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

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
SH001	HWY 33:12 C1 9.432	Swan Hills Retaining Wall	33:12	Km 9.4
Legal Description:		**UTM Co-ordinates**		
7-5-67-9 W5		11U E 607430	N 6070455	

Current Monitoring:	16-May-2024	**Previous Monitoring**	09-Jun-2023
Instruments Read By:	Mr. Niraj Regmi, G.I.T., and Mr. Nixson Mationg, Thurber		

Instruments Read During This Site Visit			
Slope Inclinometers (SIs): SI-16, SI-18, SI-20, SI18-5 SI18-6	**Pneumatic Piezometers (PN):** PN-1 to PN-4, PN01-2, PN18-4A, PN18-4B PN18-5A, PN18-5B PN18-6A, PN18-6B PN18-7A, PN18-7B	**Vibrating Wire Piezometers (VW): N/A**	**Standpipe Piezometers (SP): N/A**
Load Cell (LC): N/A	**Strain Gauges: N/A**	**SAAs: N/A**	**Others:**

Readout Equipment Used			
Slope Inclinometers: Two RST Digital Inclinometer probes with 2 ft. wheelbases and RST Pocket PC readouts	**Pneumatic Piezometers:** RST C108 pneumatic piezometer readout	**Vibration Wire Piezometers:**	**Standpipe Piezometers:**
Load Cell:	**Strain Gauges:**	**SAAs:**	**Others:**
Note:			

Discussion	
Zones of New Movement:	None
Interpretation of Monitoring Results:	Slope inclinometers SI-16, SI-18 and SI-20 are located about 120 m southwest of the pile wall, outside of the main slide area, and continue to show no discernible movement. SI18-5 and SI18-6 are both installed between the highway and the pile wall. SI18-5 showed a rate of movement of 3.1 mm/yr over 7.9 m to 9.2 m depth since the spring of 2023 readings. This movement rate is consistent with the long-term movement rate (since initialization) of 2.7 mm/yr. SI18-6 shows no discernible movement since installation other than some scatter in the upper 2 m. South of the pile wall, pneumatic piezometers PN-1, PN-2, PN-3 and PN-4 showed decreases in groundwater level of 0.08 m, 0.03 m, 0.01 m and 0.03 m, respectively, since the spring of 2023 readings. PN01-2 showed an increase in groundwater level of 0.76 m since the spring of 2023 readings. These instruments have shown overall stable groundwater levels for the past several reading cycles, and all of them show current groundwater levels within the historical levels in

	the instruments except for PN01-2, which registered an all time high groundwater elevation of 1154.85 m. Behind the piles wall, pneumatic piezometer PN18-4A showed a decrease in groundwater level of 0.02 m since the spring of 2023 reading. PN18-4B, PN18-5A, PN18-5B, PN18-6A and PN18-6B showed increases in groundwater level of 1.39 m, 2.92 m, 4.90 m, 1.47 m, and 1.62 m, respectively, since the spring of 2023 readings. The current groundwater level in these instruments are the highest measured in the instruments since initialization. Overall, the groundwater levels in these instruments are showing readings above historical ranges for the instruments. At Site SH001A, pneumatic piezometers PN18-7A and PN18-7B showed increases in groundwater level of 0.85 m and 1.35 m, respectively, since the spring of 2023 readings. PN18-7A currently shows an above-ground (flowing artesian) groundwater level of 2.86 m. This instrument has been showing artesian pressures since the spring of 2019 (about one year after installation). The groundwater level in both instruments are the highest measured in the instruments since initialization. Tables SH001-2 and SH001-3 summarize the pneumatic piezometer readings. The pneumatic piezometer results are plotted on Figures SH001-1, SH001-2, SH001-3, and SH001-4 in Appendix A.
Future Work:	The instruments should be read again in the spring of 2025.
Instrumentation Repairs:	No instrument repairs are required currently.
Additional Comments:	The groundwater levels at SieSH001A are very high. The site should be inspected for signs of seepage and increased slope deformation and pavement cracking.

Attachments:	▪ Table SH001-1 Spring 2024 – HWY 33:12 Swan Hills Retaining Wall, Slope Inclinometer Instrumentation Reading Summary ▪ Table SH001-2 Spring 2024 – HWY 33:12 Swan Hills Retaining Wall, Pneumatic Piezometer Instrumentation Reading Summary ▪ Table SH001-3 Spring 2024 – HWY 33:12 Swan Hills Retaining Wall, Pneumatic Piezometer Instrumentation Reading Summary (2018 Instruments) ▪ Statement of Limitations and Conditions ▪ APPENDIX A – SH001 SPRING 2024 □ Field Inspector's report □ Site Plan Showing Approximate Instrument Locations (Drawings No. 32121-SH001-1 and 32121-SH001A-1) □ SI Reading Plots □ Figure SH001-1 (Pneumatic Piezometer Elevations) □ Figure SH001-2 (Pneumatic Piezometer Depths) □ Figure SH001-3 (Pneumatic Piezometer Depths – 2018 Instruments – SH001) □ Figure SH001-4 (Pneumatic Piezometer Depths – 2018 Instruments – SH001A)

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

2024-07-15

Lucas Green, P.Eng.
Geotechnical Engineer

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

Table Sh001-1 Spring 2024 – Hwy 33:12 Swan Hills Retaining Wall Slope Inclinomter Instrumentation Reading Summary

Date Monitored: May 16, 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-16	September 20, 1994	No discernible movement	N/A	Operational	June 9, 2023	No discernible movement	N/A	N/A
SI-18	September 20, 1994	No discernible movement	N/A	Operational	June 9, 2023	No discernible movement	N/A	N/A
SI-20	September 20, 1994	No discernible movement	N/A	Operational	June 9, 2023	No discernible movement	N/A	N/A
SI-21	*September 20, 1994*	*24.0 mm over 4.2 m to 6.7 m in 14° direction*	*3.2 mm/yr between Sep 2001 and Oct 2001*	*Damaged*	*October 23, 2010*	*N/A*	*N/A*	*N/A*

Drawings 32121-SH001-1 and 32121-SH001A-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

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Table Sh001-1 – Continued Spring 2024 – Hwy 33:12 Swan Hills Retaining Wall Slope Inclinomter Instrumentation Reading Summary

Date Monitored: May 16, 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)
SH001								
SI18-4	*March 20, 2018*	*36.5 mm over 15.8 to 17.0 m depth in 346° direction*	*51.1 on September 25, 2019*	*Sheared at 17.7 m below top of casing*	*September 25, 2020*	*N/A*	*N/A*	*N/A*
SI18-5	March 20, 2018	16.7 mm over 7.9 to 9.2 m depth in 329° direction	4.1 on September 25, 2019	Operational	June 9, 2023	2.9	3.1	< -0.1
SI18-6	April 23, 2018	No discernible movement	N/A	Operational	June 9, 2023	N/A	N/A	N/A
SH001A								
SI18-7	*April 23, 2018*	*50.1 mm over 6.1 to 7.9 m depth in 316° direction*	*79.2 on June 3, 2018*	*Sheared at 8.5 m depth*	*June 18, 2019*	*N/A*	*N/A*	*N/A*

Drawings 32121-SH001-1 and 32121-SH001A-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

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Table Sh001-2 Spring 2024 – Hwy 33:12 Swan Hills Retaining Wall Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: May 16, 2024

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM GROUNDWATER ELEVATION (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER ELEVATION (m)	PREVIOUS GROUNDWATER ELEVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SH001									
PN-1	May 22, 1990	1135.56	1149.56	Operational	1136.78 in November 1993	2.0	1135.76	1135.84	-0.08
PN-2	May 22, 1990	1146.06	1149.56	Operational	1148.21 in October 1997	8.0	1146.88	1146.91	-0.03
PN-3	May 22, 1990	1136.15	1139.20	Operational	1137.56 in September 1991	0.4	1136.19	1136.20	-0.01
PN-4	May 22, 1990	1132.20	1139.20	Operational	1137.61 in October 1991	28.6	1135.12	1135.15	-0.03
PN01-1	*June 20, 2001*	*1145.42*	*1159.10*	*Not Operational (Spring 2018)*	*1154.19 in May 2013*	*N/A*	*N/A*	*N/A*	*N/A*
PN01-2	June 20, 2001	1145.82	1156.50	Operational	1154.85 in May 2024	88.6	1154.85	1154.09	0.76

Drawings 32121-SH001-1 and 32121-SH001A-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

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Table Sh001-3 Spring 2024 – Hwy 33:12 Swan Hills Retaining Wall Pneumatic Piezometer Instrumentation Reading Summary (2018 Instruments)

Date Monitored: May 16, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	CURRENT STATUS	MAXIMUM GROUNDWATER LEVEL (mBGS)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER DEPTH (mBGS)	PREVIOUS GROUNDWATER DEPTH (mBGS)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SH001								
PN18-4A (37838)	March 20, 2018	8.5	Operational	4.00 on March 20, 2018	38.2	4.60	4.58	-0.02
PN18-4B (37832)	March 20, 2018	15.0	Operational	6.20 on May 16, 2024	86.3	6.20	7.59	1.39
PN18-5A (37836)	March 20, 2018	9.9	Operational	5.23 on May 16, 2024	45.8	5.23	8.15	2.92
PN18-5B (37834)	March 20, 2018	17.7	Operational	10.66 on May 16, 2024	69.0	10.66	15.56	4.90
PN18-6A (37835)	March 20, 2018	5.3	Operational	2.29 on May 16, 2024	29.5	2.29	3.76	1.47
PN18-6B (37833)	March 20, 2018	12.2	Operational	6.82 on May 16, 2024	52.8	6.82	8.44	1.62
SH001A								
PN18-7A (37837)	March 20, 2018	6.0	Operational	-2.86* on May 16, 2024	86.9	-2.86	-2.01*	0.85
PN18-7B (37831)	March 20, 2018	12.0	Operational	9.91 on May 16, 2024	20.5	9.91	11.26	1.35

Drawings 32121-SH001-1 and 32121-SH001A-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.
* Negative (-) values indicate an above ground (artesian) groundwater level. BGS = Below Ground Surface.

THURBER

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.

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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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THURBER ENGINEERING LTD.

