

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



Site Number	Location	Name	Hwy	km
NC006	HWY 2:46 C1 47.6	Mitsue Lake Recreation Area	2:46	Km 47.6
Legal Description: 9-12-72-5 W5		UTM Co-ordinates		
		11U E 651534	N	6122185

Current Monitoring:	14-June-2024	Previous Monitoring	07-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): SI20-1, SI20-2, SI20-3, and SI20-4	Pneumatic Piezometers (PN): N/A	Vibration Wire Piezometers (VW): VW20-1, VW20-2A, VW20-2B, VW20- 3A, VW20-3B, VW20-4A and VW20-4B	Standpipe Piezometers (SP): N/A
Load Cell (LC): N/A	Strain Gauges: N/A	SAA: N/A	Others:

Readout Equipment Used			
Slope Inclinometers: RST Digital Inclinator probe with a 2 ft. wheelbase and a RST Pocket PC readout	Pneumatic Piezometers:	Vibration Wire Piezometers: GEOKON GK-404 digital readout	Standpipe Piezometers:
Load Cell:	Strain Gauges:	SAA:	Others:

Notes:
<ul style="list-style-type: none"> - A site plan showing instrument locations is included in Appendix A. - SIs plots with A and B directions are presented in Appendix A and summarized in Table NC006-1, attached. Where movement was recorded, the resultant (plot X) and the rate of movement plot are also included. - Vibrating wire piezometer plots are included in Appendix A. - Vibrating Wire Piezometer readings are summarized in Table NC006-2, attached.

Discussion	
Zones of New Movement:	None
Interpretation of Monitoring Results:	<p>SI20-1, installed in the south ditch of the highway, has shown no discernible movement since initialization. SI20-2, installed through the embankment on the north side of the highway, showed a rate of movement 23.9 mm/yr over 0 m to 1.8 m depth since the fall of 2023 readings. SI20-3, installed downslope of the highway inside the tree line, showed a rate of movement of 3.1 mm/yr over 1.4 m to 3.2 m depth since the fall of 2023 readings. SI20-4, installed further downslope of SI20-3 within the tree line, has shown no discernible movement since initialization.</p> <p>Vibrating wire piezometers VW20-1, VW20-2B and VW20-3B showed decreases in groundwater level of 0.30 m, 0.14 m and 0.24 m, respectively, since the fall of 2023 readings. VW20-2A,</p>

	VW20-3A, VW20-4A and VW20-4B showed increases in groundwater level of 0.20 m, 0.63 m, 0.50 m and 0.35 m, respectively. Overall, the measured groundwater levels are within the historically measured groundwater levels for the site.
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:	<ul style="list-style-type: none"> • Table NC006-1 Spring 2024 – HWY 2:46 Mitsue Lake Recreation Area (Km 47.6), Slope Inclinometer Instrumentation Reading Summary • Table NC006-2 Spring 2024 – HWY 2:46 Mitsue Lake Recreation Area (Km 47.6), Vibrating Wire Piezometer Instrumentation Reading Summary • Statement of Limitations and Conditions • APPENDIX A – NC006-1 SPRING 2024 <ul style="list-style-type: none"> ○ Field Inspector's report ○ Site Plan Showing Approximate Instrument Locations (Drawing No. 32122-NC006) ○ SI Reading Plots ○ Figure NC006-1 (Piezometric Depths)
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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

Bruce Nestor, P.Eng.
Geotechnical Engineer



Table NC006-1: Spring 2024 – Hwy 2:46 Mitsue Lake Recreation Area (KM 47.6) Slope Inclinometer 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)
SI20-1	December 21, 2020	No discernible movement	N/A	Operational	October 7, 2023	N/A	N/A	N/A
SI20-2	June 5, 2022 (reinitialized)	34.5 over 0 m to 1.8 m depth in 345° direction	25.8 in September 2022	Operational	October 7, 2023	16.5	23.9	23.8
SI20-3	December 20, 2020	13.2 over 1.4 m to 3.2 m depth in 348° direction	22.2 in June 2021	Operational	October 7, 2023	2.2	3.1	-0.4
SI20-4	December 19, 2021	No discernible movement	N/A	Operational	October 7, 2023	N/A	N/A	N/A

