

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



Site Number	Location	Name	Hwy	km
NC090	HWY 2:42 C1 17.72	Baptiste Creek	2:42	Km 17.2
Legal Description: 5-6-67-23 W4		UTM Co-ordinates		
		12U E 338297	N	6071816

Current Monitoring:	14-June-2024	Previous Monitoring	07-Oct-2023
Instruments Read By:	Mr. Niraj Regmi, G.I.T and Mr. Nixon Mationg, of Thurber		

Instruments Read During This Site Visit			
Slope Inclinometers (SIs): SI19-1	Pneumatic Piezometers (PN): N/A	Vibration Wire Piezometers (VW): VW19-1A and VW19-1B	Standpipe Piezometers (SP): N/A
Load Cell (LC): VC2130 to VC2136	Strain Gauges: three vibrating wire strain gauges	SAs: N/A	Others:

Readout Equipment Used			
Slope Inclinometers: RST Digital Inclinometer probe with a 2 ft wheelbase and an RST Pocket PC readout	Pneumatic Piezometers:	Vibration Wire Piezometers: Campbell Scientific CR6 datalogger	Standpipe Piezometers:
Load Cell: Campbell Scientific CR6 datalogger	Strain Gauges: Campbell Scientific CR6 datalogger	SAs:	Others:

Note:
<ul style="list-style-type: none"> - Drawings showing instrument locations are included in Appendix A. - SIs plots with A and B directions are presented in Appendix A and summarized in Table NC090-1, attached. Where movement was recorded, the resultant (plot X) and the rate of movement plot are also included. - The Vibrating wire piezometer plot is included in Appendix A. - The Vibrating wire load cell plot is included in Appendix A. - The Vibrating wire strain gauge plot is included in Appendix A. - Vibrating wire piezometer readings are summarized in Table NC089-2, attached. - Vibrating wire load cell readings are summarized in Table NC089-3, attached. - Vibrating wire strain gauge readings are summarized in Table NC089-4, attached.

Discussion	
Zones of New Movement:	None
Interpretation of Monitoring Results:	<p>Slope inclinometer SI19-1, installed upslope of the cantilever sheet pile wall, showed a rate of movement of 3.5 mm/yr over 0.4 m to 1.7 m depth since the fall of 2023 readings. SI19-1 has appeared to show a movement over this zone since the end of construction; however, this may only reflect a surficial movement of backfill material around the SI, or poor grouting condition within the upper section of the SI casing.</p> <p>Vibrating wire piezometer VW19-1A showed an increase in groundwater level of 0.21 m since the fall of 2023 reading. VW19-1B showed a decrease in groundwater level of 0.41 m since the fall of 2023 readings. Both vibrating wire piezometers have shown a pattern</p>

	<p>of reasonable variation in groundwater level, with the highest groundwater levels typically recorded between the months of April and June. The seasonal variation is more pronounced in VW19-1A, which is installed closer to the ground surface at 5 m depth.</p> <p>Load cells VC2135, VC2132, VC2131, VC2136, VC2133, and VC2130 showed increases in measured load, ranging from 0.53 kN in load cell VC2136 to 2.74 kN in VC2135 since the fall of 2023 readings. Load cell VC2134 has shown a decrease in measured load of 2.25 kN since the fall of 2023 readings. The measured loads in the load cells have remained relatively stable since the spring of 2023 readings. The load cells have generally shown a pattern of seasonal variation in loads, with the highest loads typically recorded during the winter months. VC2135, VC2131, and VC2136 are currently above their design load by 1.40 kN, 7.65 kN, and 0.30 kN, respectively.</p> <p>The upper, middle, and lower strain gauges showed increases in total micro-strain of 8.38 $\mu\epsilon$, 13.54 $\mu\epsilon$ and 4.91 $\mu\epsilon$, respectively, since the fall of 2023 readings. In general, the strain gauge readings continue to show minimal bending stresses in the tied-back sheet pile wall.</p> <p>The instrumentation readings indicate that the pile walls have performed well since construction completion.</p>
Future Work:	The instruments at this site should be read again in the fall of 2024.
Instrumentation Repairs:	No instrument repairs are required at this time.
Additional Comments:	

Attachments:	<ul style="list-style-type: none"> • Table NC090-1 Spring 2024 – HWY 2:42 Baptiste Creek Bridge NW Approach Fill Landslide (Bf7055), Slope Inclinator Instrumentation Reading Summary • Table NC090-2 Spring 2024 – HWY 2:42 Baptiste Creek Bridge NW Approach Fill Landslide (Bf7055), Vibrating Wire and Standpipe Piezometer Instrumentation Reading Summary • Table NC090-3 Spring 2024 – HWY 2:42 Baptiste Creek Bridge NW Approach Fill Landslide (Bf7055), Vibrating Wire Load Cell Instrumentation Reading Summary • Table NC090-4 Spring 2024 – HWY 2:42 Baptiste Creek Bridge NW Approach Fill Landslide (Bf7055), Vibrating Wire Strain Gauge Instrumentation Reading Summary • Statement of Limitations and Conditions • APPENDIX A – NC090-1 SPRING 2024 <ul style="list-style-type: none"> ○ Field Inspector's report ○ Site Plan and Cross Section Showing Approximate Instrument Locations (Drawings No. 32122-NC090 1 and 32122-NC090-2)
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	<ul style="list-style-type: none">○ SI Reading Plots○ Figure NC090-1 (Piezometric Data Plot)○ Figure NC090-2 (Load Cell Data Plot)○ Figure NC090-3 (Strain Gauge Data Plot)
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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

Lucas Green, P.Eng.
Geotechnical Engineer



Table NC090-1 Spring 2024 – Hwy 2:42 Baptiste Creek Bridge NW Approach Fill Landslide (Bf7055) Slope Incliner 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)
SI19-1	August 21, 2019	28.1 mm over 0.4 to 1.7 m depth in 126° direction	365 on Sep. 14, 2019	Operational	October 7, 2023	2.4	3.5	4.8

Drawings 32122-NC090-1 and NC090-2 in Appendix A show approximate locations of the monitoring instrumentation at this site.