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

SPRING 2024

APPENDIX A
DATA PRESENTATION

SITE SH001/SH001A: HWY 33:12 (SWAN HILLS RETAINING WALL)

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (SH001)
SPRING 2024

Location:	Swan Hills Retaining Wall (HWY 33:12 C1 9.432)	**Readout:**	RST PN C108 Unit 4
File Number:	32121	**Casing Size**	2.75", SI 16,18 and 20 3.34"
Probe:	RST Set 5R & 8R	**Temp:**	5/Rain
Cable:	RST Set 5R & 8R	**Read by:**	NKR/NRM

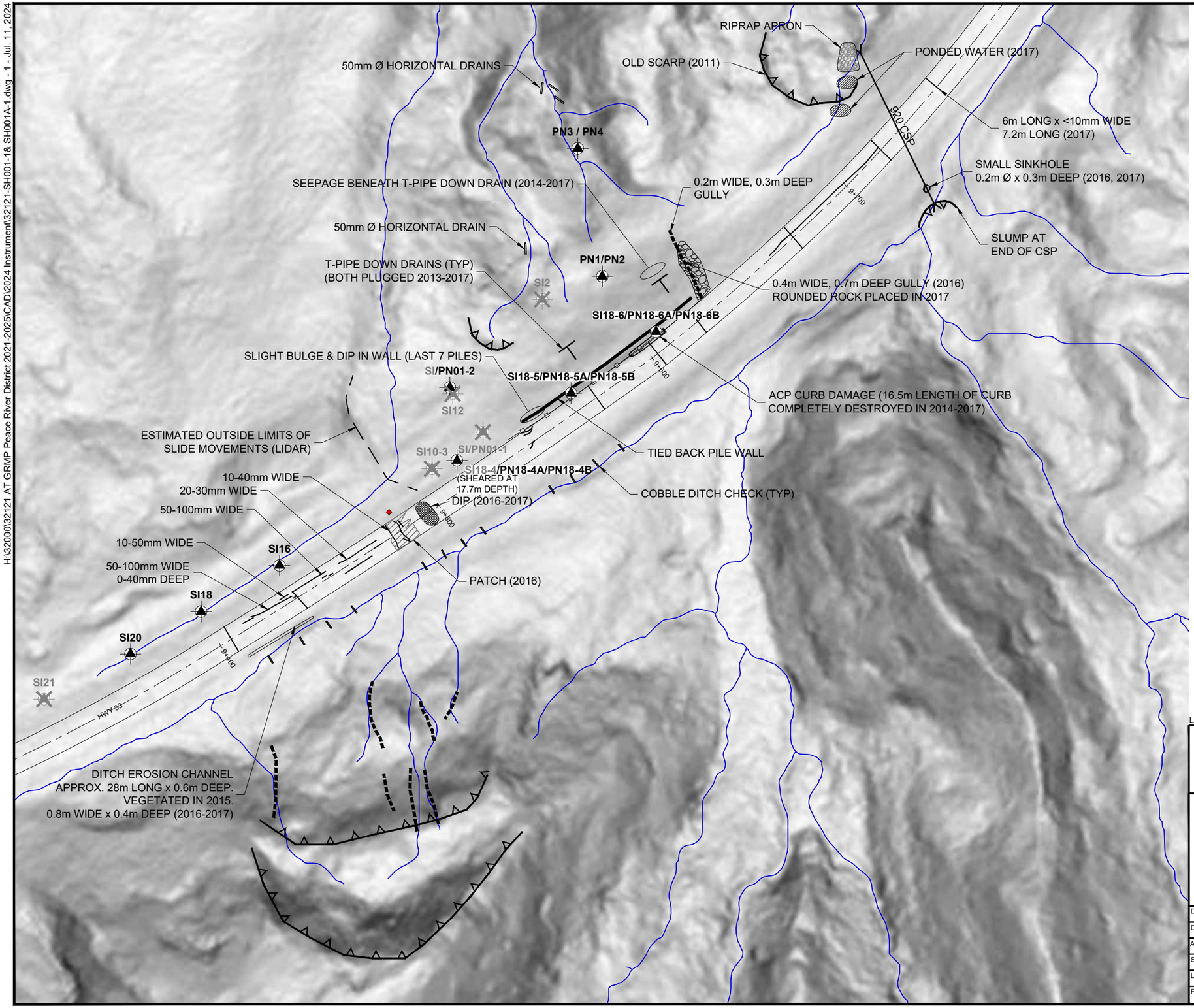
SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 11)		Date	Stickup (m)	Depth from top of casing (ft)	Magn. North A+ Groove	Current Bottom Depth Readings				Probe/ Reel		Remarks
	Easting	Northing				degree	A+	A-	B+	B-	#	Size (")	
SI-16	607430	6070455	16-May-24	0.45	96 to 4	345	-37	57	-139	132	8R	3.34	
SI-18	607398	6070436	16-May-24	1.05	96 to 4	320	332	-313	-82	78	8R	3.34	
SI-20	607371	6070420	16-May-24	0.72	96 to 4	345	480	-395	647	-687	8R	3.34	
SI18-5	607536	6070521	16-May-24	0.90	82 to 2	301	150	-143	-14	-6	5R	2.75	
SI18-6	607554	6070532	16-May-24	1.07	52 to 2	265	1281	-1270	-298	255	5R	2.75	

PNEUMATIC PIEZOMETER (PN) READINGS

PN#	GPS Location (UTM 11)		Date	Reading	Identification
	Easting	Northing		(kPa)	Number
PN-1	607556	6070560	16-May-24	2	12871
PN-2	607556	6070560	16-May-24	8	12872
PN-3	607542	6070600	16-May-24	0.4	12291
PN-4	607542	6070600	16-May-24	28.6	12305
PN01-2	607494	6070525	16-May-24	88.6	25973
PN18-4A	607498	6070498	16-May-24	38.2	37838
PN18-4B	607498	6070498	16-May-24	86.3	37832
PN18-5A	607536	6070521	16-May-24	45.8	37836
PN18-5B	607536	6070521	16-May-24	69	37834
PN18-6A	607554	6070532	16-May-24	29.5	37835
PN18-6B	607554	6070532	16-May-24	52.8	37833
PN18-7A	607829	6070861	16-May-24	86.9	37837
PN18-7B	607829	6070861	16-May-24	20.5	37831

DAILY INSPECTOR REPORT



N
W E
S

LEGEND

- SCARP (INTERPRETED FROM LIDAR)
- APPROXIMATE INSTRUMENT LOCATION
- NON - OPERATIONAL INSTRUMENT
- PN PNEUMATIC PIEZOMETER
- SI SLOPE INCLINOMETER
- GULLY
- DRAINAGE PATHS (INTERPRETED FROM LIDAR)
- GUARDRAIL
- RED TEMPORARY HAZARD SIGN

NOTES

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. LIDAR SHADED ACCORDING TO SLOPE FROM WHITE AT 0° TO BLACK AT 35° AND STEEPER.
3. 2021 INSPECTION OBSERVATIONS SHOWN IN BLACK.
4. DRAWING UPDATED IN 2017 USING LIDAR, SATELLITE IMAGERY, AND A MEASURING WHEEL.

LIDAR PROVIDED BY ALBERTA TRANSPORTATION (FLOWN 2007)

Alberta

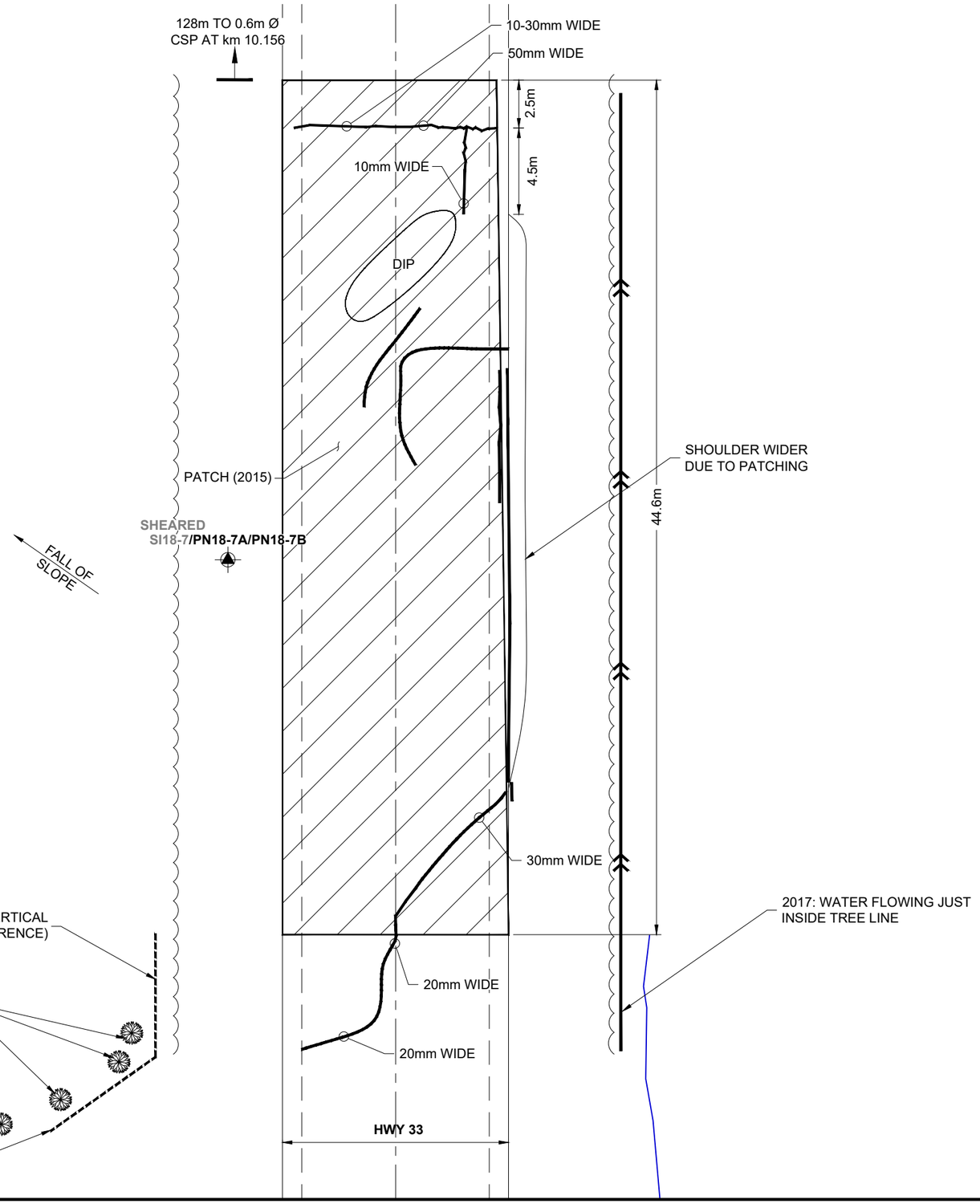
PEACE REGION (PEACE RIVER DISTRICT)

SH001: HWY 33:12 SWAN HILLS RETAINING SITE PLAN SHOWING APPROXIMATE INSTRUMENT LOCATIONS

DWG No. 32121-SH001-1

DRAWN BY	ML
DESIGNED BY	LRG
APPROVED BY	DWP
SCALE	1:1500
LAST UPDATED	JULY 2024
FILE No.	32121

THURBER ENGINEERING LTD.