Drawing 32122-NC006 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



Table NC006-2: Spring 2024 – Hwy 2:46 Mitsue Lake Recreation Area (Km 47.6) Vibrating Wire Piezometer Instrumentation Reading Summary

Date Monitored: June 14, 2024

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)
VW20-1 (70917)	December 19, 2020	12.04	-	Operational	6.76 on June 30, 2021	7.90	7.60	-0.30
VW20-2A (70911)	December 20, 2020	3.96	-	Operational	3.24 on June 30, 2021	3.38	3.58	0.20
VW20-2B (70914)	December 20, 2020	13.72	-	Operational	5.74 on June 30, 2021	6.75	6.61	-0.14
VW20-3A (70912)	December 20, 2020	8.69	-	Operational	2.86 on June 5, 2022	3.45	4.08	0.63
VW20-3B (70916)	December 20, 2020	16.76	-	Operational	1.48 on June 30, 2021	2.57	2.33	-0.24
VW20-4A (70913)	December 19, 2020	2.74	-	Operational	1.11 on June 5, 2022	1.89	2.39	0.50
VW20-4B (70915)	December 19, 2020	15.24	-	Operational	2.53 on June 5, 2022	3.14	3.49	0.35

Drawing 32122-NC006 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site



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.



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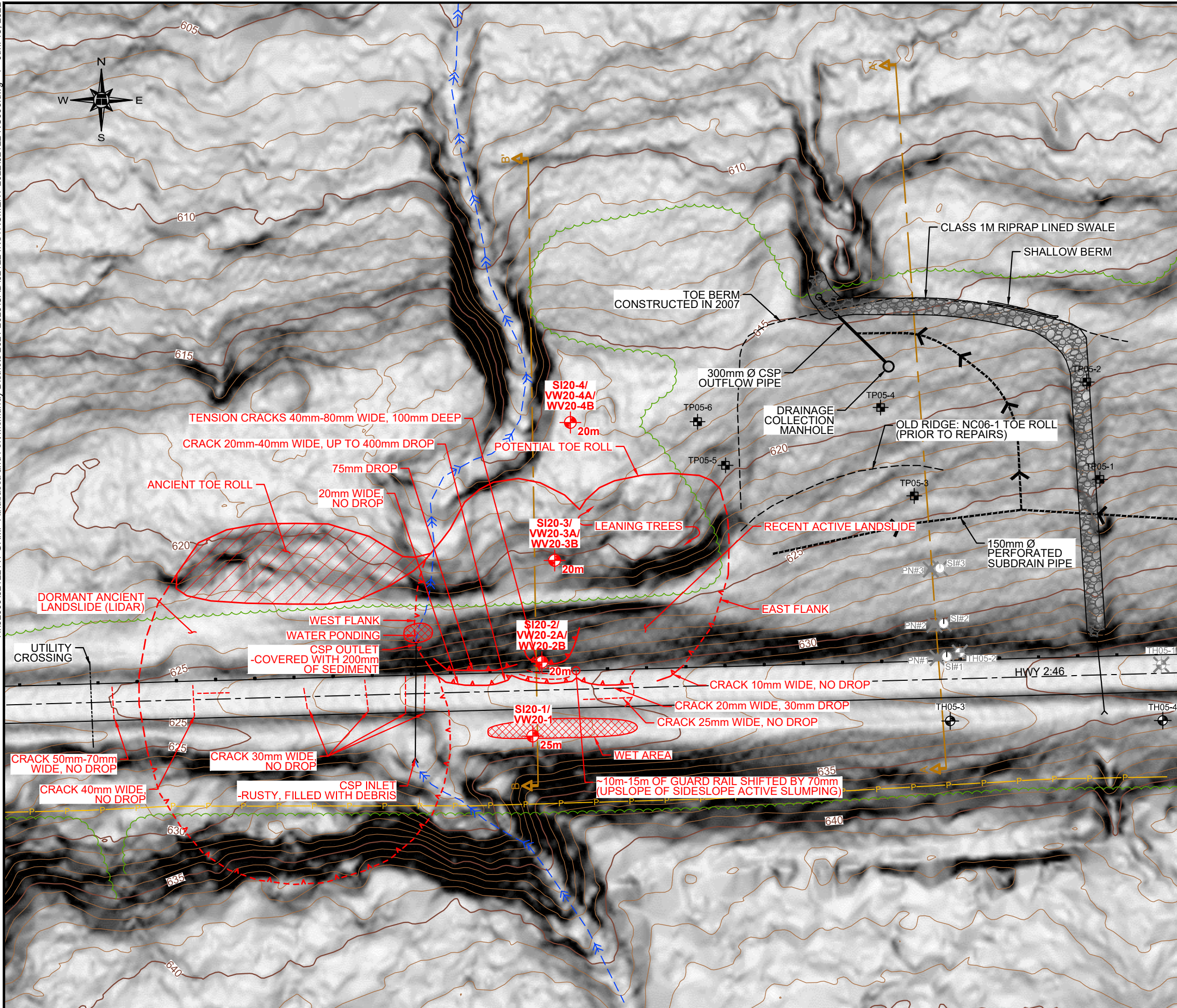
**ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP (CON0022163)
NORTH CENTRAL (ATHABASCA AND FORT McMURRAY DISTRICTS)
INSTRUMENTATION MONITORING RESULTS**

