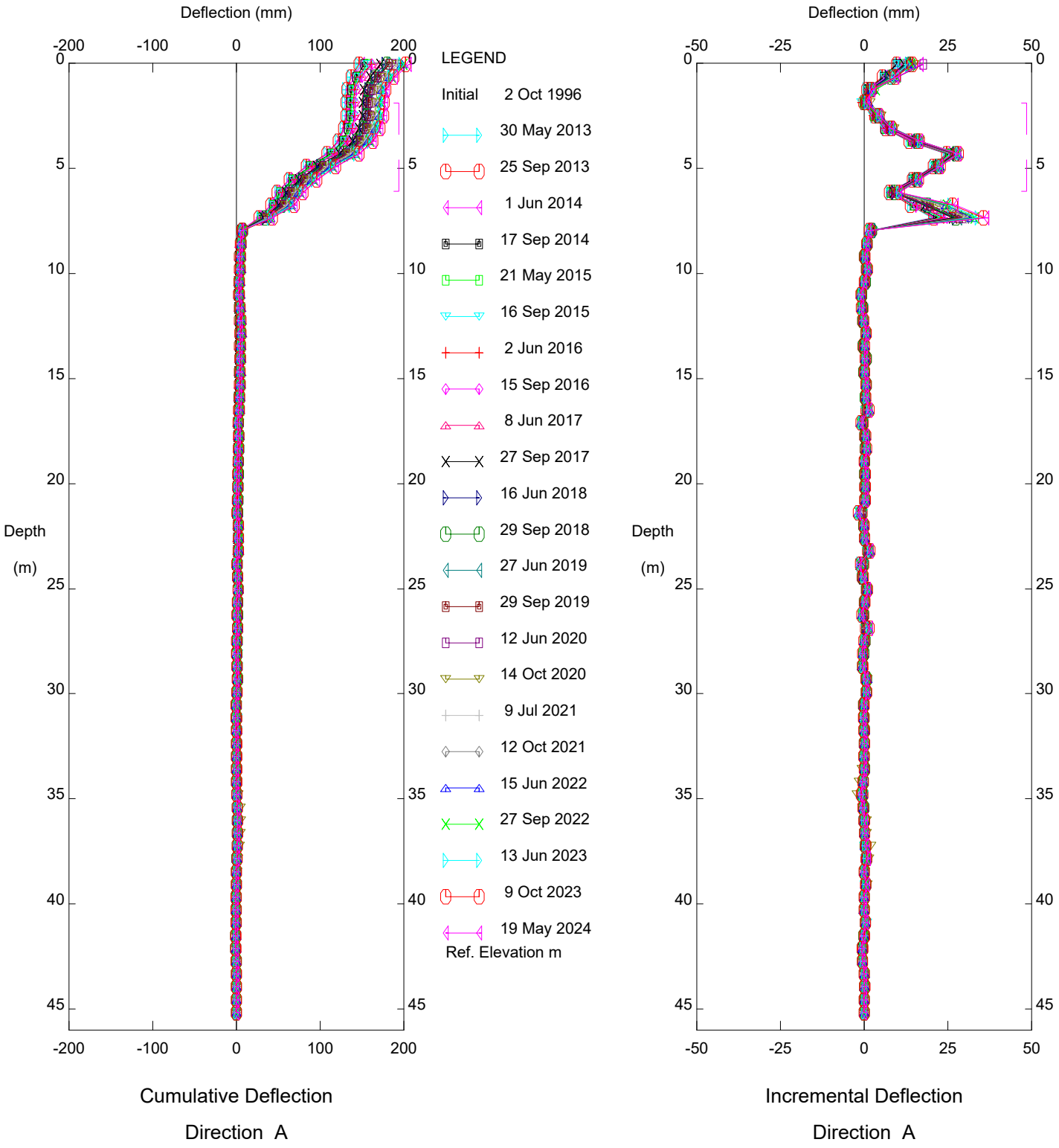

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

(PH059) PEACE RIVER EAST HILL -SITE 2, Inclinometer SI-81