LEGEND

- CRACK
- WATER COURSE
- APPROXIMATE INSTRUMENT LOCATION
- PN PNEUMATIC PIEZOMETER
- SI SLOPE INCLINOMETER
- APPROXIMATE TREE LINE

NOTES
1. FEATURE LOCATIONS ARE APPROXIMATE.
2. 2021 INSPECTION OBSERVATIONS SHOWN IN BLACK (2013-2015 FROM AMEC FIGURE 1, PROJECT EG10030, PROVIDED BY ALBERTA TRANSPORTATION).
3. CRACK PATTERN REMEASURED IN 2017 USING MEASURING WHEEL. PREVIOUS PATTERN REMOVED. DRAWING UPDATED USING HIGH RESOLUTION SATELLITE IMAGERY AND LIDAR (FLOWN 2007)

0 2.5 5 7.5 10 12.5 15 m
SCALE 1:250

Alberta

PEACE REGION (PEACE RIVER DISTRICT)

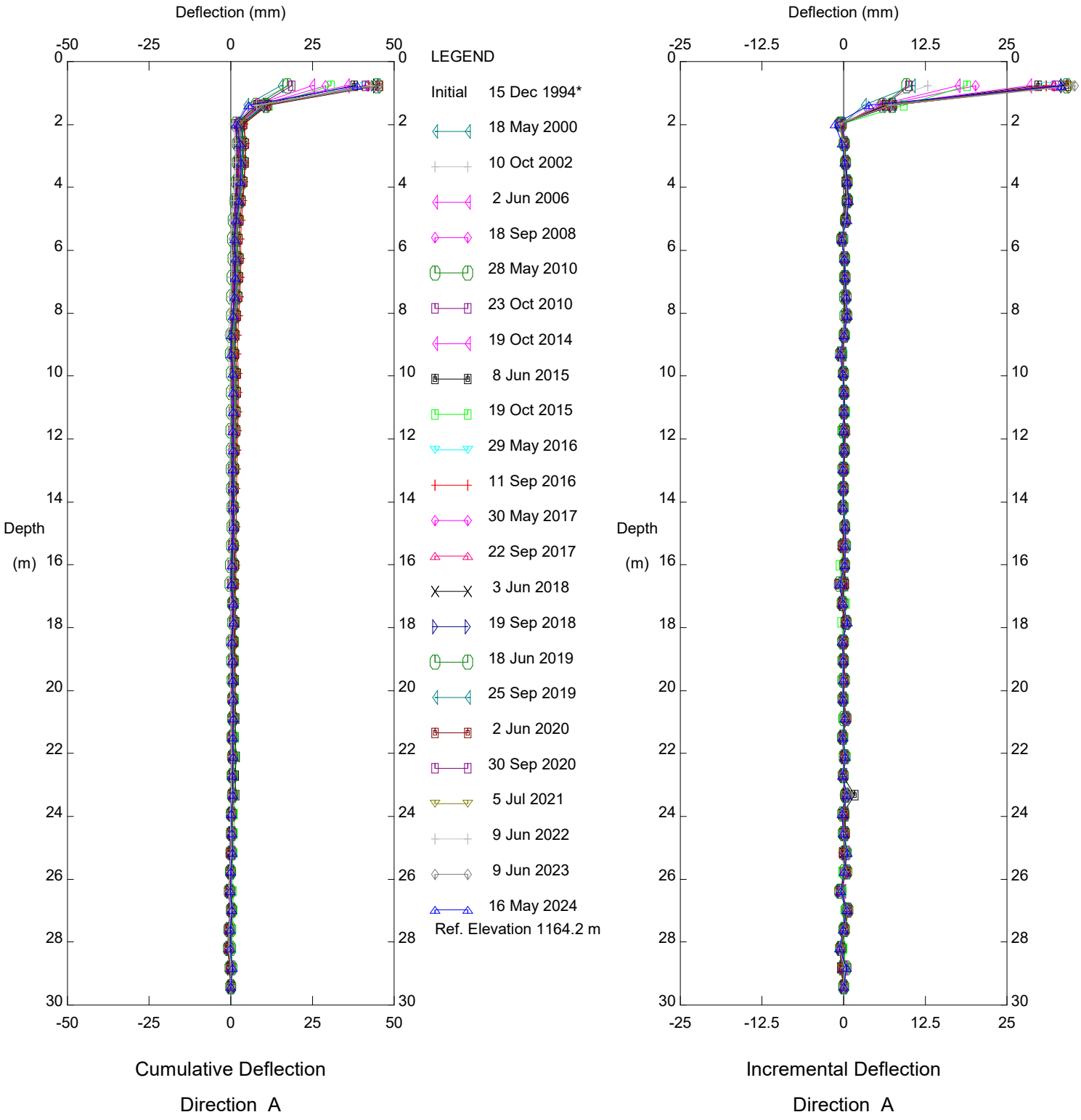
SH001A: HWY 33:12
SITE PLAN SHOWING APPROXIMATE INSTRUMENT LOCATIONS

DWG No. 32121-SH001A-1

DRAWN BY	ML
DESIGNED BY	LRG
APPROVED BY	DWP
SCALE	1:250
LAST UPDATED	JULY 2024
FILE No.	32121

THURBER ENGINEERING LTD.

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

SH001 - Swan Hills Retaining Wall, Inclinometer SI 16

Alberta Transportation

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

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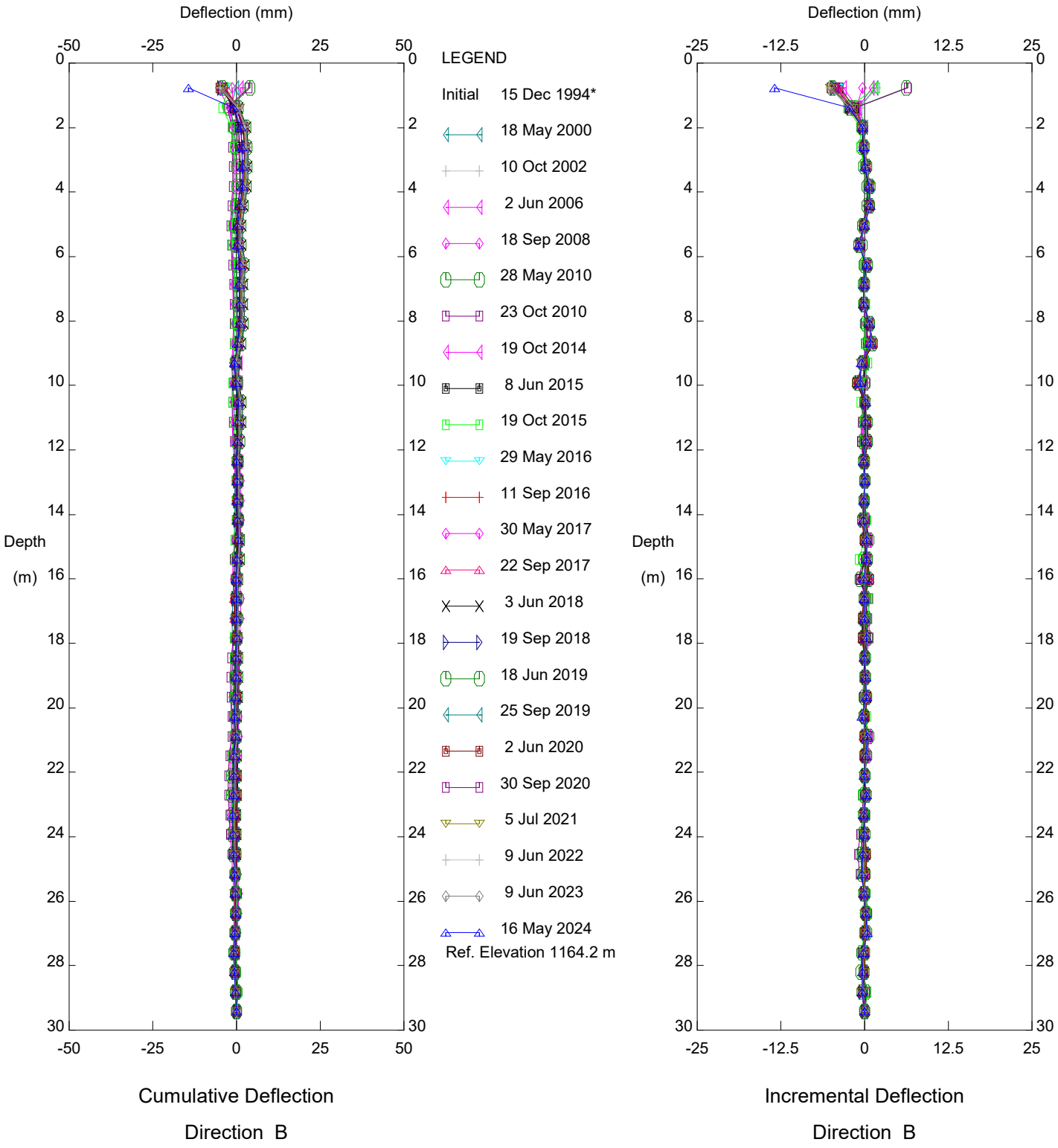
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