Table NC090-2: Spring 2024 – Hwy 2:42 Baptiste Creek Bridge NW Approach Fill Landslide (Bf7055) Vibrating Wire Piezometer Instrumentation Reading Summary

Date Monitored: June 14, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	CURRENT STATUS	MAXIMUM GROUNDWATER DEPTH (m)	CURRENT GROUNDWATER DEPTH (m)	PREVIOUS GROUNDWATER DEPTH (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
VW19-1A ⁽¹⁾ (4060)	August 21, 2019	5.0	Operational	1.98 on September 10, 2019	2.54	2.75	0.21
VW19-1B ⁽¹⁾ (4061)	August 21, 2019	10.0	Operational	1.00 on June 18, 2020	2.21	1.80	-0.41

Drawings 32122-NC090-1 and NC090-2 in Appendix A show approximate locations of the monitoring instrumentation at this site.

Notes:

- 1) Vibrating wire piezometer data is recorded daily through on-site datalogger and is downloaded twice annually during the instrumentation readings.



Table NC090-3: Spring 2024 – Hwy 2:42 Baptiste Creek Bridge NW Approach Fill Landslide (Bf7055) Vibrating Wire Load Cell Instrumentation Reading Summary

Date Monitored: June 14, 2024

LOAD CELL SERIAL #	ANCHOR NUMBER	DESIGN LOAD / LOCK-OFF LOAD (kN)	MAXIMUM RECORDED LOAD (kN)	RECORDED LOAD ⁽¹⁾ (June 14, 2024) (kN)	PREVIOUS RECORDED LOAD ⁽¹⁾ (October 7, 2023) (kN)	CHANGE IN LOAD SINCE PREVIOUS READING (kN)
VC2135	8	140/140	169.00 on January 30, 2022	141.40	138.66	2.74
VC2132	12	210/210	221.59 on January 31, 2022	193.84	192.88	0.96
VC2131	13	140/140	158.37 on January 30, 2022	147.65	145.68	1.97
VC2136	19	140/140	151.31 on January 29, 2022	140.30	139.77	0.53
VC2134	24	210/210	231.75 on March 5, 2023	192.63	194.88	-2.25
VC2133	29	140/140	129.34 on February 18, 2021	117.12	115.66	1.46
VC2130	34	210/210	189.61 on March 5, 2023	178.73	177.90	0.83

Drawings 32122-NC090-1 and NC090-2 in Appendix A show approximate locations of the monitoring instrumentation at this site.

Notes:

- 1) Load cell data is recorded daily through existing datalogger on site. Datalogger data is downloaded twice annually during instrumentation readings.



Table NC090-4: Spring 2024 – Hwy 2:42 Baptiste Creek Bridge NW Approach Fill Landslide (Bf7055) Vibrating Wire Strain Gauge Instrumentation Reading Summary

Date Monitored: June 14, 2024

STRAIN GAUGE	ELEVATION	TOTAL MICROSTRAIN ⁽¹⁾ (JUNE 14, 2023) ($\mu\epsilon$)	PREVIOUS TOTAL MICROSTRAIN ⁽¹⁾ (OCTOBER 7, 2023) ($\mu\epsilon$)	CHANGE IN MICROSTRAIN SINCE PREVIOUS READING ($\mu\epsilon$)
Upper	585.5	24.18	15.80	8.38
Middle	584.0	39.09	25.55	13.54
Lower	582.5	43.53	38.62	4.91

Drawings 32122-NC090-1 and NC090-2 in Appendix A show approximate locations of the monitoring instrumentation at this site.

Notes:

- 1) Strain Gauge data is recorded daily through existing datalogger on site. Datalogger data is downloaded twice annually during instrumentation readings.



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.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

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.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.



THURBER ENGINEERING LTD.

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

SPRING 2024

**APPENDIX A
DATA PRESENTATION AND DRAWINGS**

**SITE NC090: HWY 2:42 BAPTISTE CREEK BRIDGE
NW APPROACH FILL LANDSLIDE (BF7055)**

**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
NORTH CENTRAL REGION - ATHABASCA AND FORT McMURRAY DISTRICTS
INSTRUMENTATION MONITORING FIELD SUMMARY (NC090)
SPRING 2024**

Location: Baptiste Creek (HWY 2:42 C1 17.723) File Number: 32122 Probe: RST SET 8R Cable: RST SET 8R	Readout: Casing Diameter: 2.75" Temp: 14 Read by: NKR/NRM
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SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 12)		Date	Stickup m	Depth from top of casing (ft)	Azimuth of A+ Groove	Current Bottom Depth Readings				Probe/ Reel #	Size(")	Remarks
	Easting (m)	Northing (m)					A+	A-	B+	B-			
SI19-1	338297	6071816	14-Jun-24	1.09	52 to 2	107	-4	12	81	-76	8R/8R	2.75	

VIBRATING WIRE LOAD CELL (VC) READINGS

VC#	Datalogger GPS Location (UTM 12)		Datalogger Serial #	Date	Comment
	Easting (m)	Northing (m)			
VC2130 to VC2136	338298	6071815	Campbell Scientific 10671	14-Jun-24	Downloaded

VIBRATING WIRE STRAIN GAUGE (SG) READINGS

SG #	Datalogger GPS Location (UTM 12)		Datalogger Serial #	Date	Comment
	Easting (m)	Northing (m)			
3 RST strain gauges	338298	6071815	Campbell Scientific 10671	14-Jun-24	Downloaded