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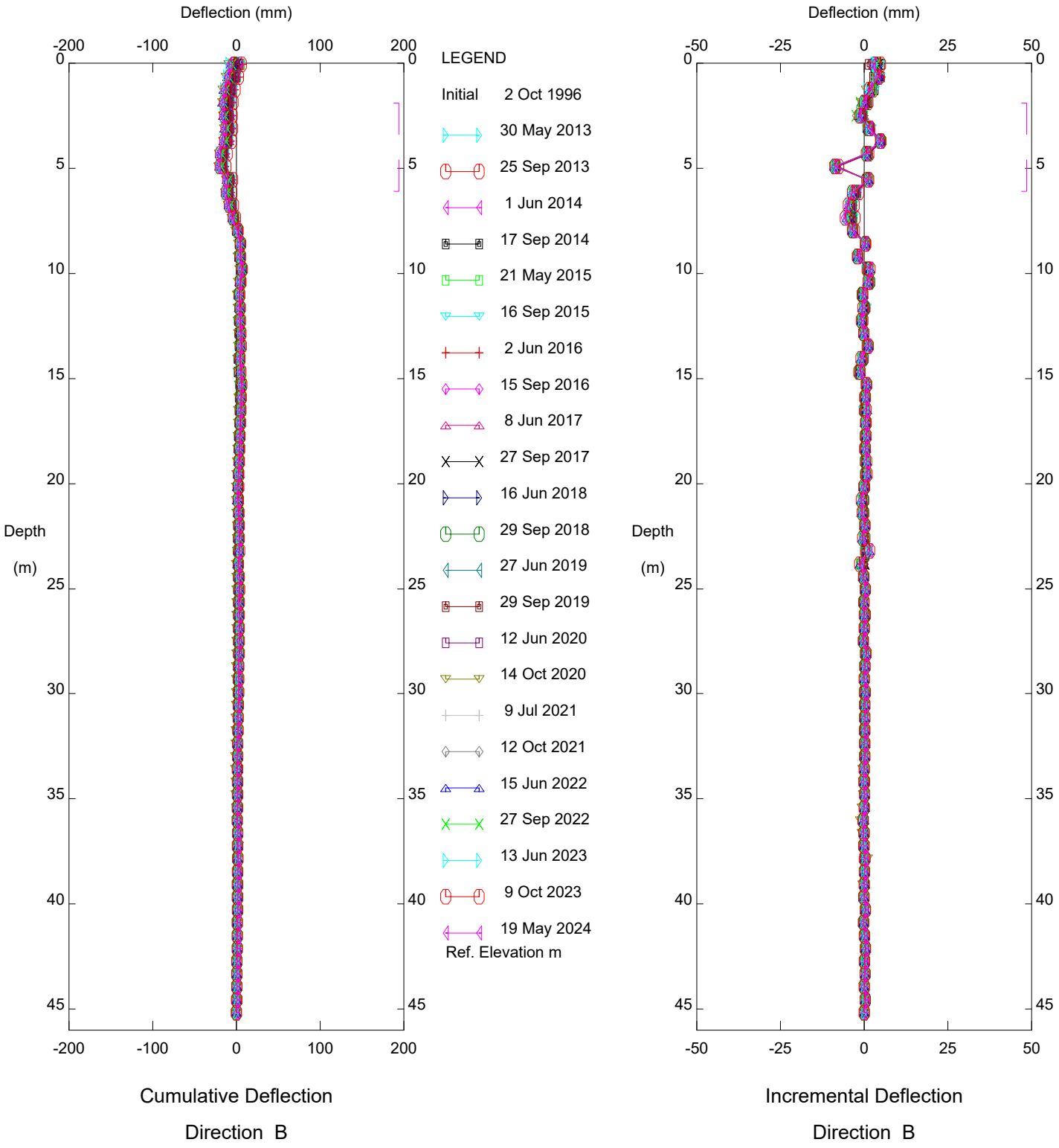
Thurber Engineering Ltd



