ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP GRANDE PRAIRIE REGION – (GRANDE PRAIRIE NORTH) INSTRUMENTATION MONITORING - SPRING 2024

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
GP040	Hwy 2:68 km 29.41, 5 km North of Rycroft	Spirit River Bridge	2:68	29.41
Legal Description: 16-4-77-5 W6		**UTM Co-ordinates**		
		11U E 394305	N 6184771	

Current Monitoring:	26-May-2024	**Previous Monitoring**	29-Apr-2021
Instruments Read By:	Mr. Niraj Regmi, G.I.T and Mr. Nixson Mationg, of Thurber		

Instruments Read During This Site Visit			
Slope Inclinometers (SIs): SI17-3 and SI20-1	**Pneumatic Piezometers (PN):** N/A	**Vibration 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: RST Digital Inclinometer probe with a 2 ft. wheelbase and a RST Pocket PC readout	**Pneumatic Piezometers:**	**Vibration Wire Piezometers:**	**Standpipe Piezometers:**
Load Cell:	**Strain Gauges:**	**SAAs:**	**Others:**
Notes:			

Discussion	
Zones of New Movement:	None
Interpretation of Monitoring Results:	Slope inclinometer SI17-3 was blocked or sheared at 3.27 m below the top of casing. SI17-3 is located east of the repaired headslope and just north of the pile wall installed in 2020/21. Continued slope movement at this location may expose more of the pile wall. This situation should be monitored. SI20-1 showed a rate of movement of 3.2 mm/yr over 0.2 m to 14.2 m depth since the previous reading on April 29, 2021. This corresponds to a decrease in rate of movement of 21.5 mm/yr since the previous reading. The movement pattern indicates a gradual tilting of the pile the SI is installed in; this should continue to be monitored. The reduced rate of movement suggests the mitigation work (soil nails and pile walls) is performing satisfactorily. All of the pneumatic piezometers on this site were previously damaged. Historical piezometer plots are provided in the Appendix.

Future Work:	Due to there being only one active instrument left on the site, we recommend reading this site once annually. The instrument should be read again in the spring of 2025. The pile head deflections in SI20-1 should be monitored to ensure that they are within the design limits. If these limits are exceeded it may be necessary to reinforce the pile wall with tie-back anchors or other remedial measures.
Instrumentation Repairs:	No instrument repairs are required at this time.
Additional Comments:	

Attachments:	▪ Table GP040-1 Spring 2024 – Hwy 2, 5 km North of Rycroft – Spirit River Head Slope Slide Slope Inclinometer Instrumentation Reading Summary ▪ Table GP040-2 Spring 2024 – Hwy 2, 5 km North of Rycroft – Spirit River Head Slope Slide Pneumatic Piezometer Instrumentation Reading Summary ▪ Statement of Limitations and Conditions ▪ APPENDIX A – GP040-1 SPRING 2024 □ Field Inspector's report □ Site Plan Showing Approximate Instrument Locations (Drawing No. GP040-1) □ SI Reading Plots □ Figure GP040-1 (Piezometric Elevations) □ Figure GP040-2 (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.
Roger Skirrow, M.Sc., P. Eng.
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: Don Proudfoot
RM APEGA ID #: 51674
DATE: July 15, 2024
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

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Table GP040-1: Spring 2024 – Hwy 2, 5 km North of Rycroft – Spirit River Head Slope Slide Slope Inclinometer Instrumentation Reading Summary

Date Monitored: May 26, 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)	RATE OF MOVEMENT (mm/yr)	CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)
SI17-1	*July 18, 2017*	*5.3 mm over 0.5 to 2.9 m depth in 316 ° direction*	*43.36 in August 2017*	*Sheared*	*September 6, 2017*	*N/A*	*31.8 mm/yr (September 2017)*	*N/A*
		76.7 mm over 2.9 to 4.8 m depth in 316 ° direction	*567.4 in August 2017*				*554.1 mm/yr (September 2017)*	
SI17-2	*July 18, 2017*	*84.2 over 1.8 m to 4.2 m depth in 34° direction*	*994.4 in July 2017*	*Sheared*	*August 18, 2017*	*N/A*	*994.4 mm/yr (August 2017)*	*N/A*
SI17-3	*July 18, 2017*	*37.9 over 0.2 m to 3.9 m depth in 341° direction*	*38.5 in January 2018*	*Sheared / Blocked at 3.27 m*	*June 22, 2020*	*N/A*	*19.4 mm/yr (June 2020)*	*N/A*
SI20-1	October 22, 2020	22.5 over 0.2 m to 14.2 m depth in 250° direction	24.7 in April 2021	Operational	April 29, 2021	9.8	3.2	-21.5