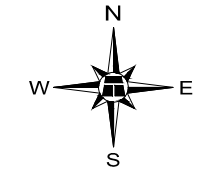
VIBRATING WIRE PIEZOMETER (VW) READINGS

VW #	Serial #	GPS Location (UTM 12)		Datalogger Serial #	Date	Comment
		Easting (m)	Northing (m)			
VW19-1A	4060	338298	6071815	CS 10671	14-Jun-24	Downloaded
VW19-1B	4061				14-Jun-24	Downloaded

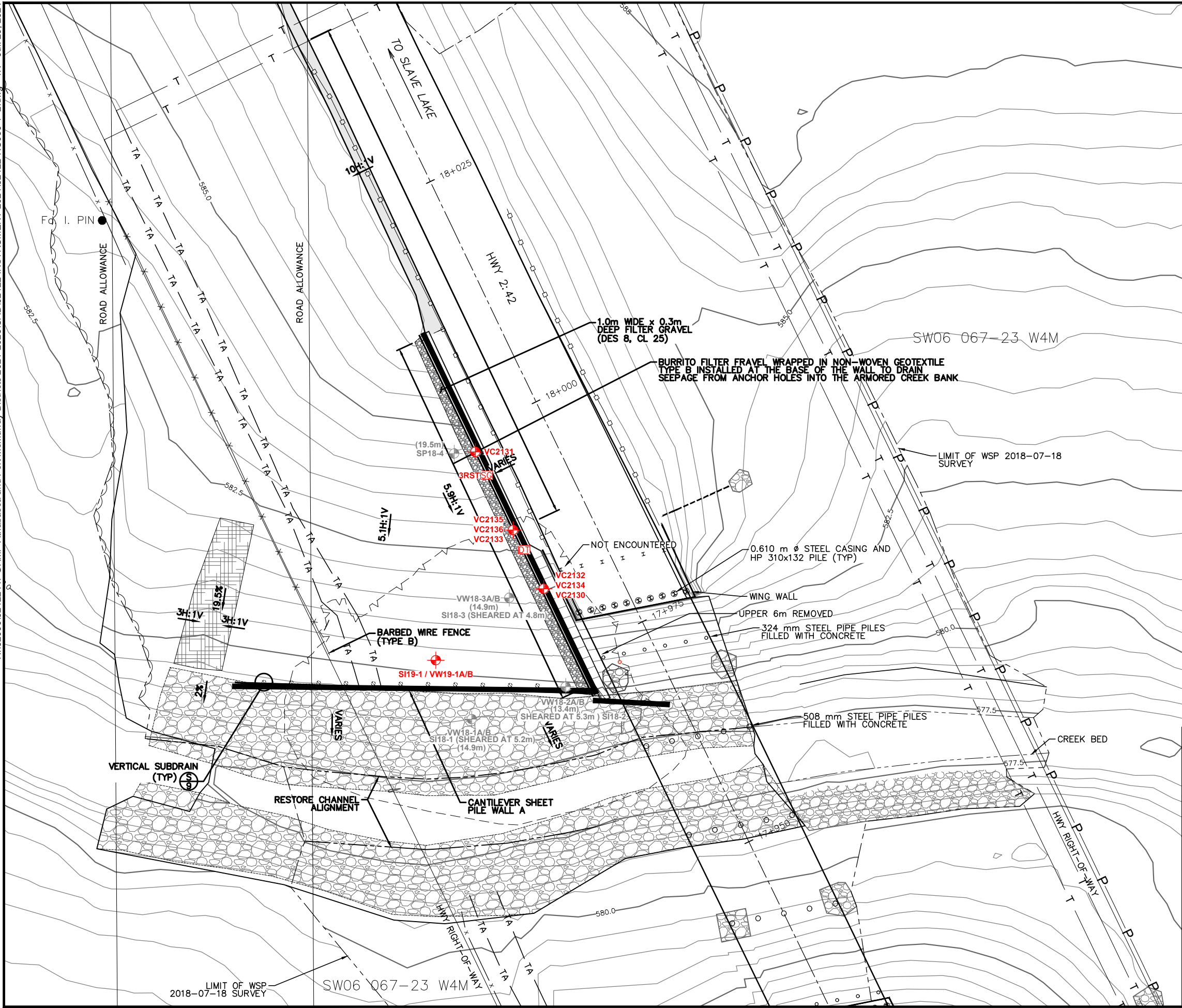
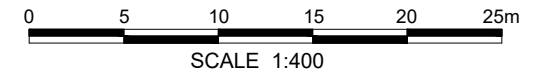
INSPECTOR REPORT


7 load cells, 3 VW strain gauges and 2 VW Piezometers are wired to a Campbell Scientific CR6 datalogger mounted on the west face of the sheet pile wall

H:\32000\32122 AT GRMP Athabasca and Fort McMurray Districts 2021-2025\CAD\32122 INSTRUMENT 2021\32122-NC090-1-2.dwg - 1N - Jul. 29, 2021



- LEGEND**
- NEW INSTRUMENT LOCATION
 - INSTRUMENT LOCATION (SHEARED OFF/DAMAGED DURING CONSTRUCTION)
 - CONTROL POINT
 - VERTICAL DRAIN
 - DATA LOGGER
 - STRAIN GAUGE
 - STABILIZED LANDSLIDE AREA
 - EXISTING CLASS 1M RIPRAP
 - DESIGN GRADING LIMITS
 - CLASS 1 RIPRAP
 - TRM TYPE C
 - TELUS LINE (APPROXIMATE)
 - ABANDONED TELUS LINE
 - BARBED WIRE FENCE
 - NEW TYPE B FENCE
 - OVERHEAD POWER LINE (APPROXIMATE)
 - TREELINE
 - GUARD RAIL
 - GROUND SURFACE CONTOUR
 - Fd. I. PIN ● FOUND IRON PIN