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

(PH059) PEACE RIVER EAST HILL -SITE 2, Inclinometer SI-81

Alberta Transportation

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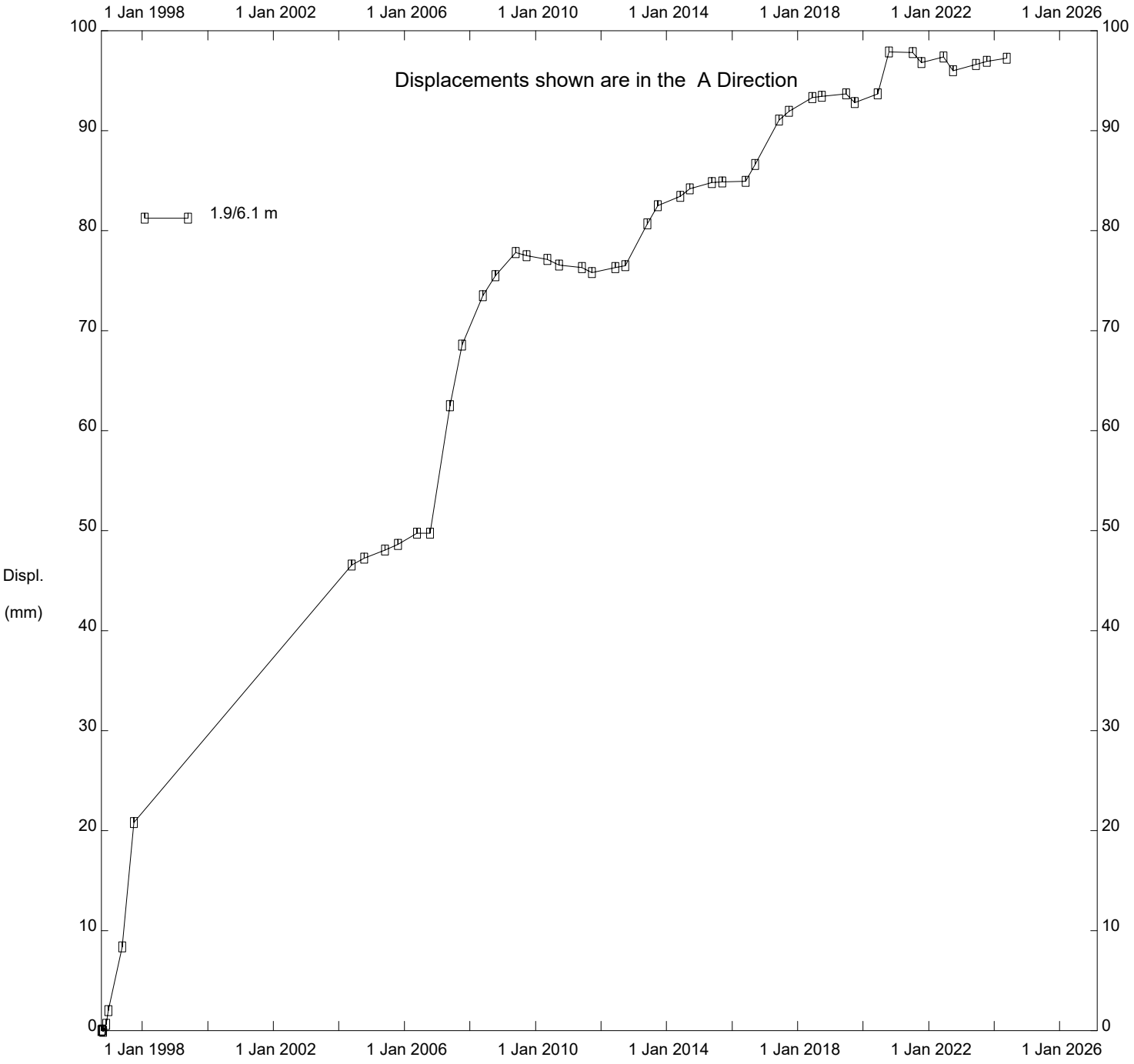
Thurber Engineering Ltd