Drawing GP040-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

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Table GP040-2 Spring 2024 – Hwy 2, 5 km North of Rycroft – Spirit River Head Slope Slide Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: Not Monitored

INSTRUMENT #	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER ELEVATION (m)	MEASURED PORE PRESSURE (kPa)	CURRENT WATER ELEVATION (m)	PREVIOUS WATER ELEVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN17-1A	*July 6, 2017*	*841.96*	*865.43*	*Damaged*	*863.05 in July 2017*	*N/A*	*N/A*	*857.78 (August 18, 2017)*	*N/A*
PN17-1B	*July 6, 2017*	*852.48*	*865.43*	*Damaged*	*864.92 in July 2017*	*N/A*	*N/A*	*861.83 (June 22, 2020)*	*N/A*
PN17-2	*July 5, 2017*	*856.89*	*865.89*	*Damaged*	*866.59 in July 2017*	*N/A*	*N/A*	*858.58 (June 22, 2020)*	*N/A*
PN17-3	*July 5, 2017*	*837.23*	*851.56*	*Damaged*	*843.14 in July 2017*	*N/A*	*N/A*	*838.64 (October 5, 2017)*	*N/A*

Drawing GP040-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

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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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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.

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ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP (CON0022165)
PEACE REGION (GRANDE PRAIRIE DISTRICT – NORTH)
INSTRUMENTATION MONITORING RESULTS

SPRING 2024

APPENDIX A
DATA PRESENTATION

SITE GP040: HWY 2, 5 km NORTH OF RYCROFT – SPIRIT RIVER HEAD SLOPE SLIDE

ALBERTA TRANSPORTATION
PEACE REGION - GRANDE PRAIRIE AREA
SLOPE INCLINOMETER MONITORING FIELD SUMMARY
SPRING 2024

Location:	Spirit River Bridge 5KM North of Rycroft	**Readout:**	RST PN C108 Unit 7
File Number:	32123	**Casing Size**	2.75
Probe:	RST Set 8R / 10	**Temp:**	19
Cable:	RST Set 8R / 10	**Read by:**	NKR/NRM

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (11 UTM)		Date	Stickup (m)	Depth from top of **CASING** (ft)	Azimuth of A+ Groove	Current Bottom Depth Readings				Probe/ Reel #	Size (")	Remarks
	(N)	(E)					A+	A-	B+	B-			
SI17-3	6184771	394305	26-May-24	0.69	48 to 2	330	290	-275	-754	758	8R/8R	2.75	
SI20-1	6184691	394281	26-May-24	0.76	48 to 2	219	-568	577	279	-278	10/10	2.75	

INSPECTOR REPORT

SI17-3 BLOCKED @ 10'9"(NOT READ)
PN Piezometers on site DAMAGED

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APPROXIMATE LIMITS OF OLD LANDSLIDE (JUNE 27, 1978)
CLASS 1M RIPRAP
1 m Ø CIP TANGENT CONCRETE PILES
1.85m DROP FROM TOP OF PILES TO RIPRAP
12th PILE FROM THE EAST END IS 2.14m FROM TOP OF PILE TO SOIL BELOW RIPRAP
EROSION GULLY 750mm WIDE AND 580mm DEEP
SURVEY BOUNDARY, OUTSIDE CONTOURS ARE FROM LIDAR
TELEPHONE PEDESTAL
DEBRIS HAS ACCUMULATED ON WEIRS
PRE-EXISTING PILE WEIRS
RIGHT-OF-WAY
GROUTED AREA FOR VOIDS FILLING AT SOUTH ABUTMENT
EXISTING 600 DIA CSP
1.1m FROM TOP OF SI TO TOP OF PROTECTOR
TH17-3
EROSION CONTROL AREA
FINAL GRADE
BRIDGE PIER
SOIL NAILS (TYP)
S120-1
TH17-2
TH17-1
CLASS 2 RIPRAP
3H : 1V
CONCRETE GUTTER
CLASS 1M RIPRAP
LAGGING
SUBDRAIN
0.51m FROM TOP OF PILE TO TOP OF RIPRAP ON CORNER