**NORTH CENTRAL
(ATHABASCA AND FORT McMURRAY DISTRICTS)**

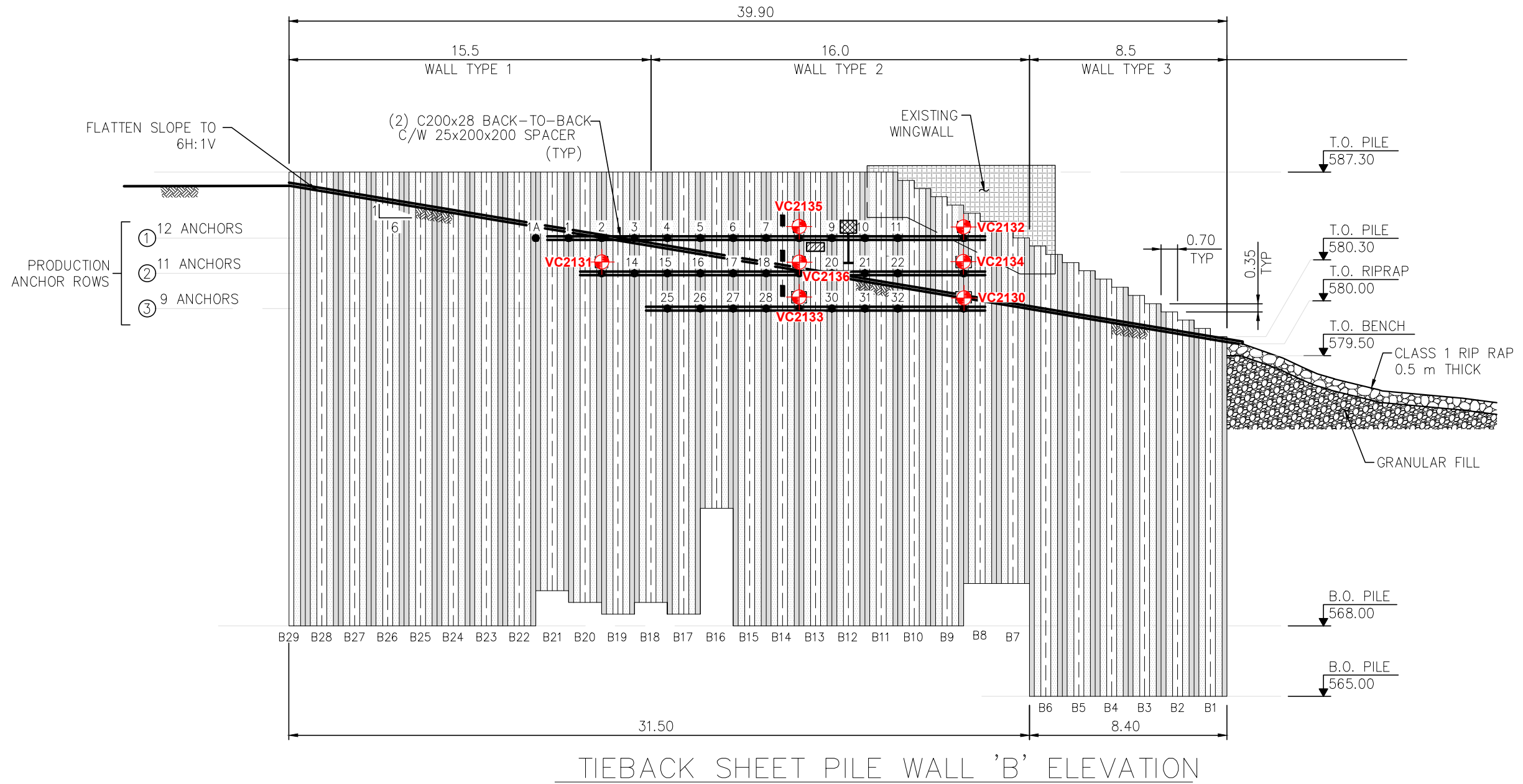
**NC090: HWY 2:42 BAPTISTE CREEK BRIDGE (BF7055)
SITE PLAN SHOWING APPROXIMATE
INSTRUMENT LOCATIONS**

DWG No. 32122-NC090-1

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	TSA
SCALE	1:400
DATE	JULY 2021
FILE No.	32122



THURBER ENGINEERING LTD.



TIEBACK SHEET PILE WALL 'B' ELEVATION

LEGEND

- LOCATION OF ANCHOR
- 1 PRODUCTION ANCHOR NUMBER
- 1A PRE-PRODUCTION ANCHOR NUMBER
- ▨ DATA LOGGER ENCLOSURE (BOLTED TO SHEET PILE)
- ▣ SOLAR PANEL AND SUPPORT FRAME (BOLTED TO SHEET PILE)
- STRAIN GAUGE LOCATION (C/W LOCKABLE PROTECTIVE COVER)
- ⊕ LOAD CELL LOCATION