SH001 - Swan Hills Retaining Wall, Inclinometer SI 16

Alberta Transportation

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

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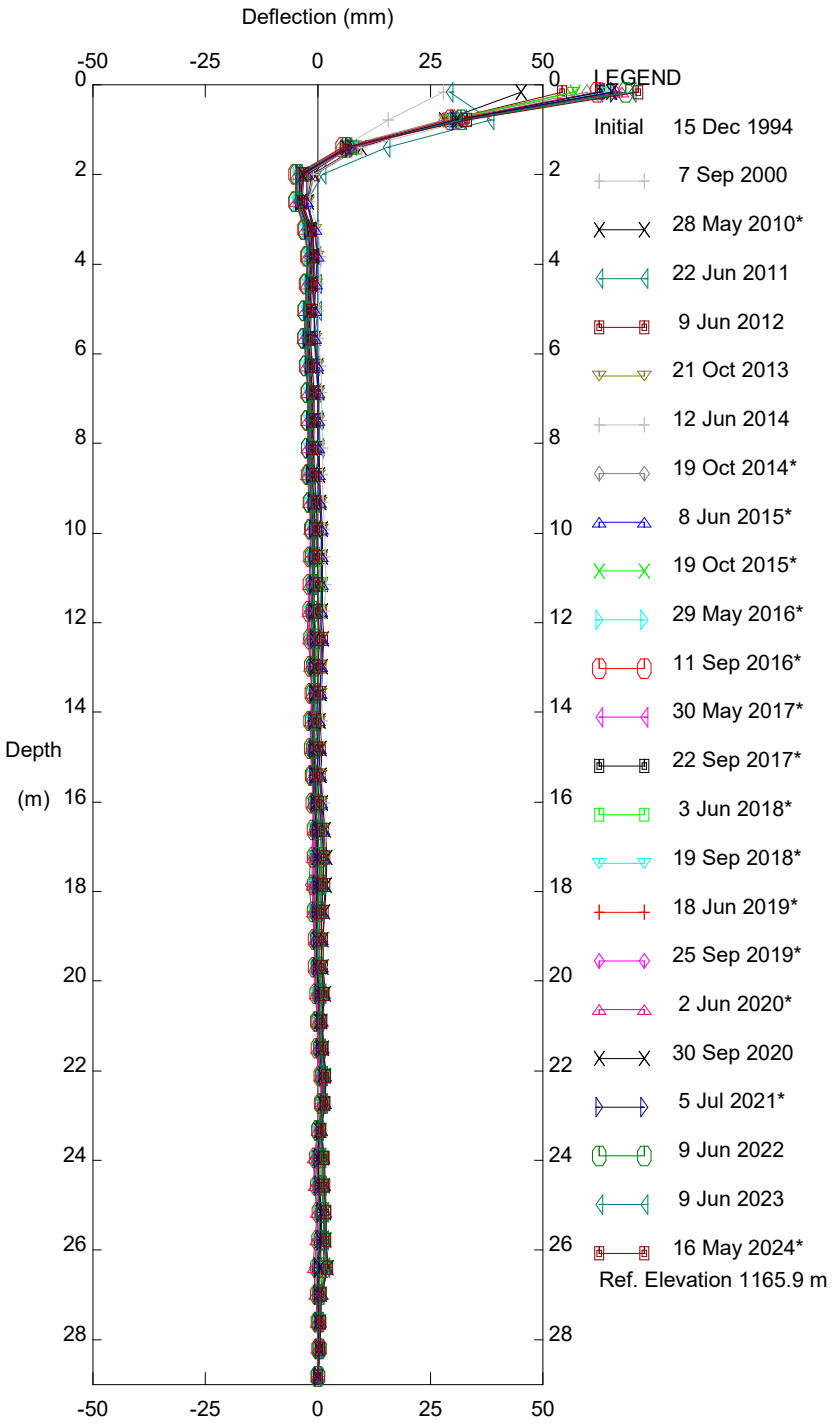
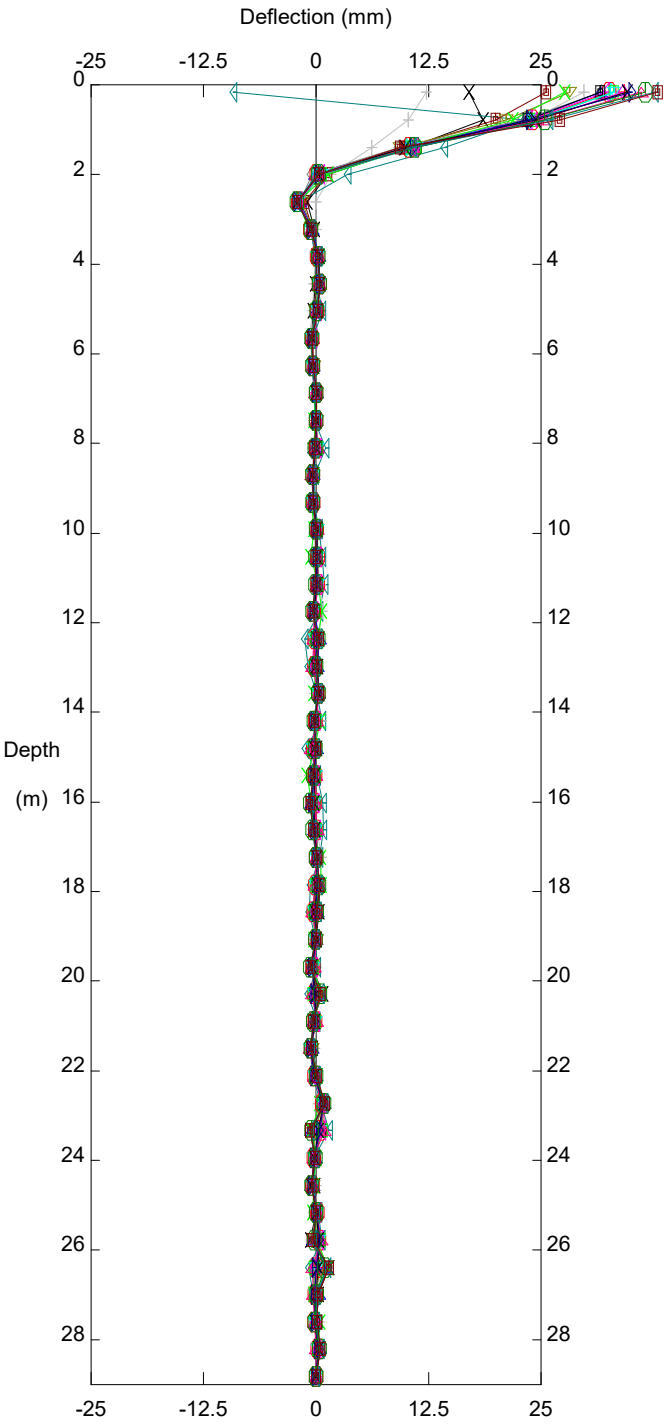
Thurber Engineering Ltd.



Cumulative Deflection

Direction A



Incremental Deflection

Direction A

SH001 - Swan Hills Retaining Wall, Inclinometer SI 18

Alberta Transportation

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

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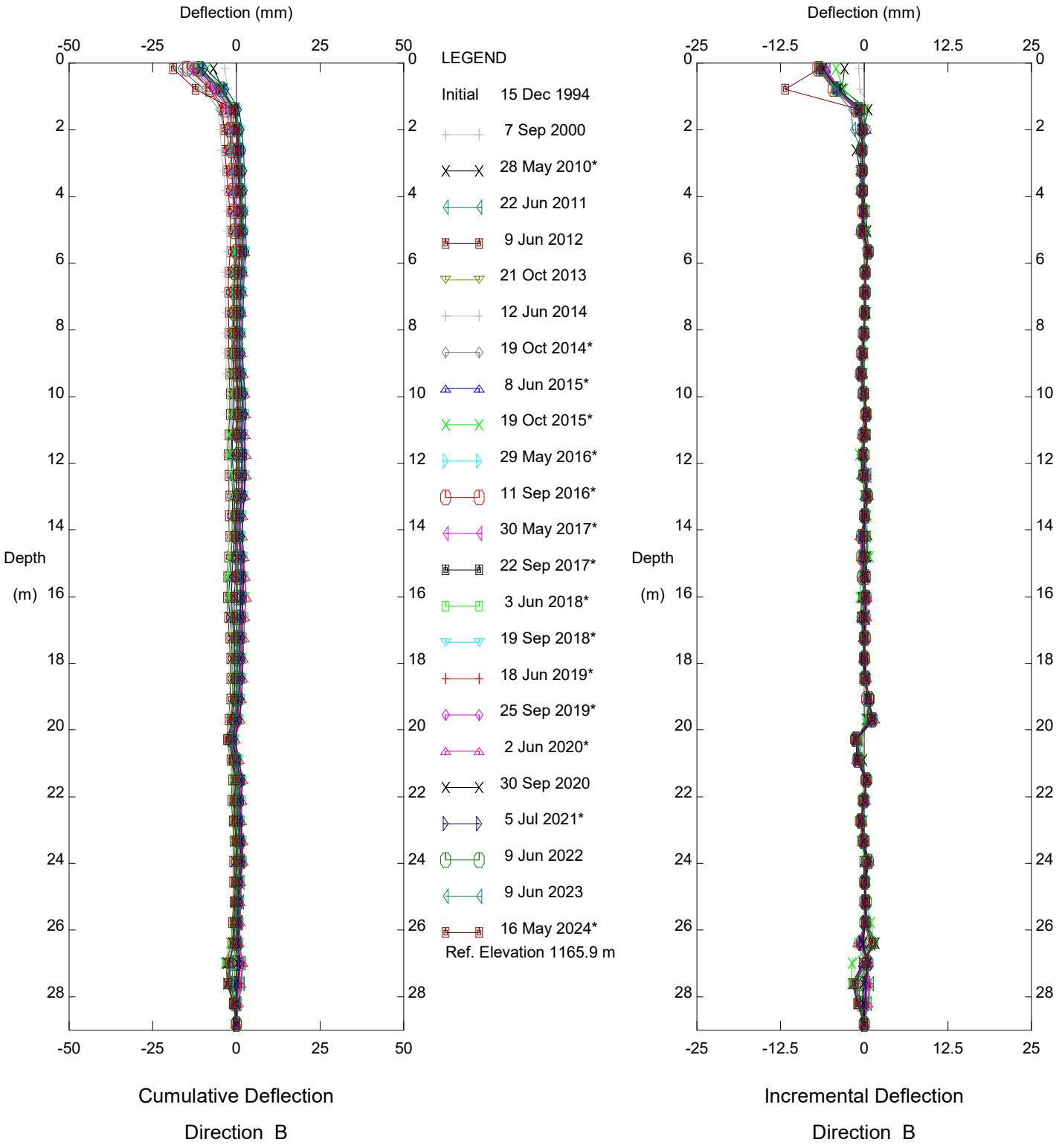
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