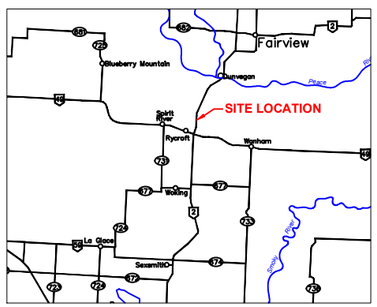
LEGEND

- APPROXIMATE TEST HOLE LOCATION(2017)
- APPROXIMATE SLOPE INCLINOMETER LOCATION (2020)
- TELUS CABLE
- OVERHEAD POWER LINE
- GUARD RAIL
- TREE LINE
- SOIL NAIL
- SUBDRAIN
- CONTROL POINT
- DIRECTION AND NUMBER OF PHOTO

NOTES:

1. MAY 29, 2023 FEATURES SHOWN IN RED
2. BASE PLAN PROVIDED BY WSP, SITE SURVEYED ON SEPTEMBER 5, 2017.
3. CONTOURS OUTSIDE SURVEY LIMIT ARE FROM 2015 LIDAR DATA.
4. NAD83 UTM 11 COORDINATE SYSTEM.
5. CONTOUR INTERVALS 0.5m.

0 10 20 30 40 50m
SCALE 1:750



KEY PLAN
SCALE: 1:2 000 000

AIR PHOTO FROM ESRI WORLD IMAGERY EXPORTED ON AUGUST 23, 2023

Alberta

PEACE REGION (GRANDE PRAIRIE)

GP040-1: HWY 2:68 - SPIRIT RIVER BRIDGE (BF75106)
2023 INSPECTION PLAN

DWG No. 32123-GP040-1

DRAWN BY	ML
DESIGNED BY	NPW
APPROVED BY	DWP
SCALE	1:750
DATE	AUGUST 2023
FILE No.	32123

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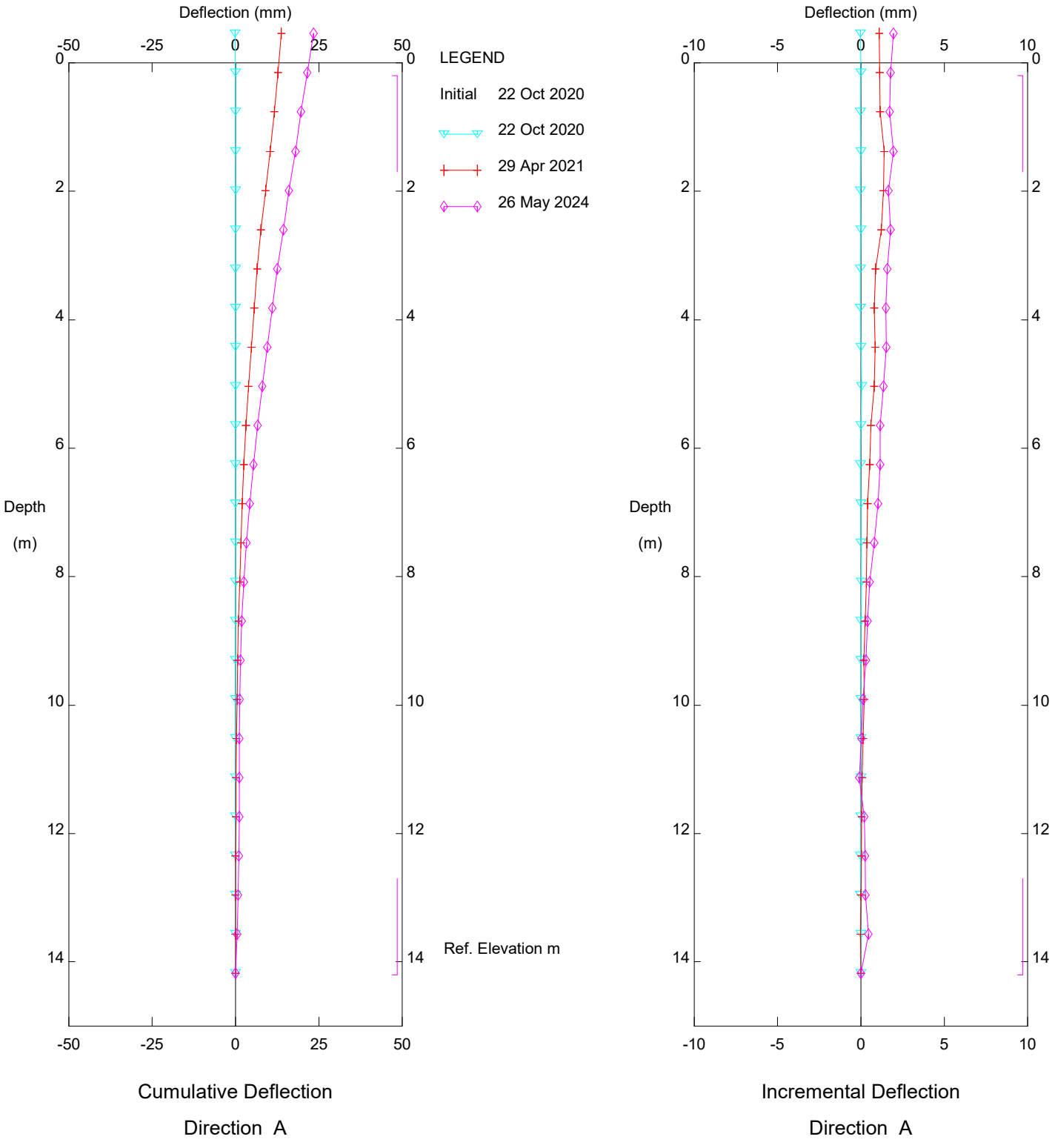