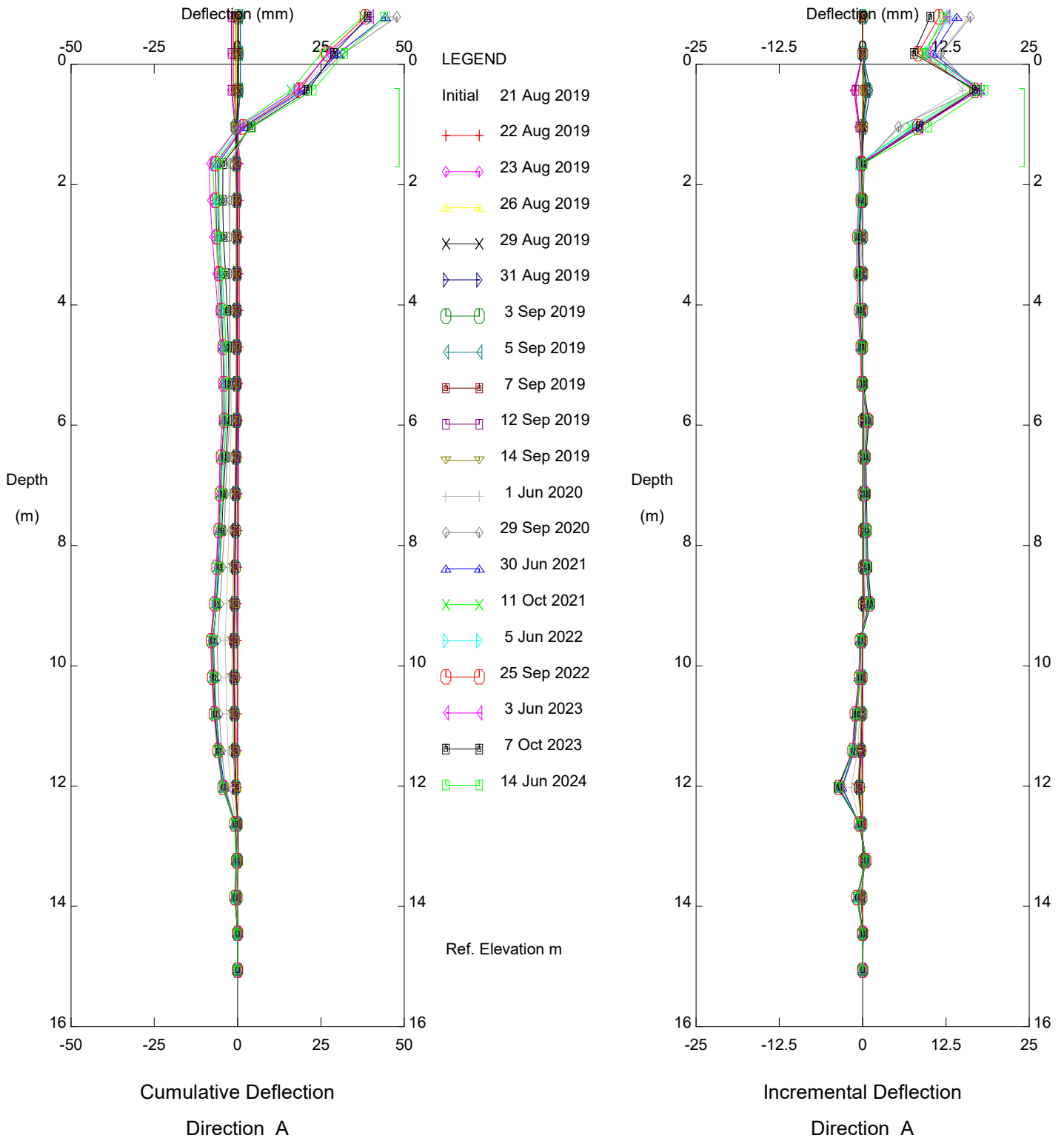


**NORTH CENTRAL
(ATHABASCA AND FORT MCMURRAY DISTRICTS)**
**NC090: HWY 2:42 BAPTISTE CREEK BRIDGE (BF7055)
TIEBACK SHEET PILE WALL 'B' ELEVATION**

DWG No. 32122-NC090-2

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	TSA
SCALE	1:200
DATE	JULY 2021
FILE No.	32122