SPRING 2024

**APPENDIX A
DATA PRESENTATION**

SITE NC006: HWY 2:46 MITSUE LAKE RECREATION AREA (KM 47.6)

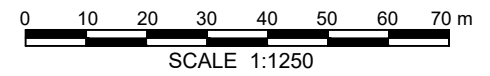
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LEGEND

- APPROXIMATE INSTRUMENT LOCATION (DEPTH (m))
- APPROXIMATE TEST HOLE LOCATION
- APPROXIMATE TEST PIT LOCATION
- APPROXIMATE PNEUMATIC PIEZOMETER LOCATION (INSTRUMENTS NOT READ AS PART OF CURRENT GRMP INSTRUMENTATION PROGRAM)
- APPROXIMATE SLOPE INCLINOMETER LOCATION (INSTRUMENTS NOT READ AS PART OF CURRENT GRMP INSTRUMENTATION PROGRAM)
- INSTRUMENT NON-OPERATIONAL
- MW MONITORING WELL
- SI SLOPE INCLINOMETER
- VW VIBRATING WIRE PIEZOMETER
- TH TEST HOLE
- TP TEST PIT
- PN PNEUMATIC PIEZOMETER
- ACTIVE HEADSCARP
- DORMANT SCARP CRACK
- CRACK
- GUARD RAIL
- OVERHEAD POWERLINE
- TREE LINE
- GULLY
- 620 GROUND CONTOUR

- NOTES:**
1. SITE FEATURES ARE APPROXIMATE
 2. LIDAR PROVIDED BY ALBERTA TRANSPORTATION
 3. JUNE 10, 2019 OBSERVATIONS SHOWN IN RED