Spirit River Bridge, Inclinometer SI20-1

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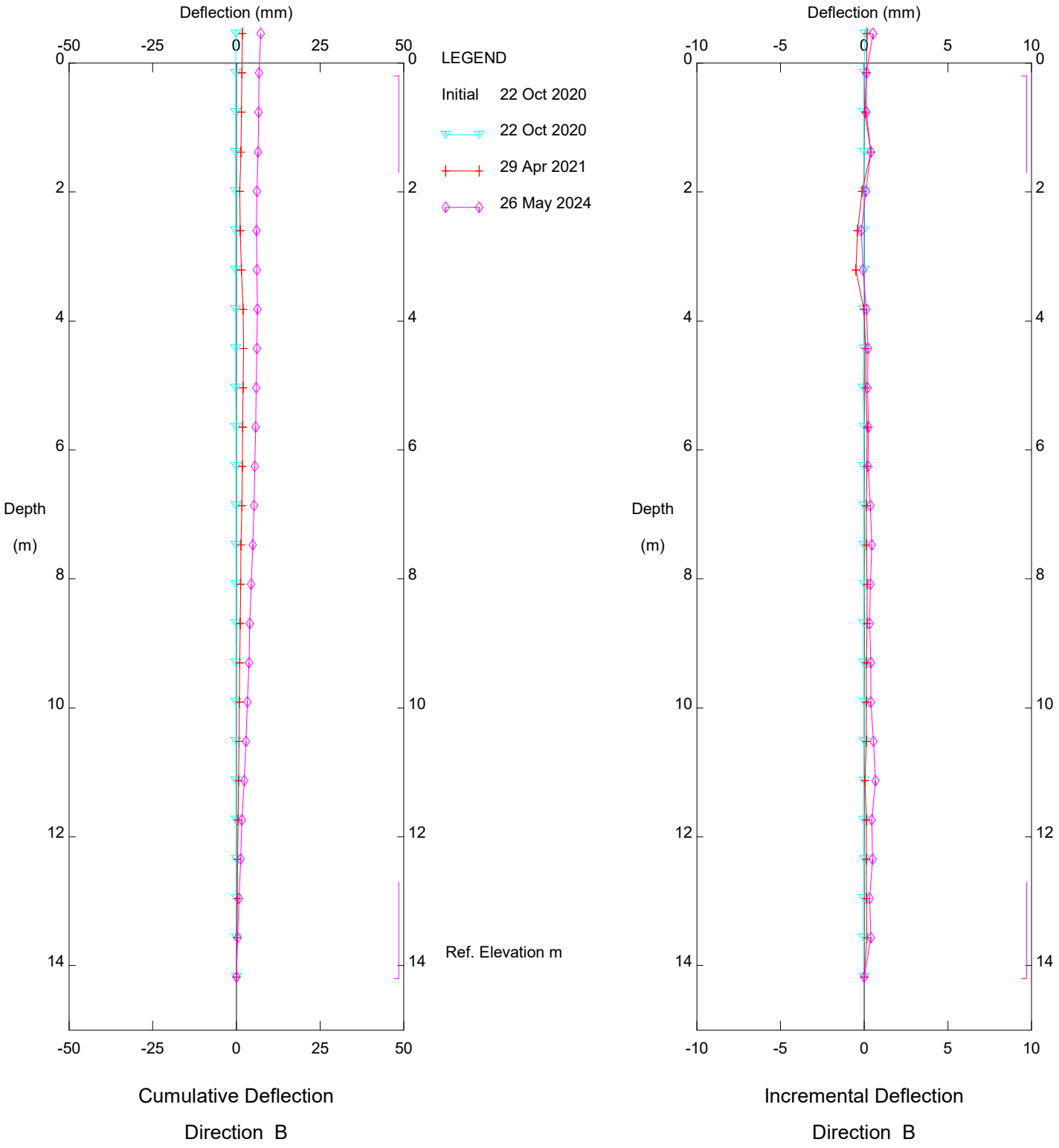