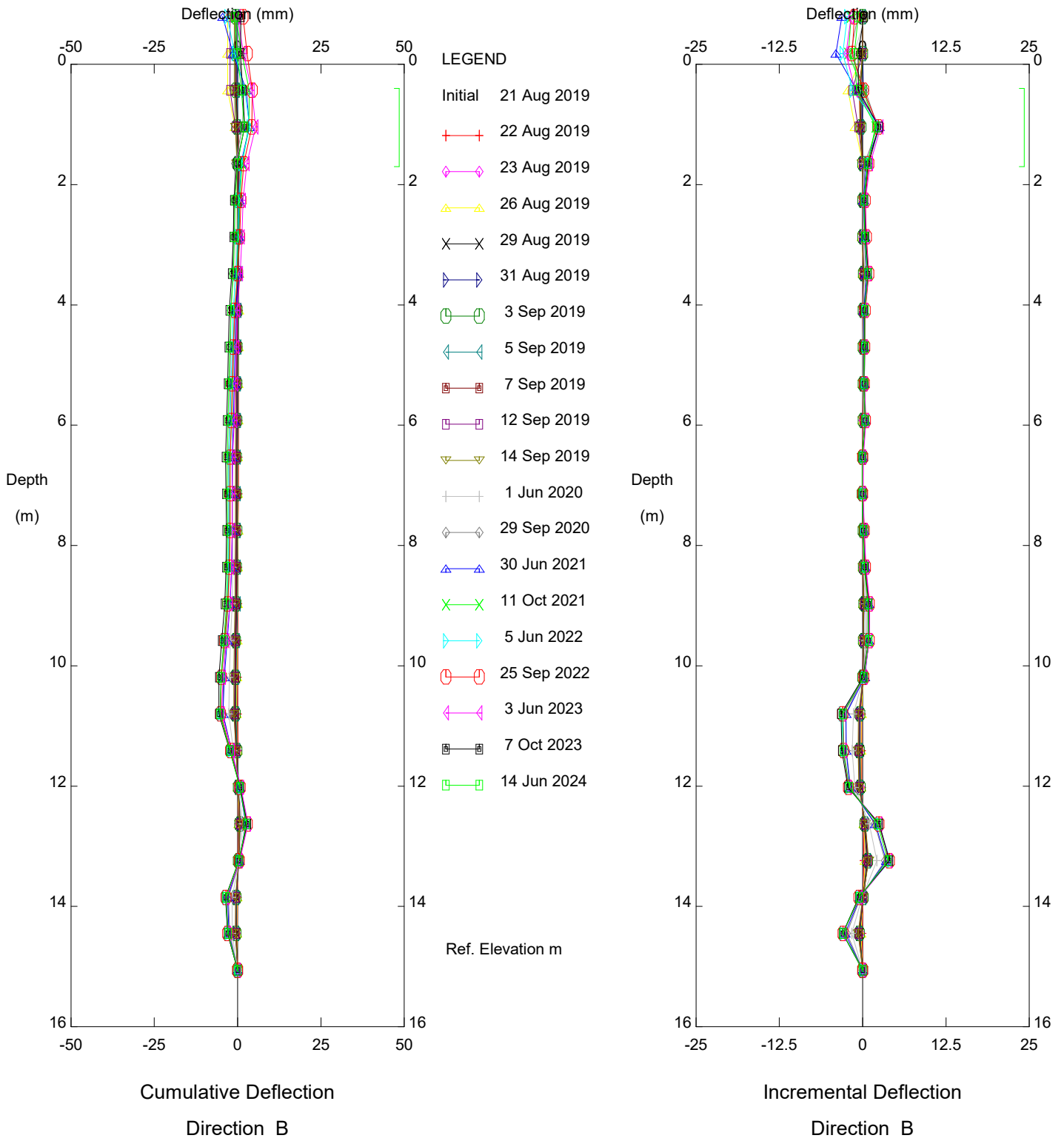




Hwy 2:42 Baptiste Creek Bridge, Inclinometer SI19-1

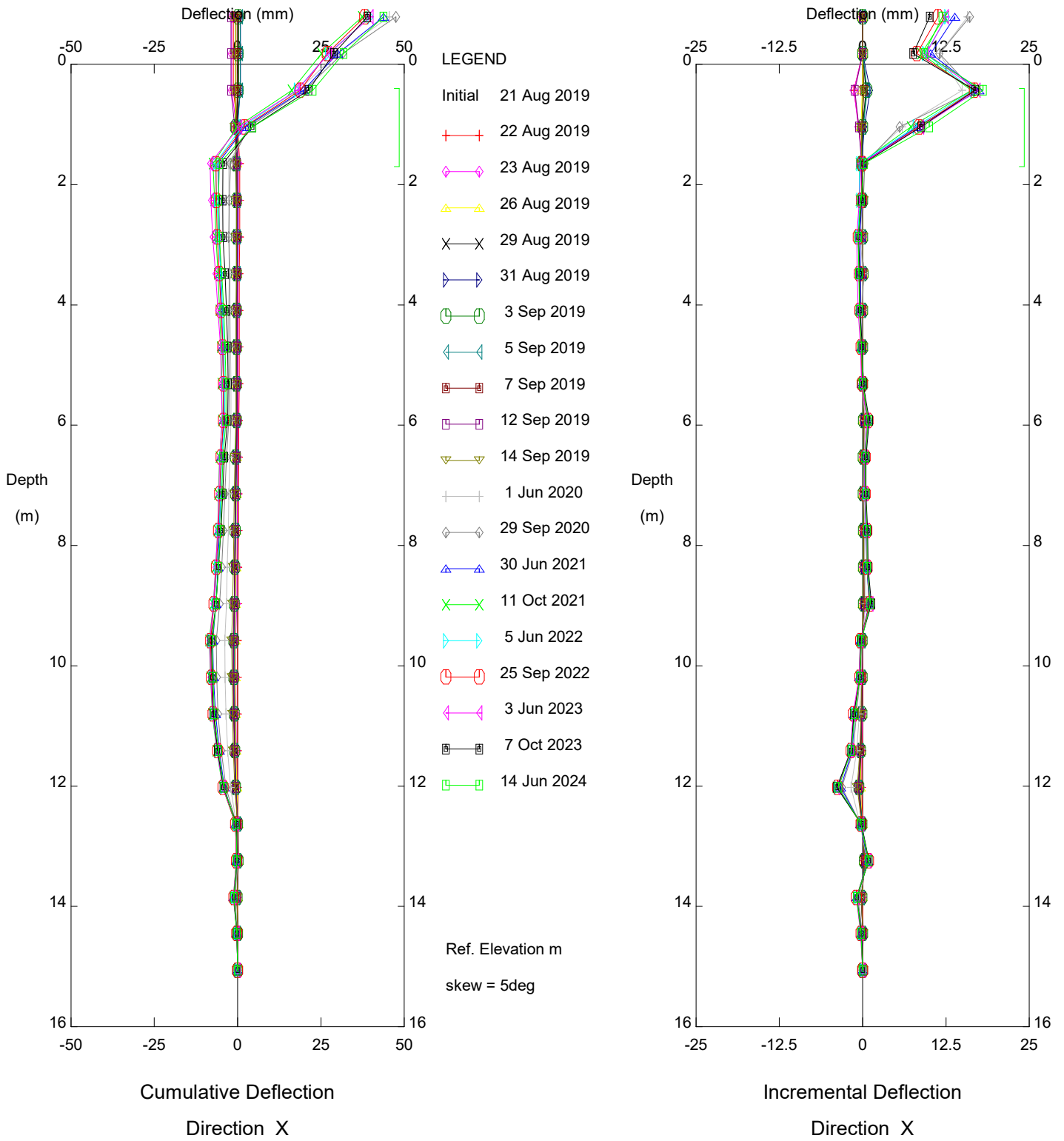
Alberta Transportation

Thurber Engineering Ltd.