(PH059) PEACE RIVER EAST HILL -SITE 2, Inclinometer SI-81

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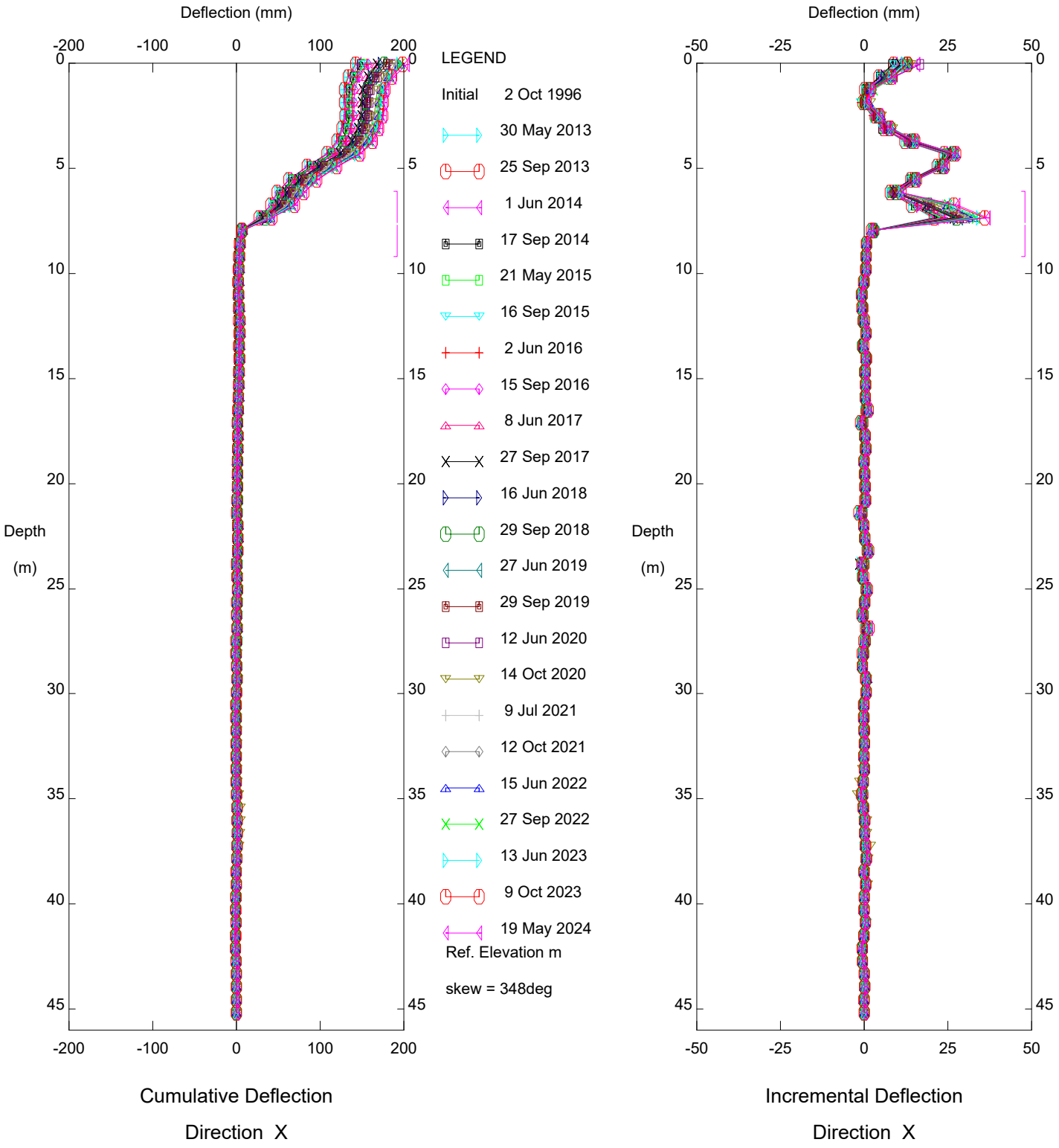