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

Spirit River Bridge, Inclinometer SI20-1

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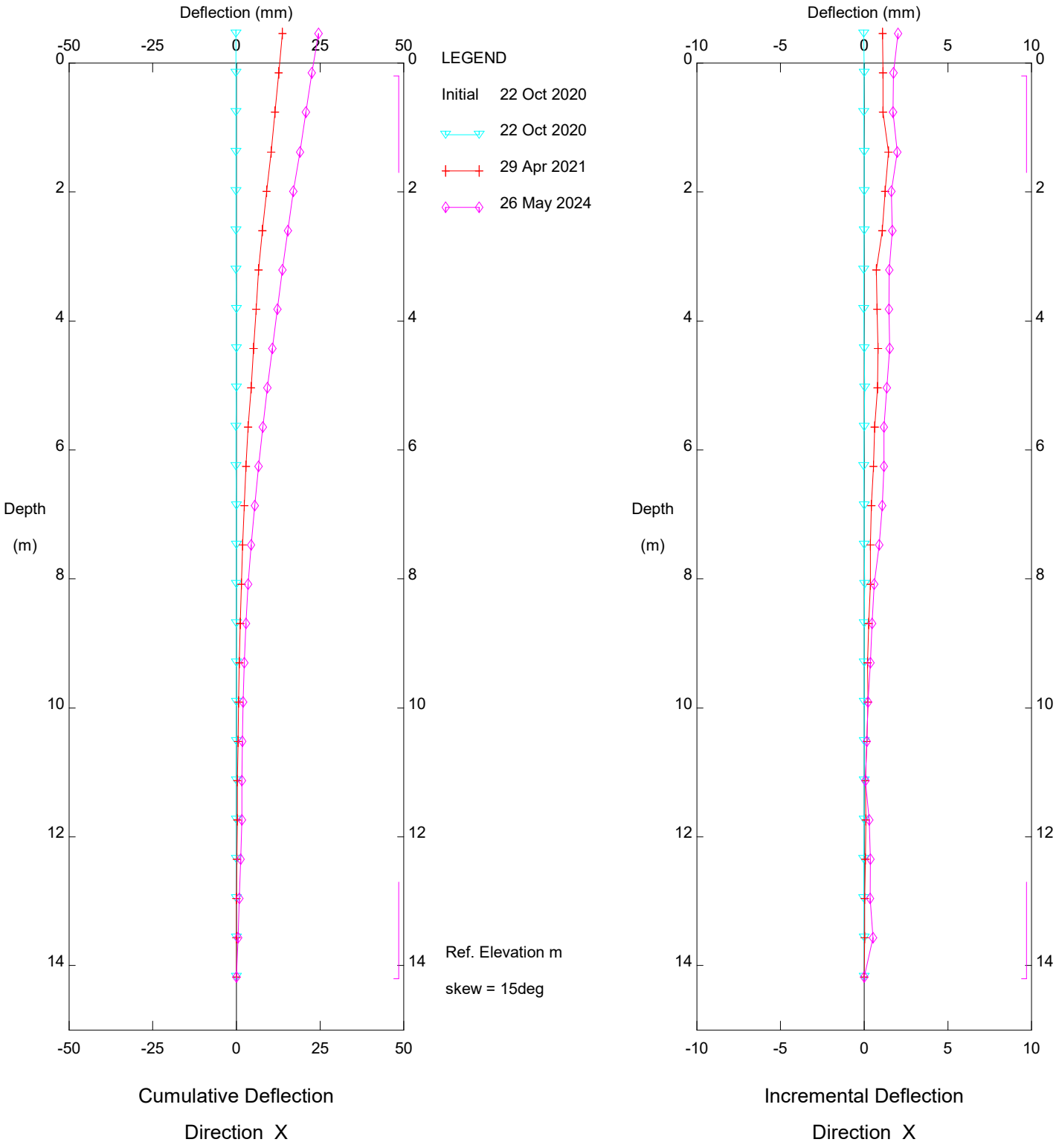