SH001 - Swan Hills Retaining Wall, Inclinometer SI 18

Alberta Transportation

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

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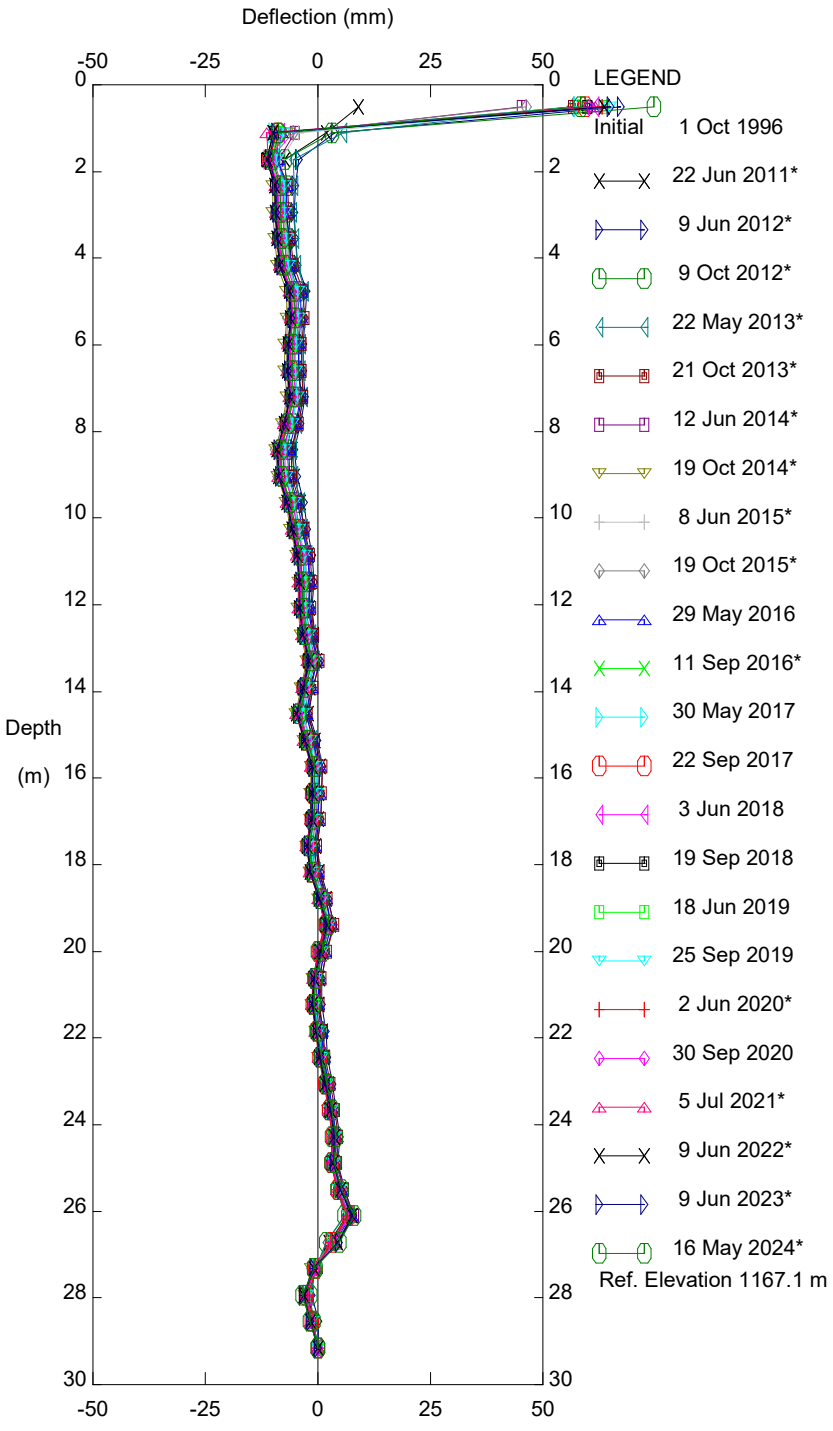
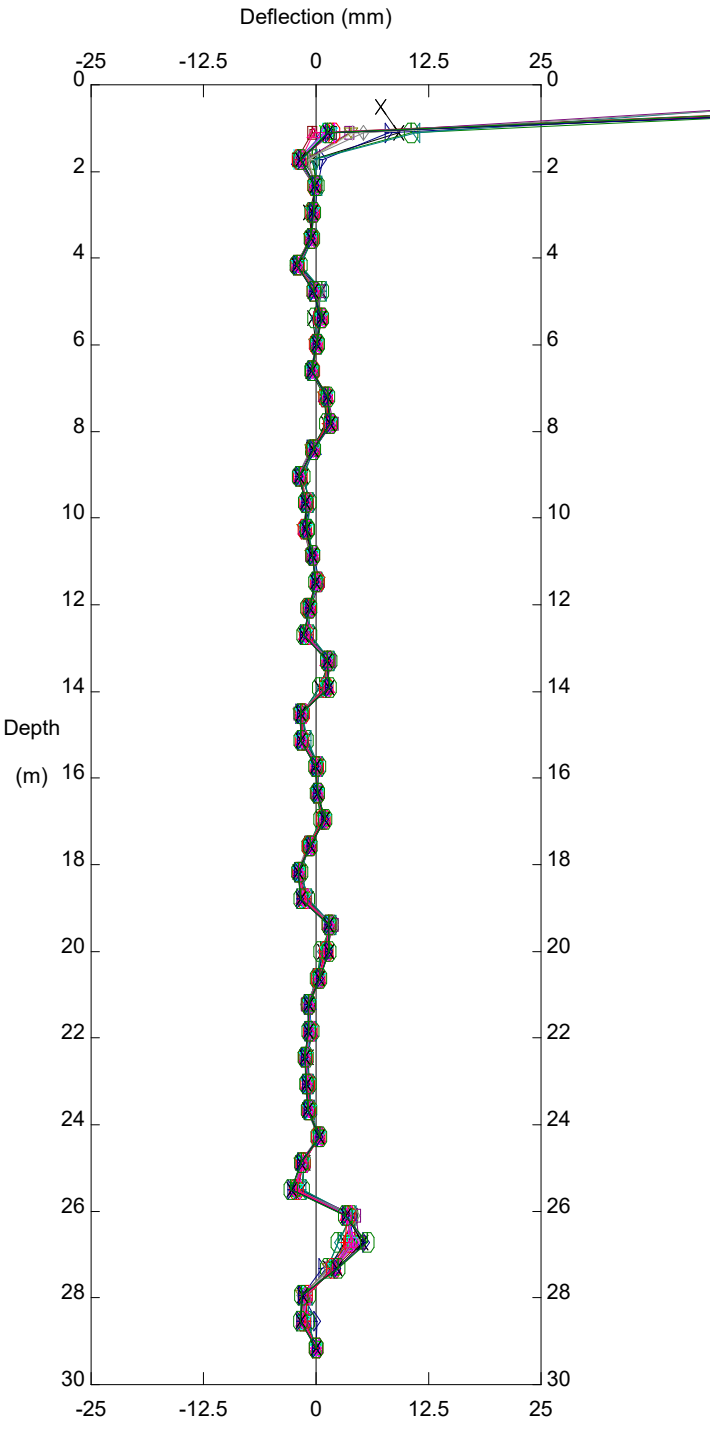
Thurber Engineering Ltd.



Cumulative Deflection

Direction A



Incremental Deflection

Direction A

Swan Hills - SH001 Retaining Wall, Inclinometer SI 20

Alberta Transportation

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

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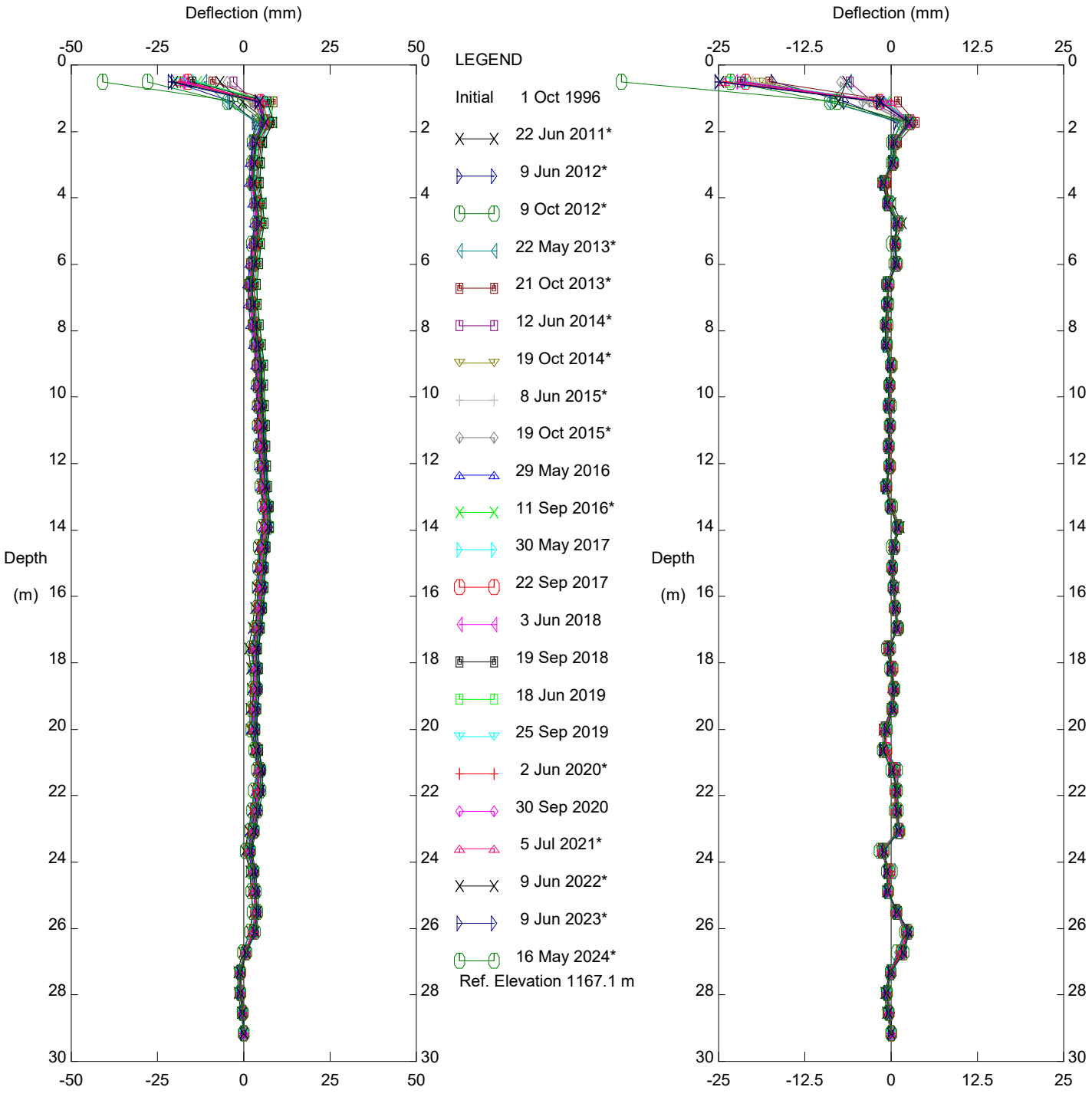
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Swan Hills - SH001 Retaining Wall, Inclinometer SI 20

Alberta Transportation

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

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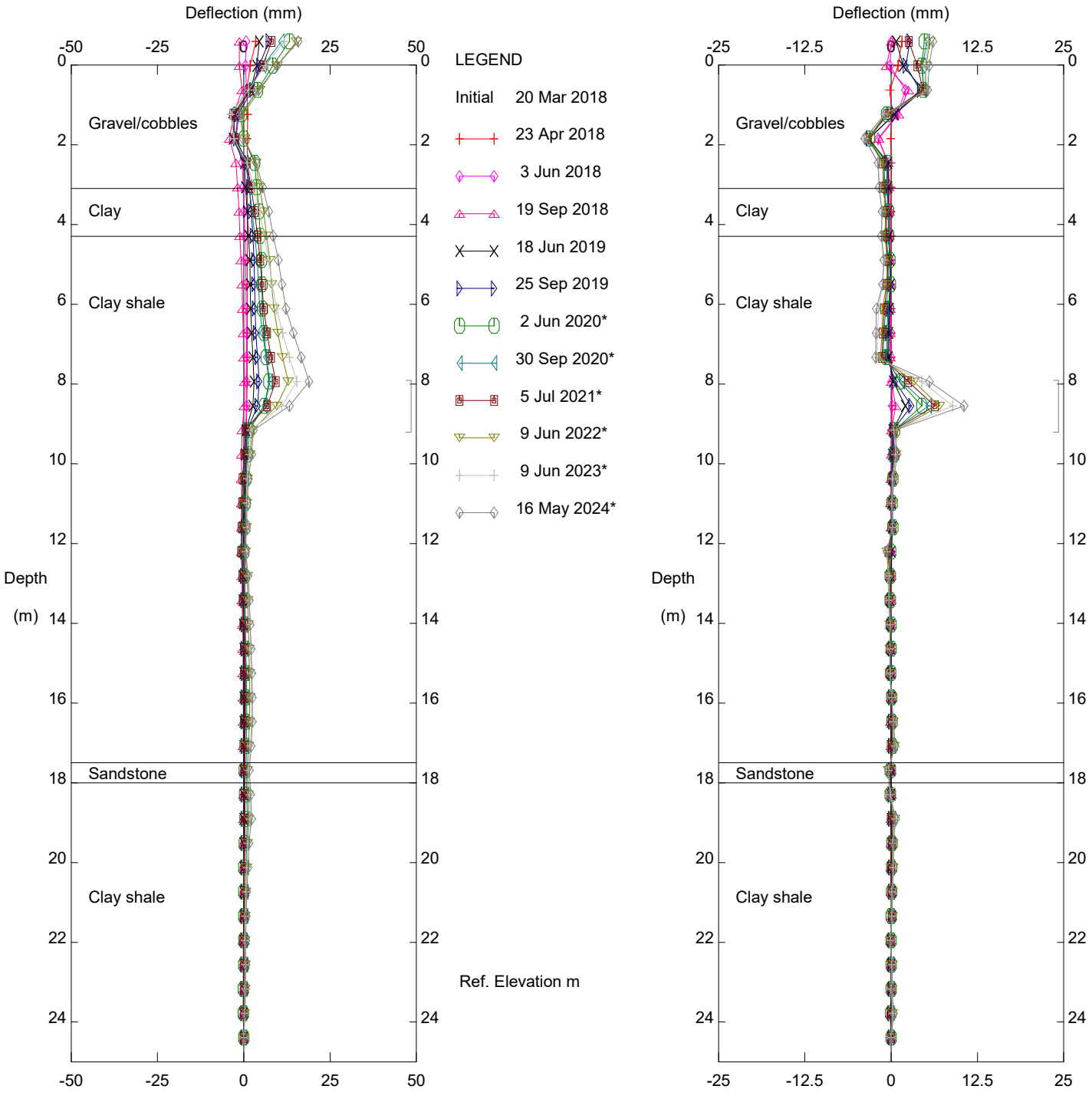
Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