Hwy 2:42 Baptiste Creek Bridge, Inclinometer SI19-1

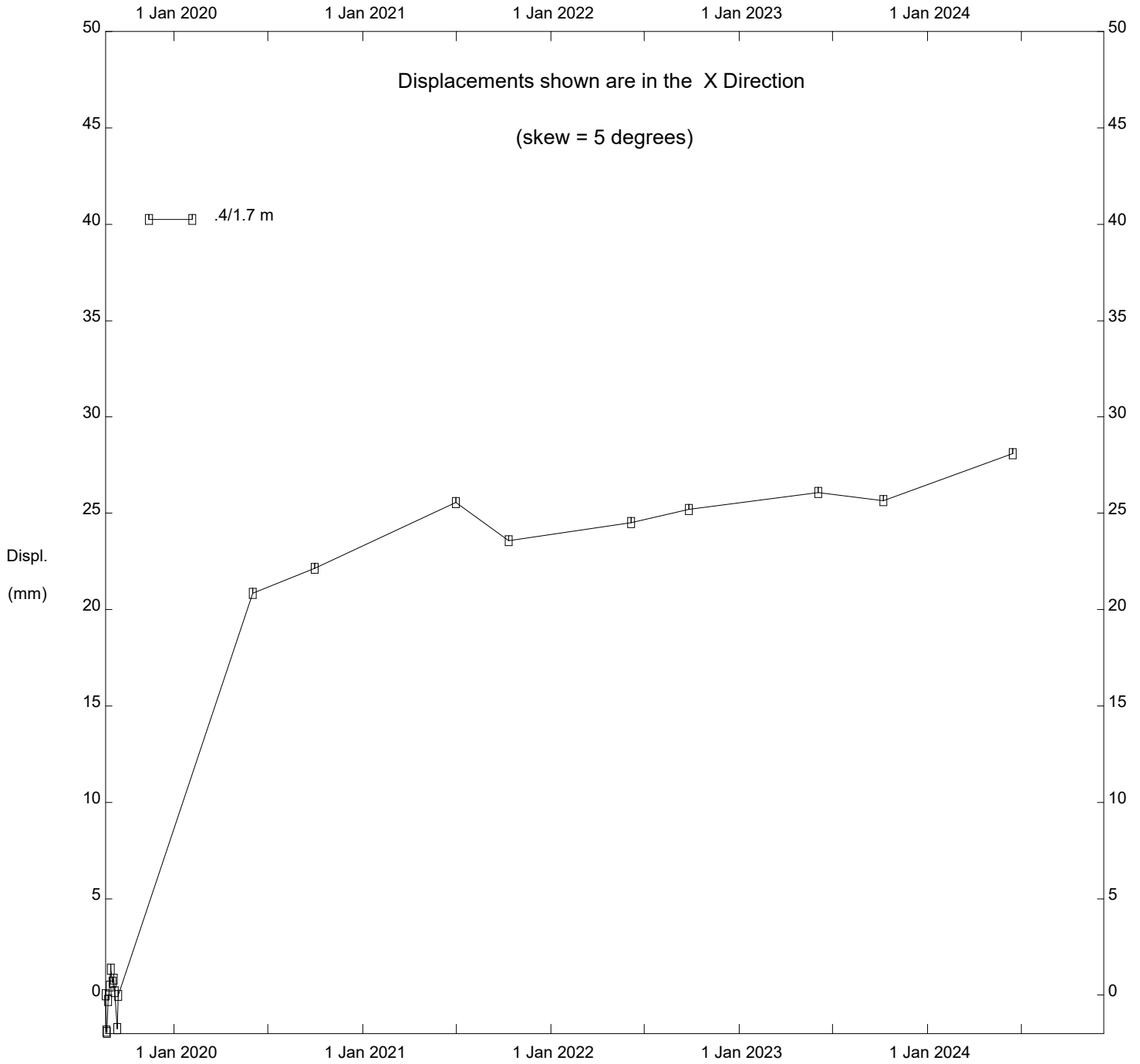
Alberta Transportation



Hwy 2:42 Baptiste Creek Bridge, Inclinator SI19-1

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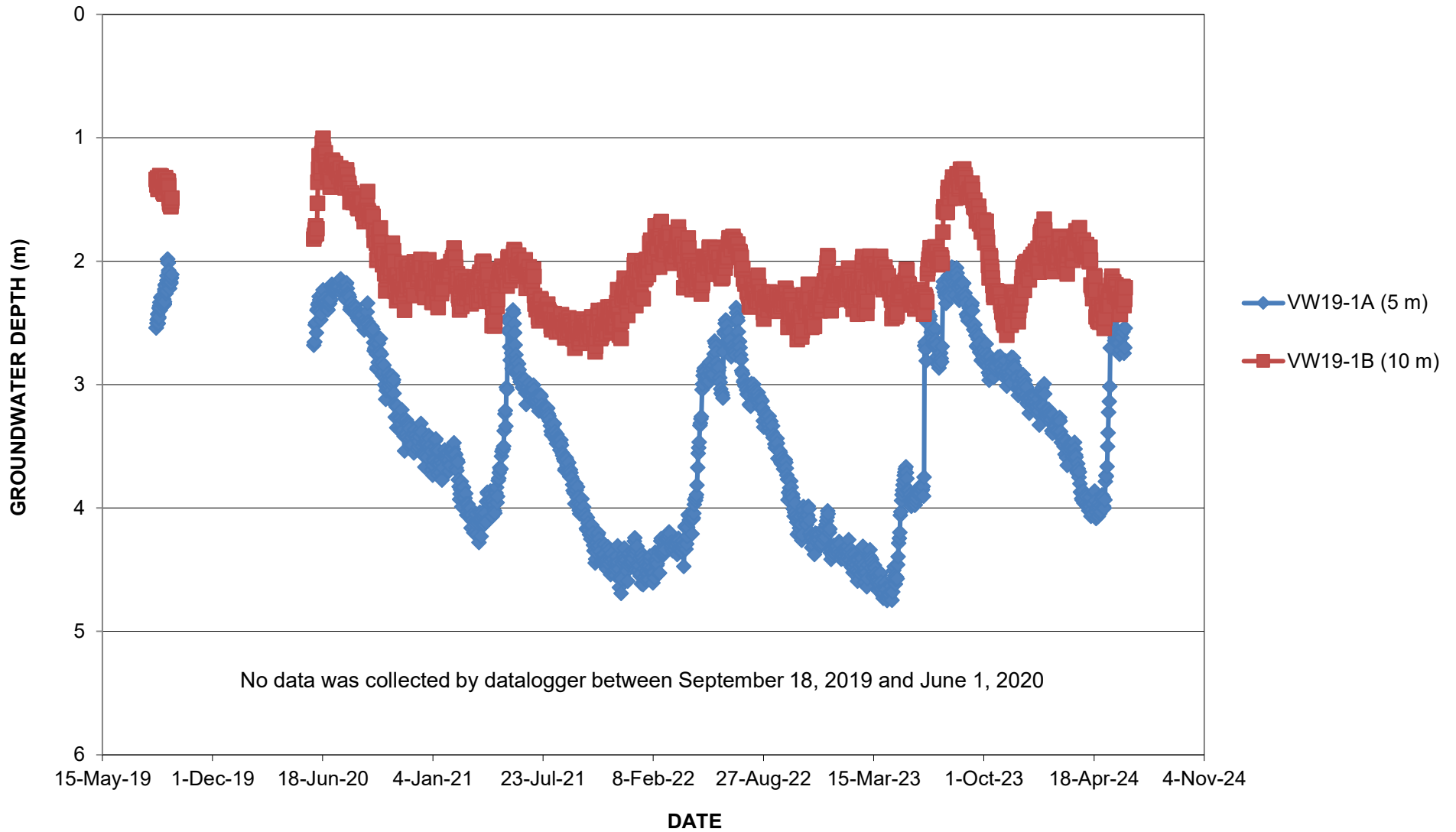
Thurber Engineering Ltd.