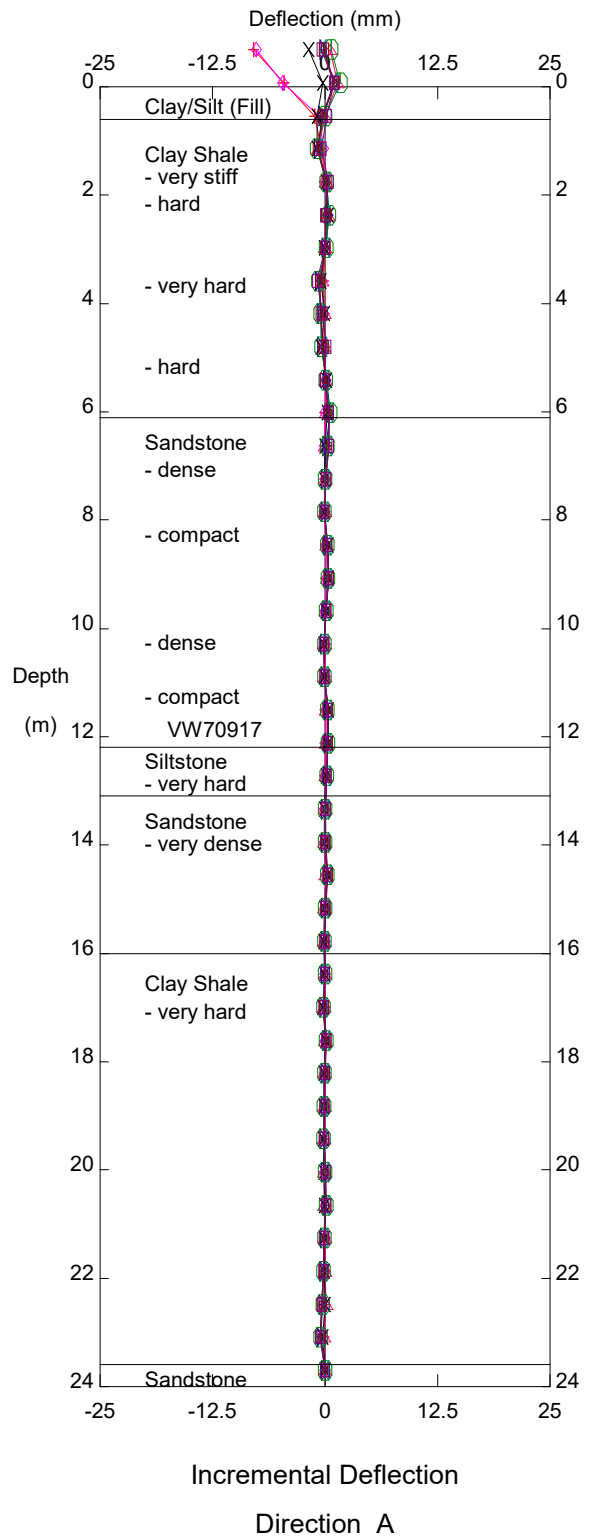
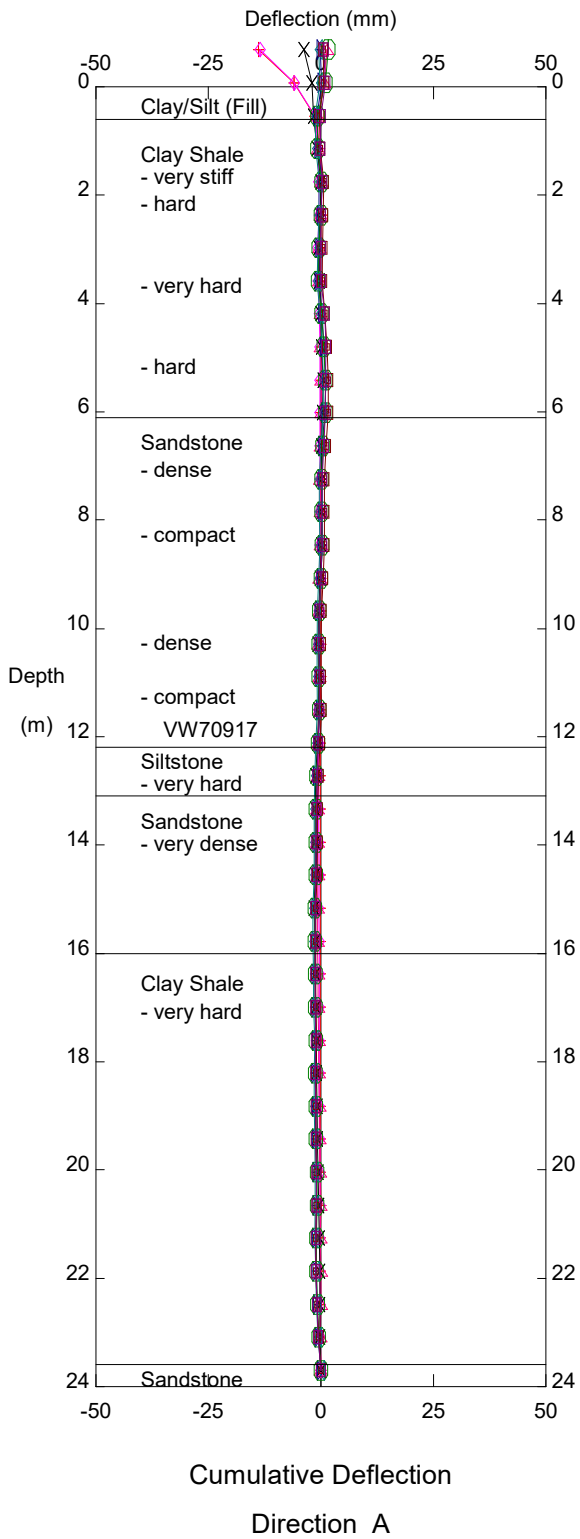
**NORTH CENTRAL
(ATHABASCA AND FORT McMURRAY DISTRICTS)
NC006 HWY 2:46 MITSUE LAKE (KM 47.6)
SITE PLAN SHOWING APPROXIMATE
INSTRUMENT LOCATIONS**