SH001 Retaining Wall, Inclinometer SI18-5

Alberta Transportation

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

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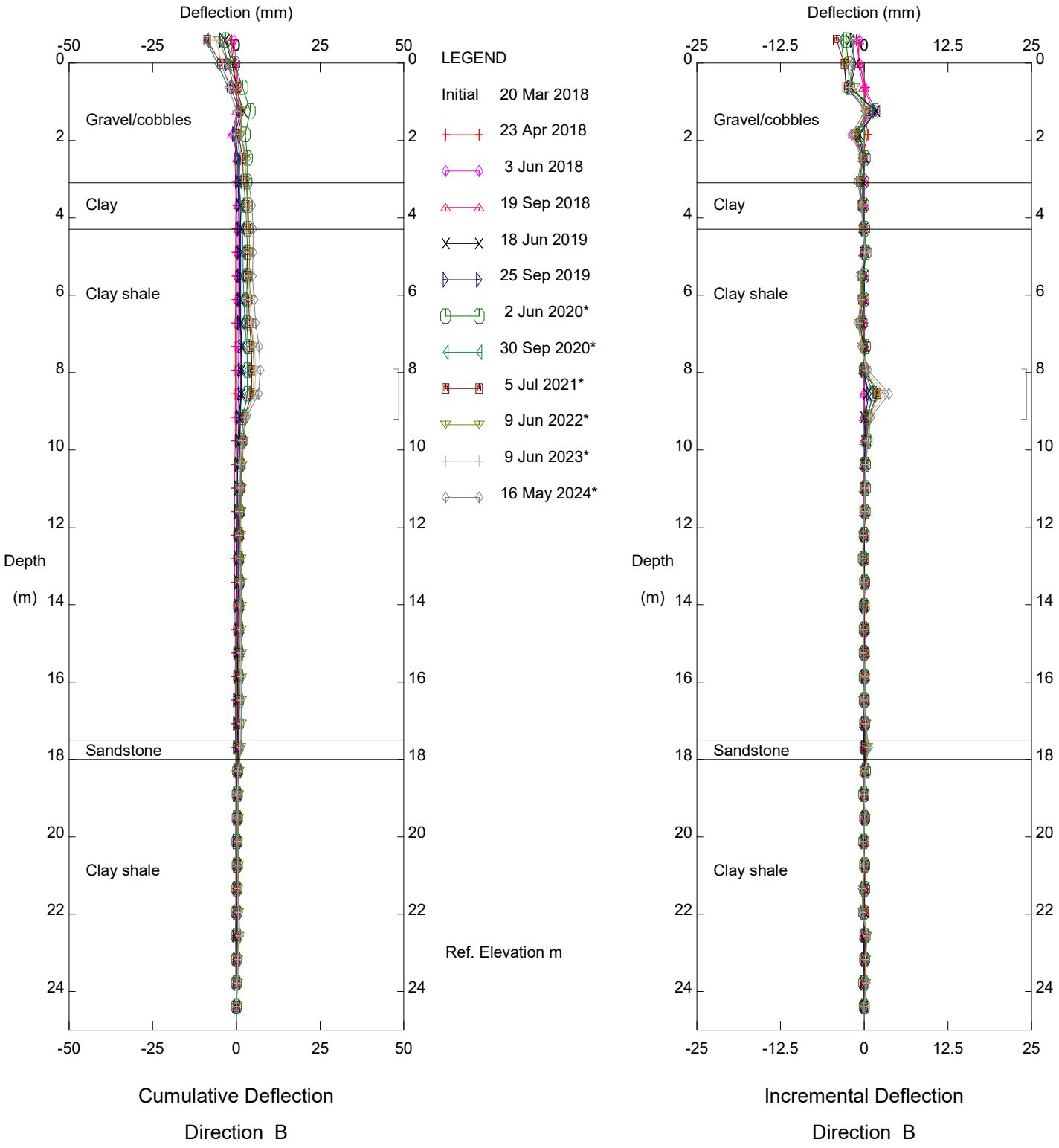
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

SH001 Retaining Wall, Inclinometer SI18-5

Alberta Transportation

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

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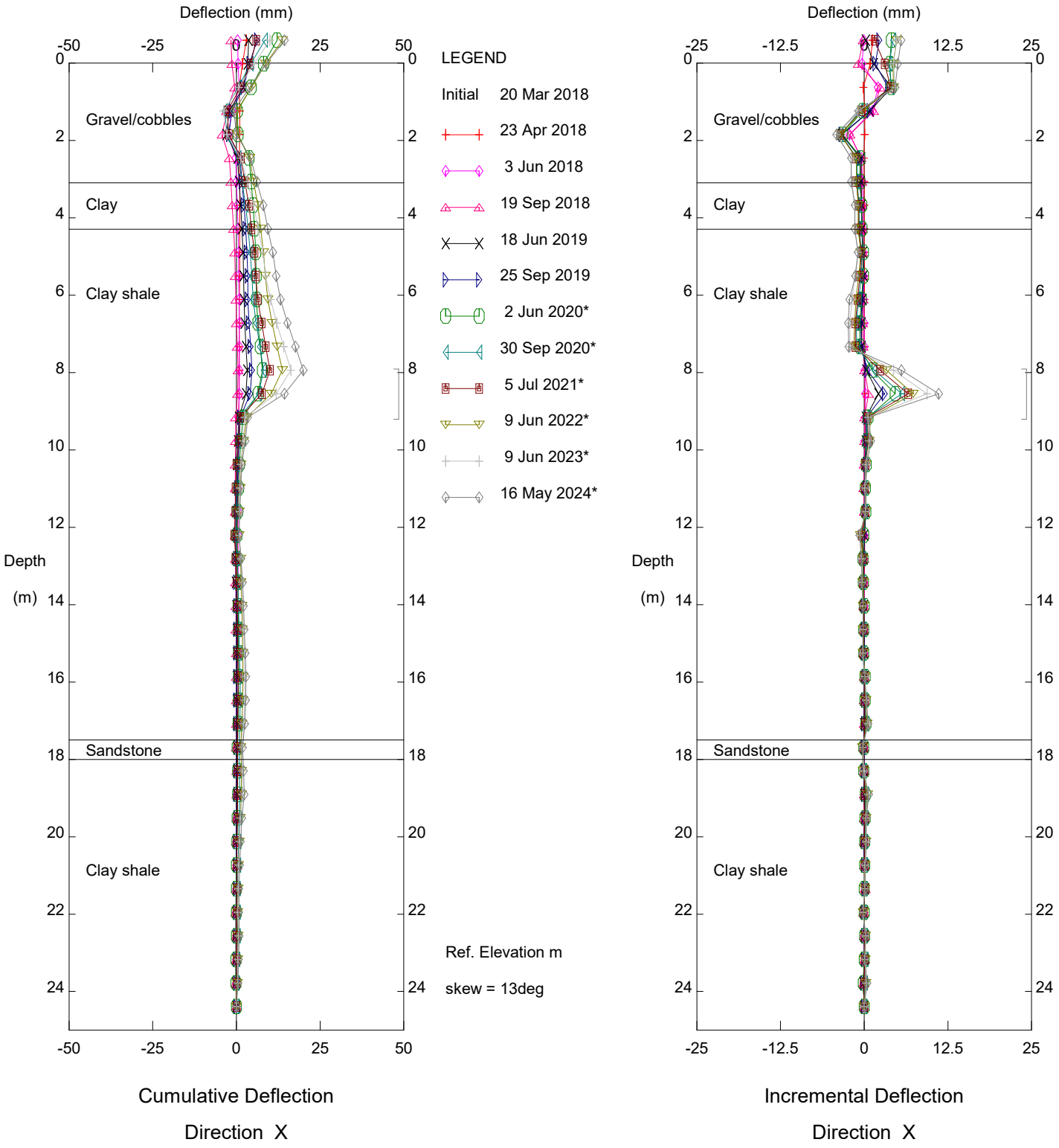
Thurber Engineering Ltd.