Spirit River Bridge, Inclinometer SI20-1

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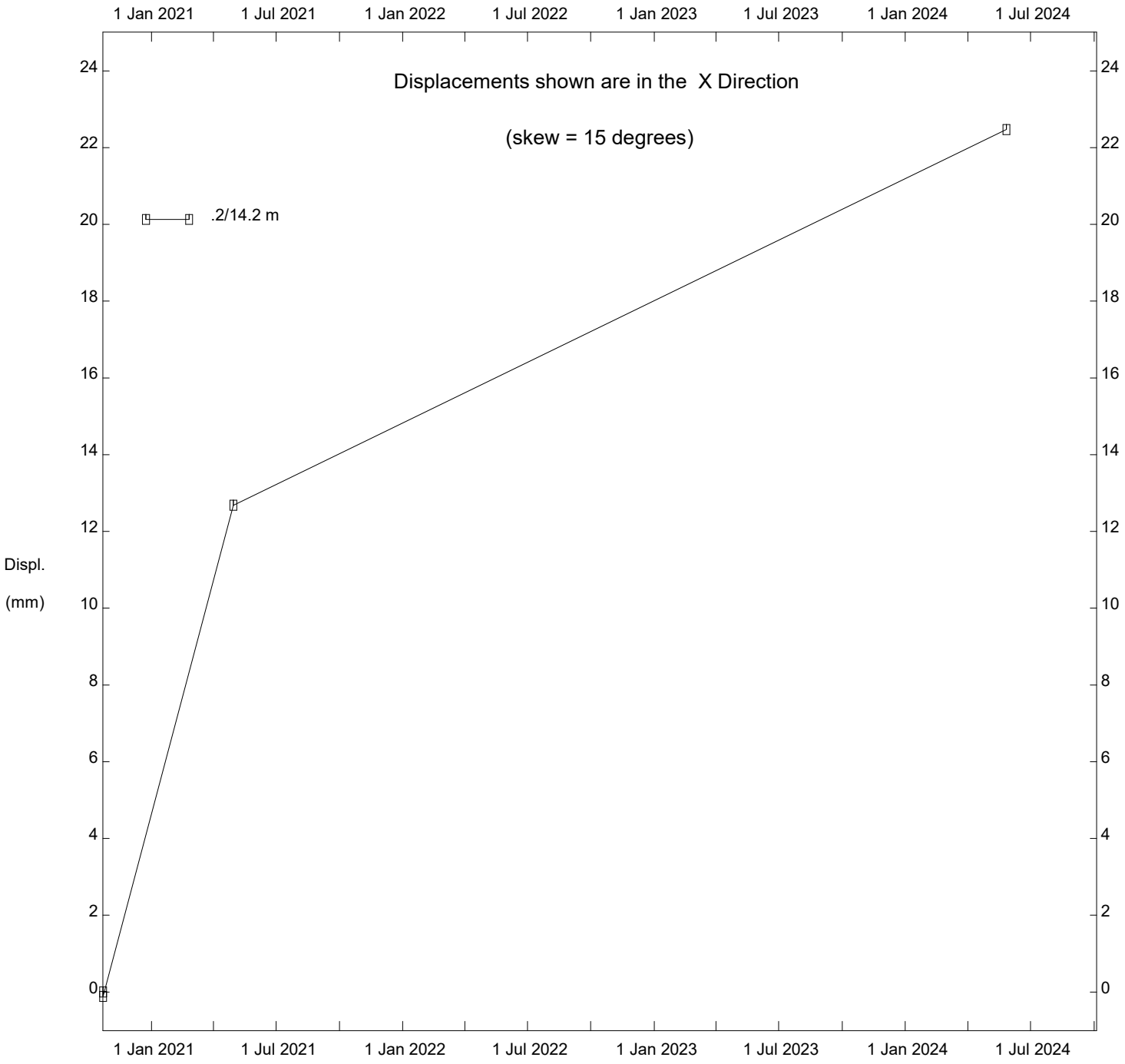