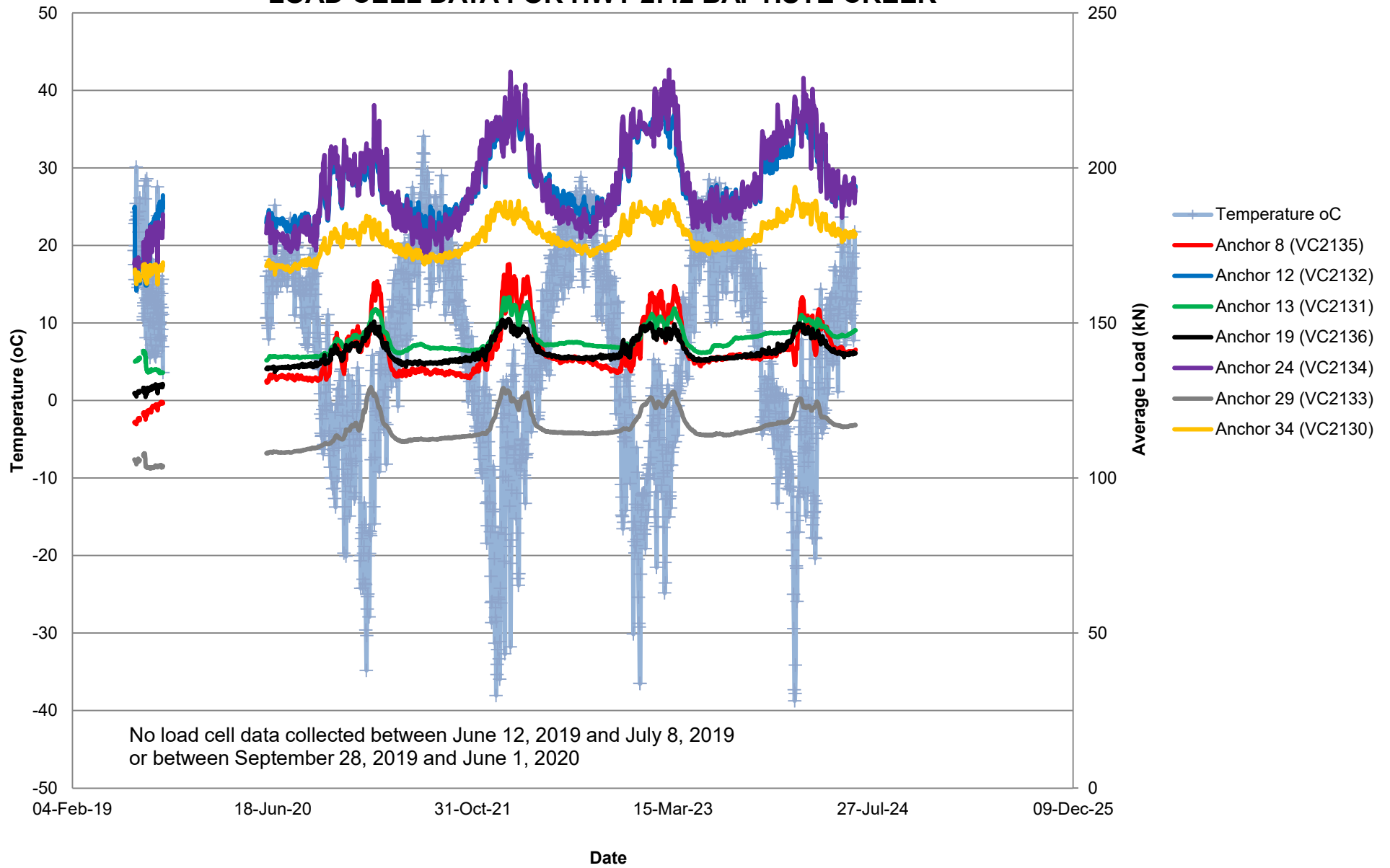
Hwy 2:42 Baptiste Creek Bridge, Inclinometer SI19-1

Alberta Transportation

**FIGURE NC090-1
PIEZOMETER DATA FOR HWY 2:42 BAPTISTE CREEK**



**FIGURE NC090-2
LOAD CELL DATA FOR HWY 2:42 BAPTISTE CREEK**



**FIGURE NC090-3
STRAIN GAUGE DATA FOR HWY 2:42 BAPTISTE CREEK**