Cumulative Deflection

Direction X

Incremental Deflection

Direction X

SH001 Retaining Wall, Inclinometer SI18-5

Alberta Transportation

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

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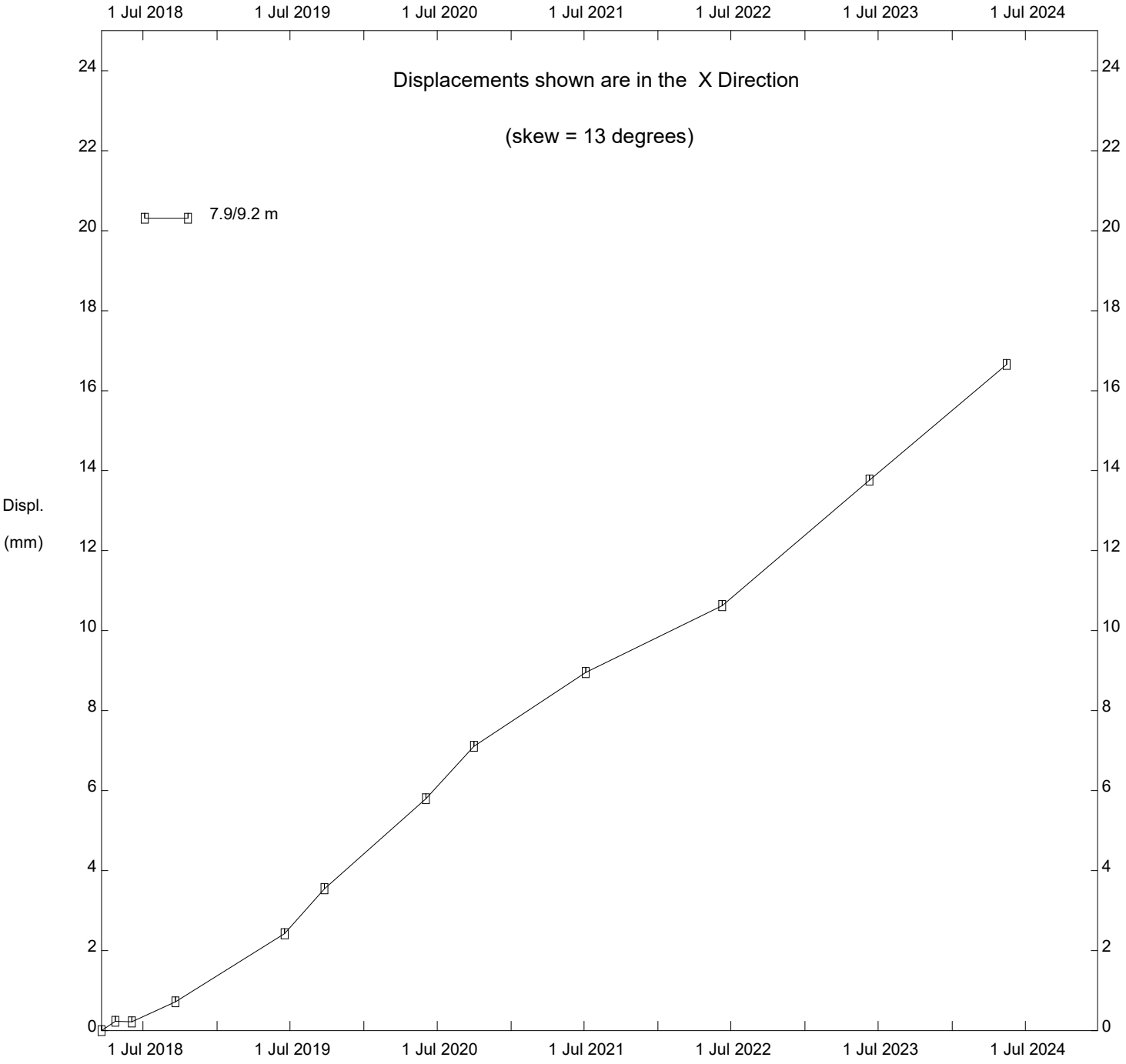
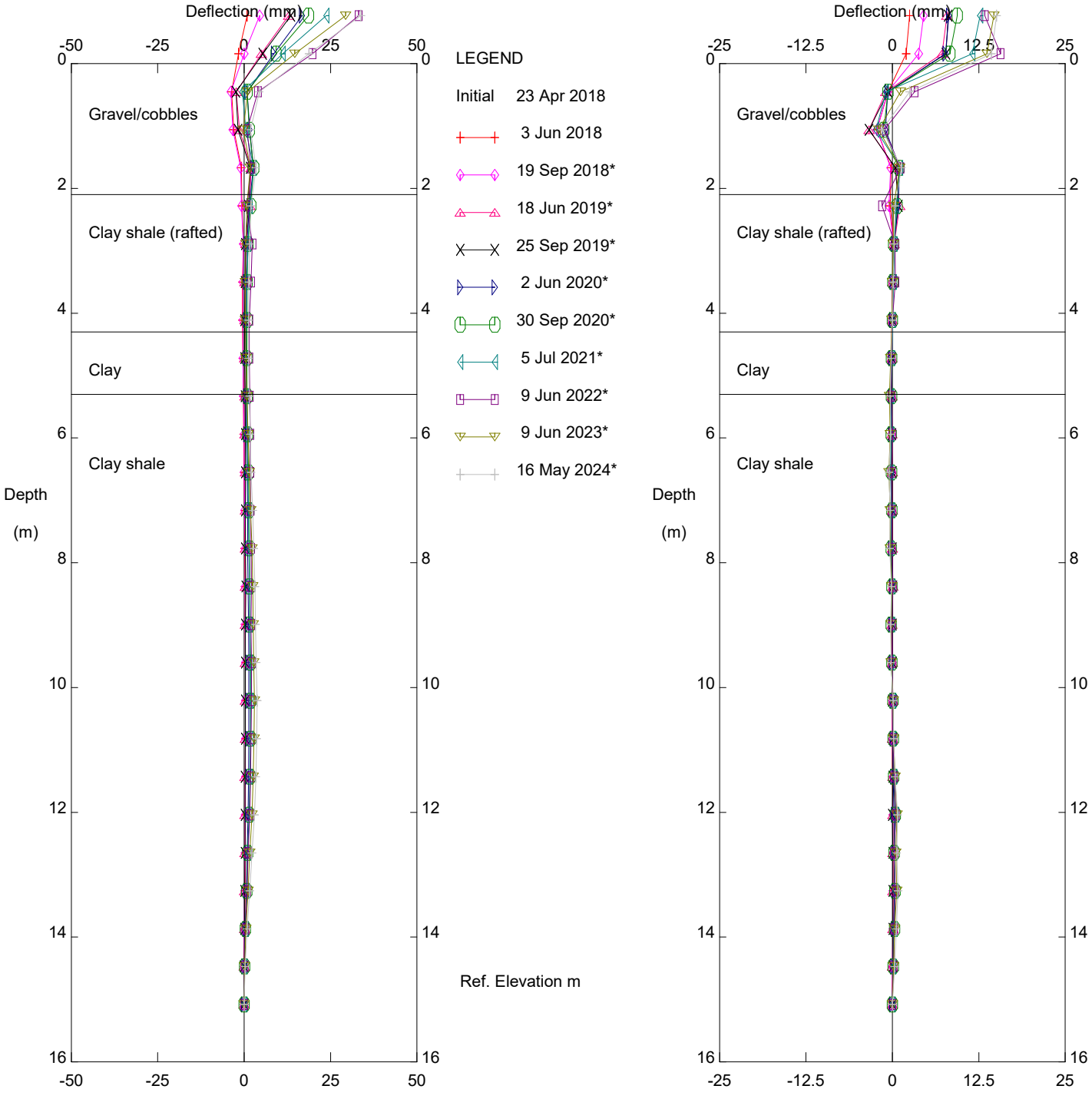
Thurber Engineering Ltd.



SH001 Retaining Wall, Inclinometer SI18-5

Alberta Transportation

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

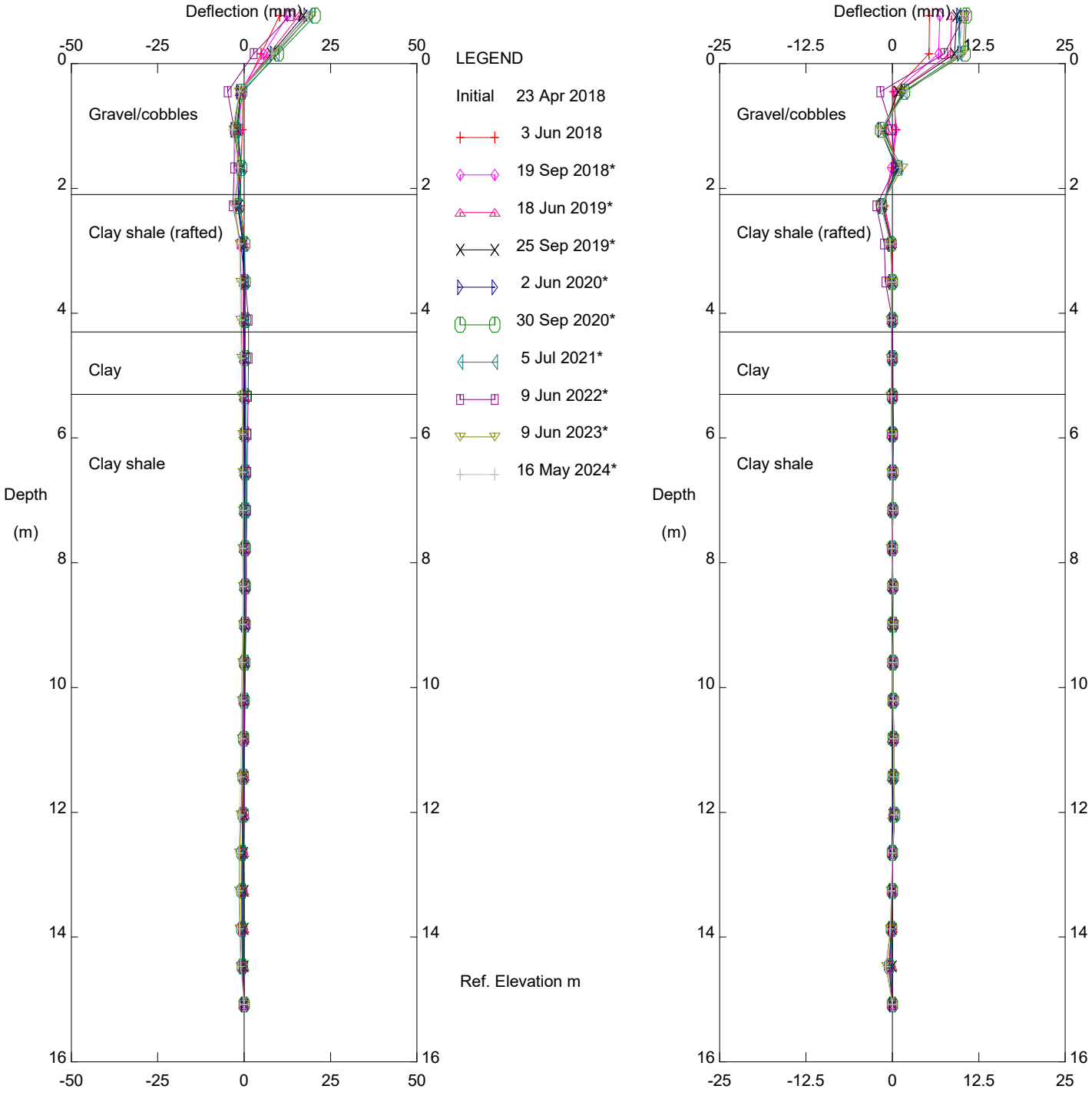
SH001 Retaining Wall, Inclinometer SI18-6

Alberta Transportation

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

H:\32000\32121 AT GRMP Peace River District 2021-2025\Section C\2024A-Spring\SI Readings\SH001\SI18-6.gtl

Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

SH001 Retaining Wall, Inclinometer SI18-6

Alberta Transportation

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

H:\32000\32121 AT GRMP Peace River District 2021-2025\Section C\2024A-Spring\SI Readings\SH001\SI18-6.gtl

FIGURE SH001-1
PNEUMATIC PIEZOMETER ELEVATIONS FOR
HWY 33:12 (SWAN HILLS RETAINING WALL)