Spirit River Bridge, Inclinometer SI20-1

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FIGURE GP040-1
PIEZOMETRIC ELEVATIONS FOR HWY 2:68 4.7 km NORTH OF RYCROFT

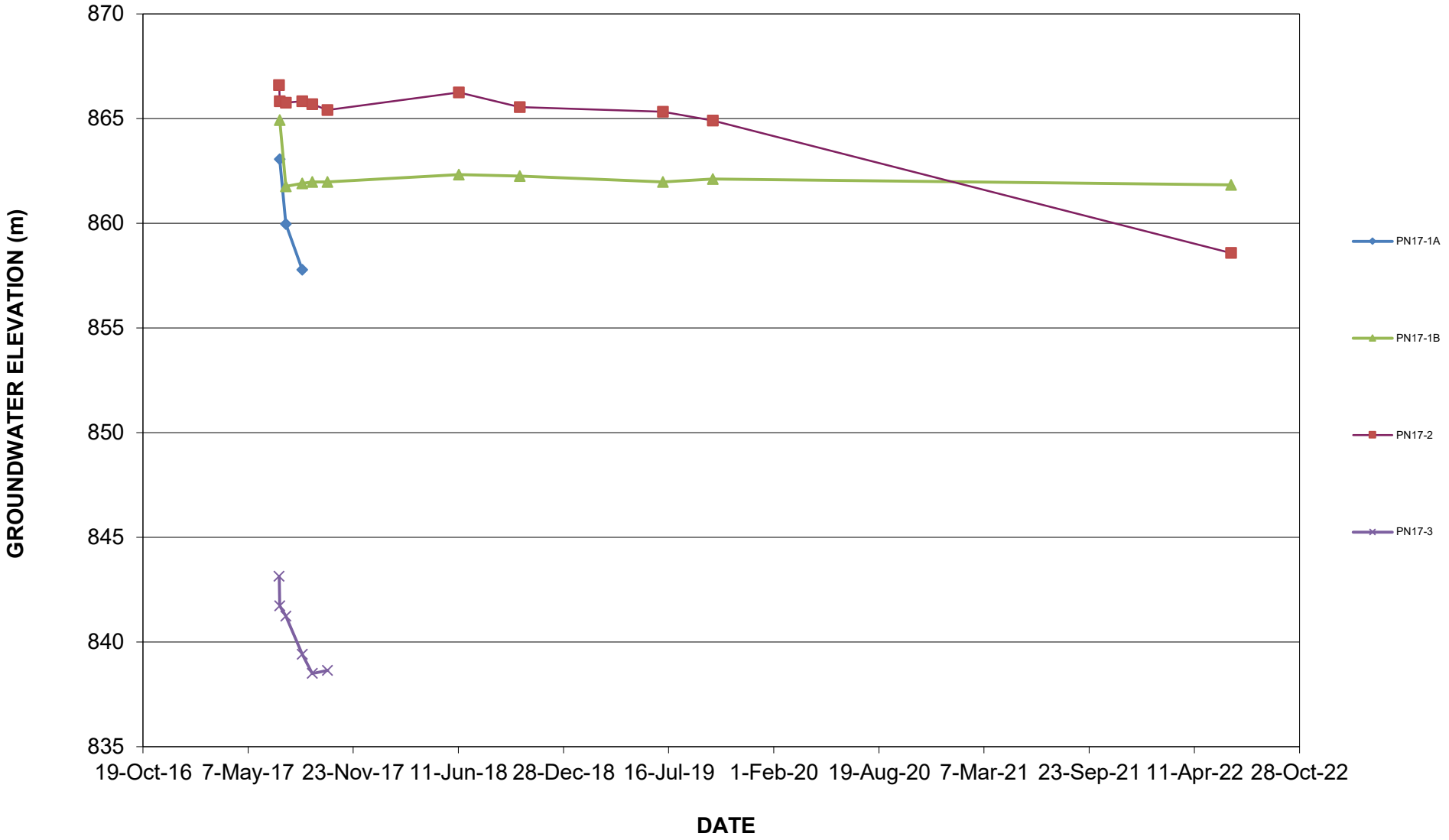

FIGURE GP040-2
PIEZOMETRIC DEPTHS FOR HWY 2:68 4.7 km NORTH OF RYCROFT