Cumulative Deflection

Direction X

Incremental Deflection

Direction X

(PH059) PEACE RIVER EAST HILL -SITE 2, Inclinometer SI-81

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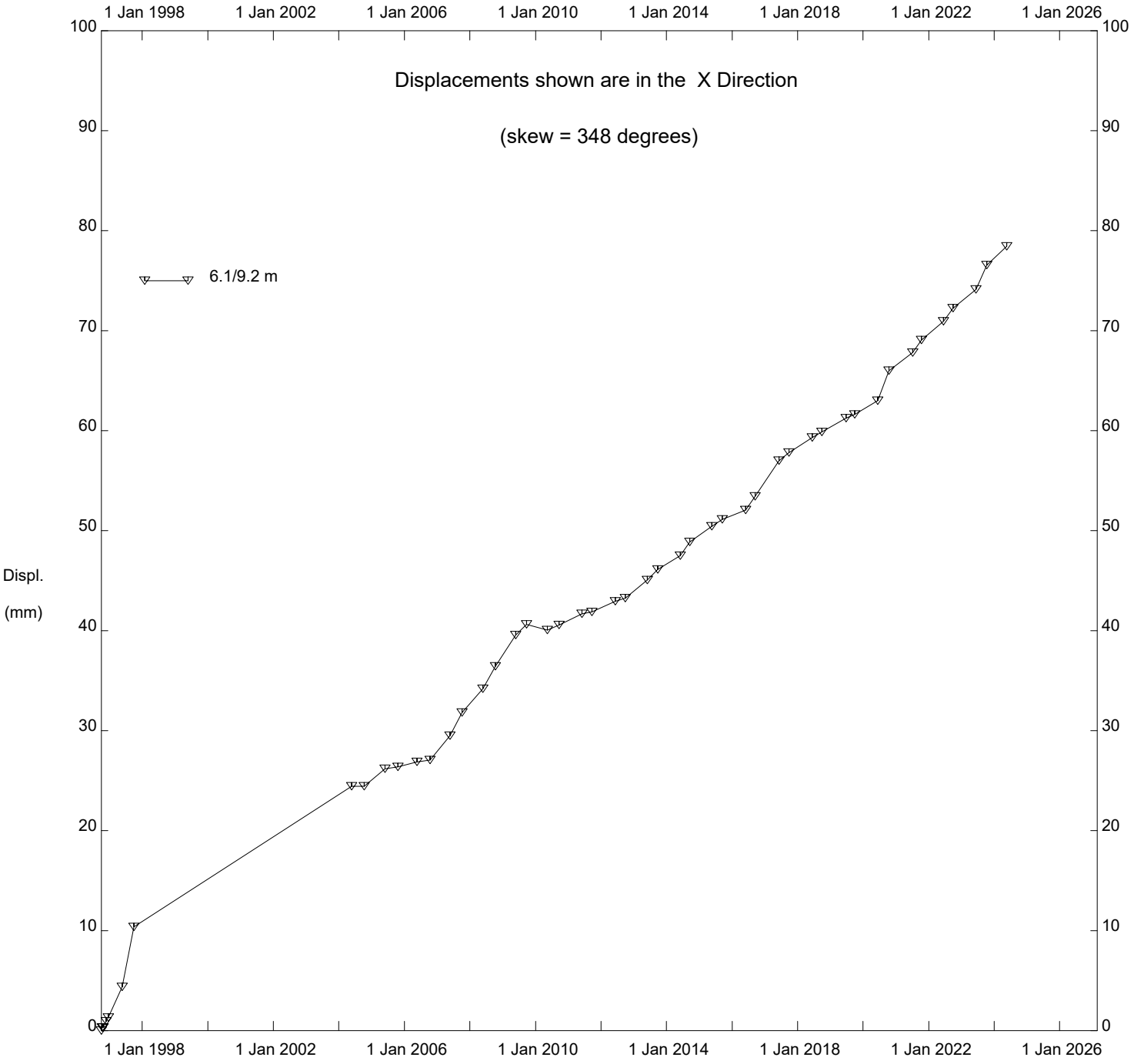
Thurber Engineering Ltd



(PH059) PEACE RIVER EAST HILL -SITE 2, Inclinometer SI-81

Alberta Transportation

FIGURE PH059-1
PIEZOMETER DATA: PEACE RIVER EAST HILL SITE #2