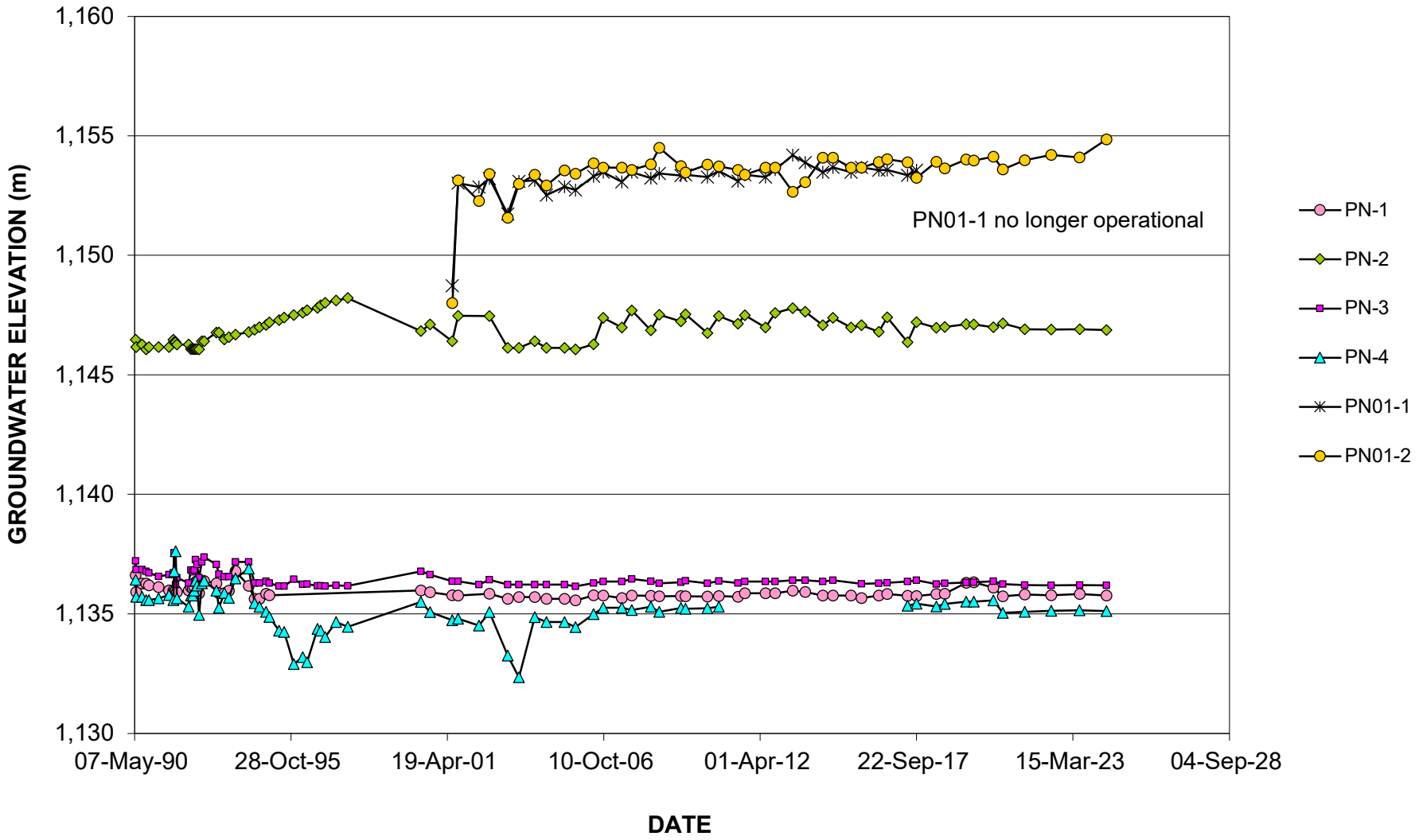


FIGURE SH001-2
PNEUMATIC PIEZOMETER DEPTHS FOR
HWY 33:12 (SWAN HILLS RETAINING WALL)

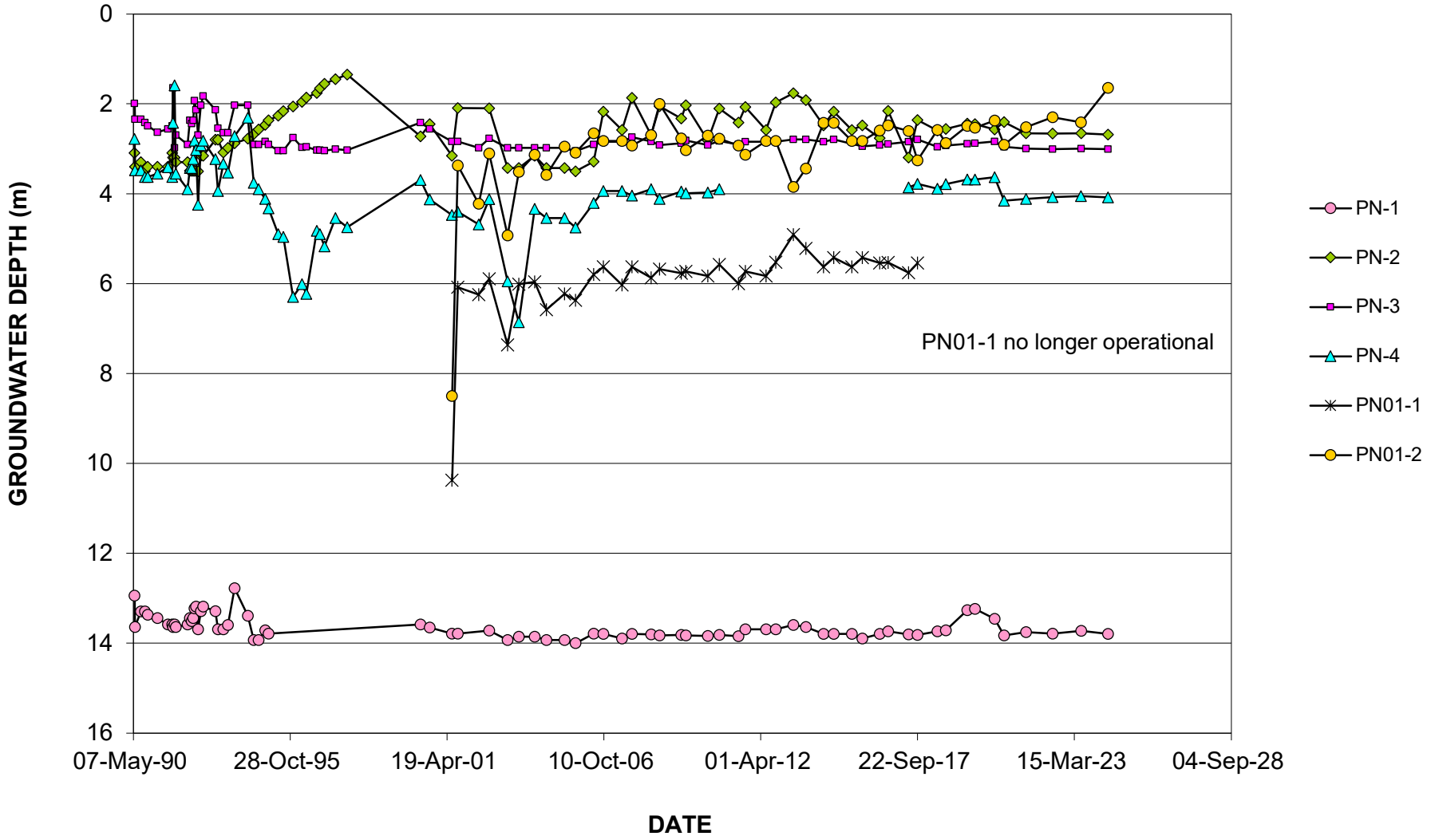


FIGURE SH001-3
PNEUMATIC PIEZOMETER DEPTHS FOR
HWY 33:12 (SWAN HILLS RETAINING WALL - 2018 INSTRUMENTS)

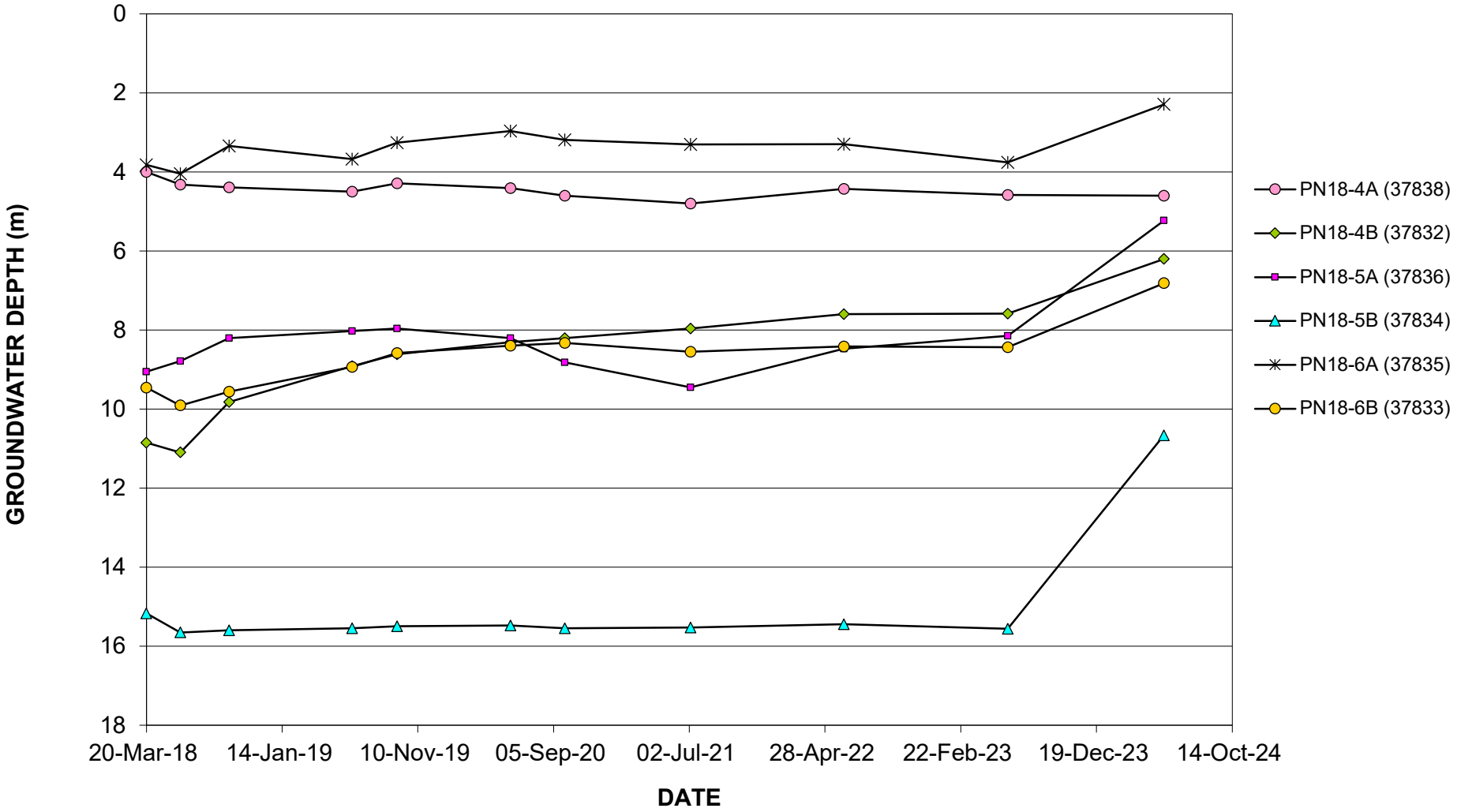


FIGURE SH001-4
PNEUMATIC PIEZOMETER DEPTHS FOR
HWY 33:12 (SWAN HILLS SITE 1A - 2018 INSTRUMENTS)