DWG No. 32122-NC006

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	TSA
SCALE	1:1250
DATE	JUNE 2022
FILE No.	32122



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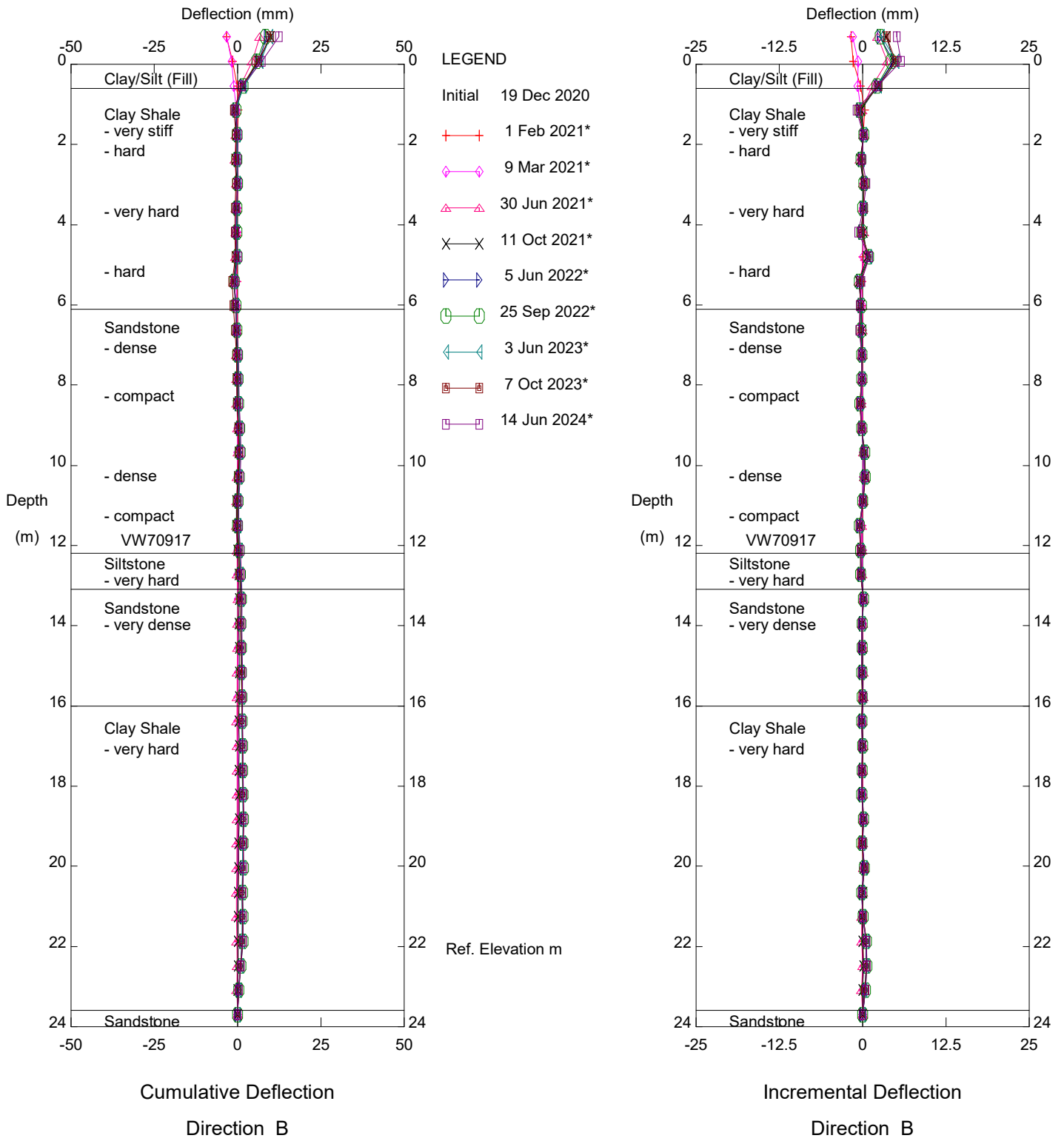


NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinometer SI20-1

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

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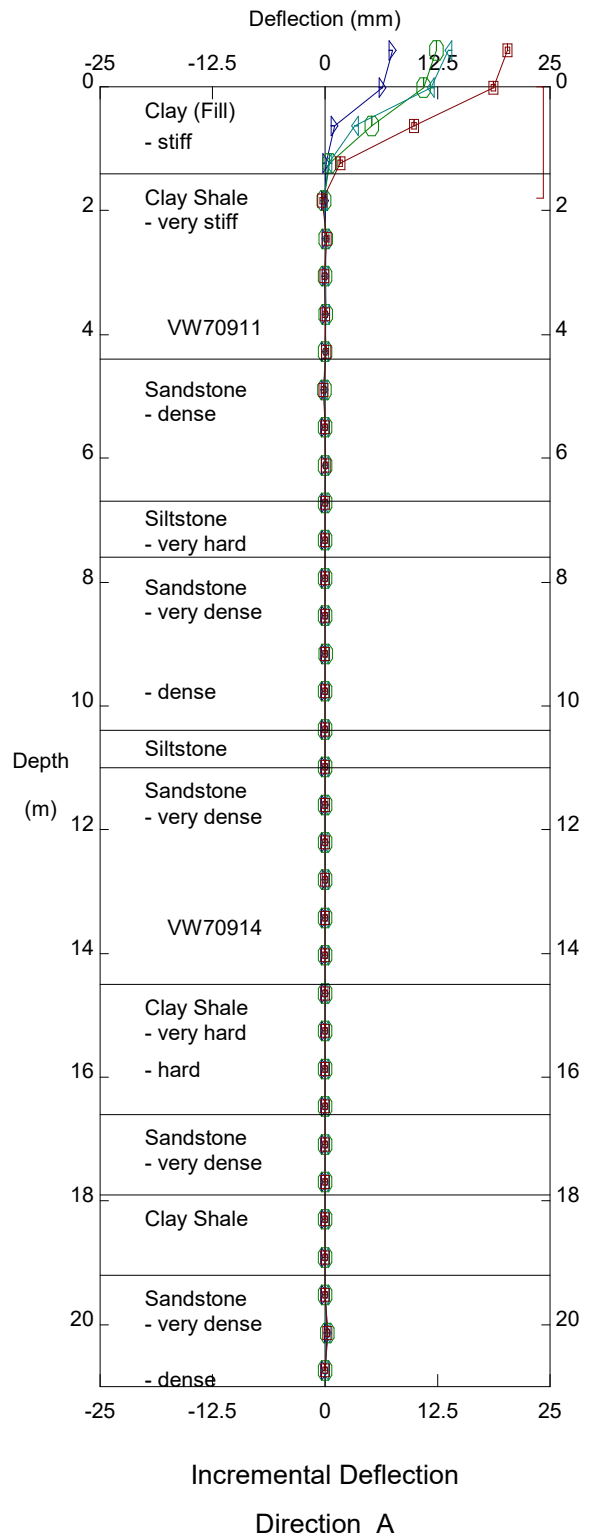
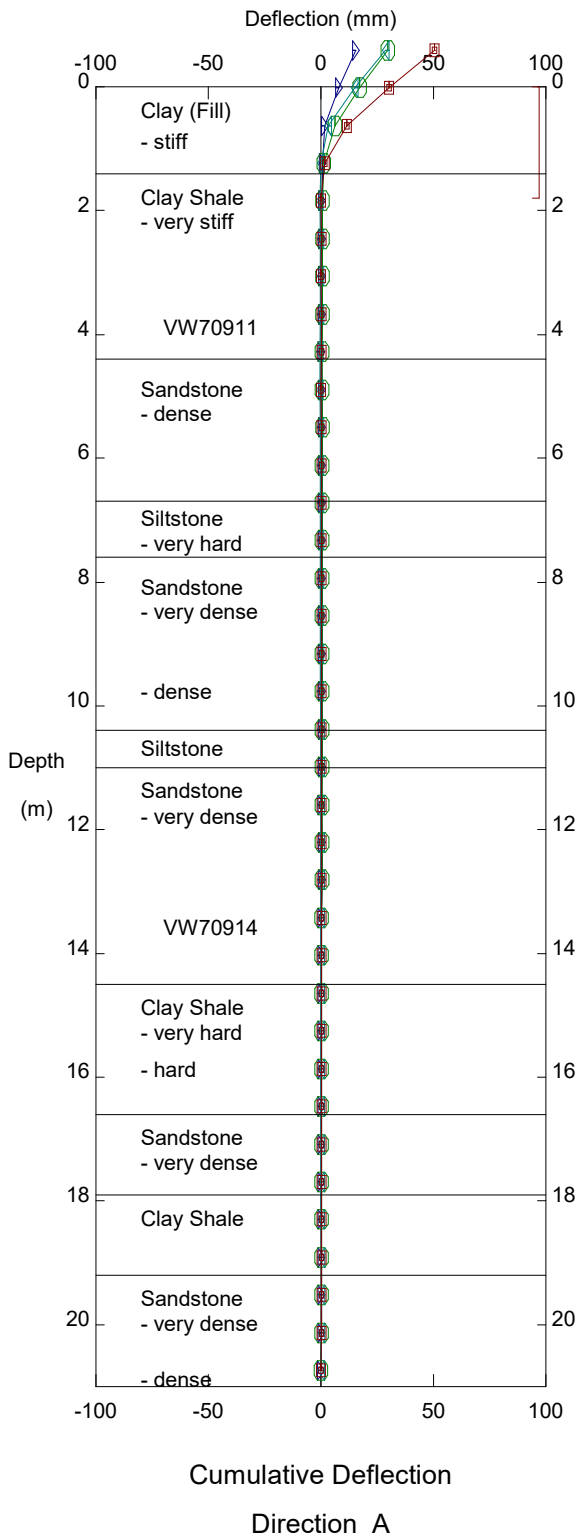


NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinometer SI20-1

Alberta Transportation

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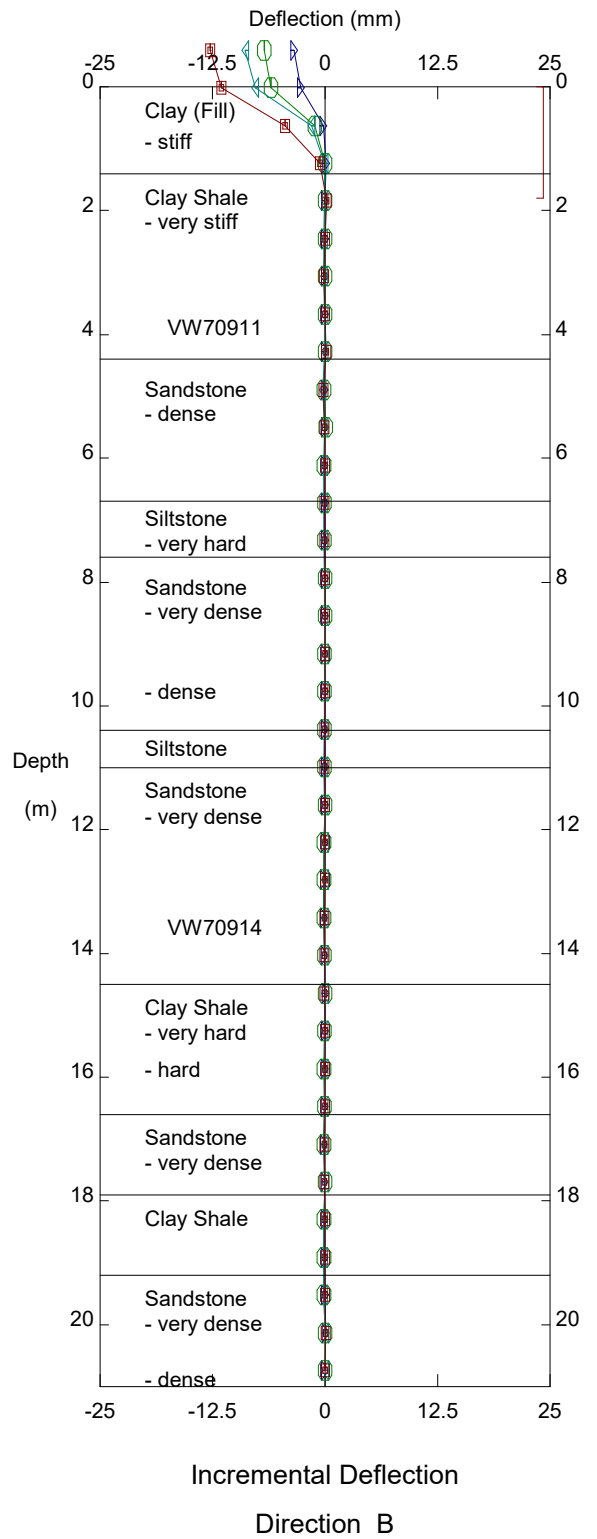
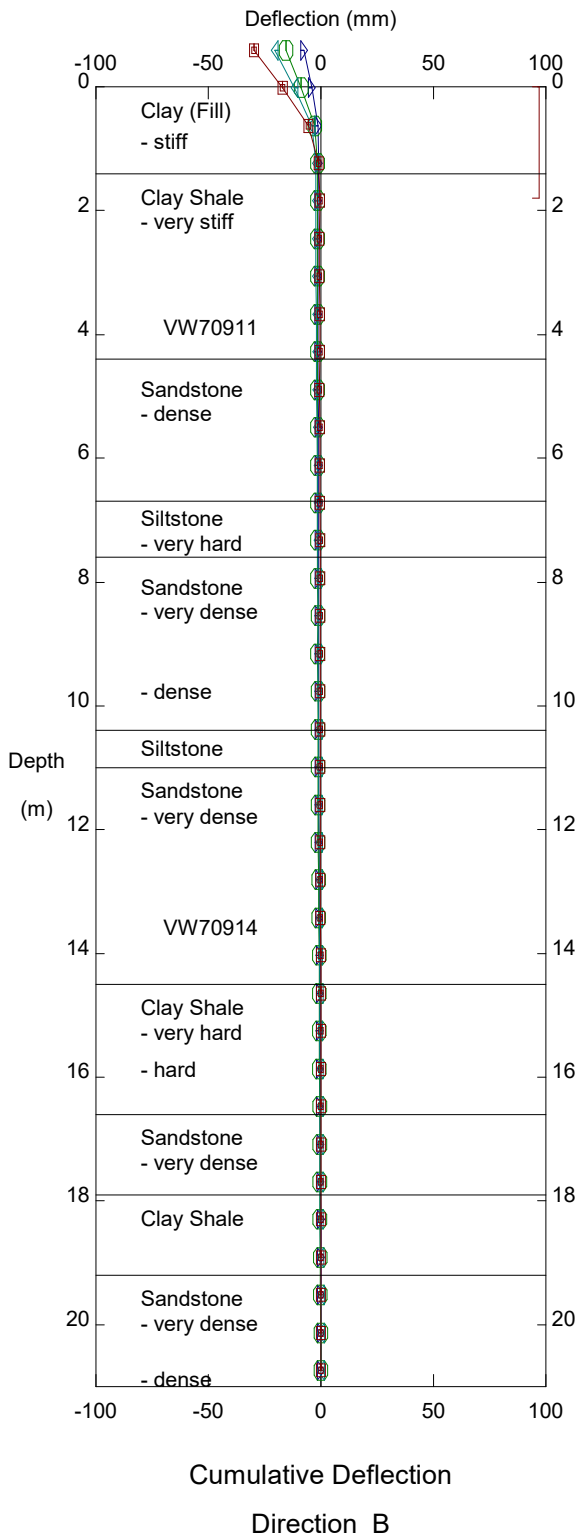


NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinometer SI20-2

Alberta Transportation

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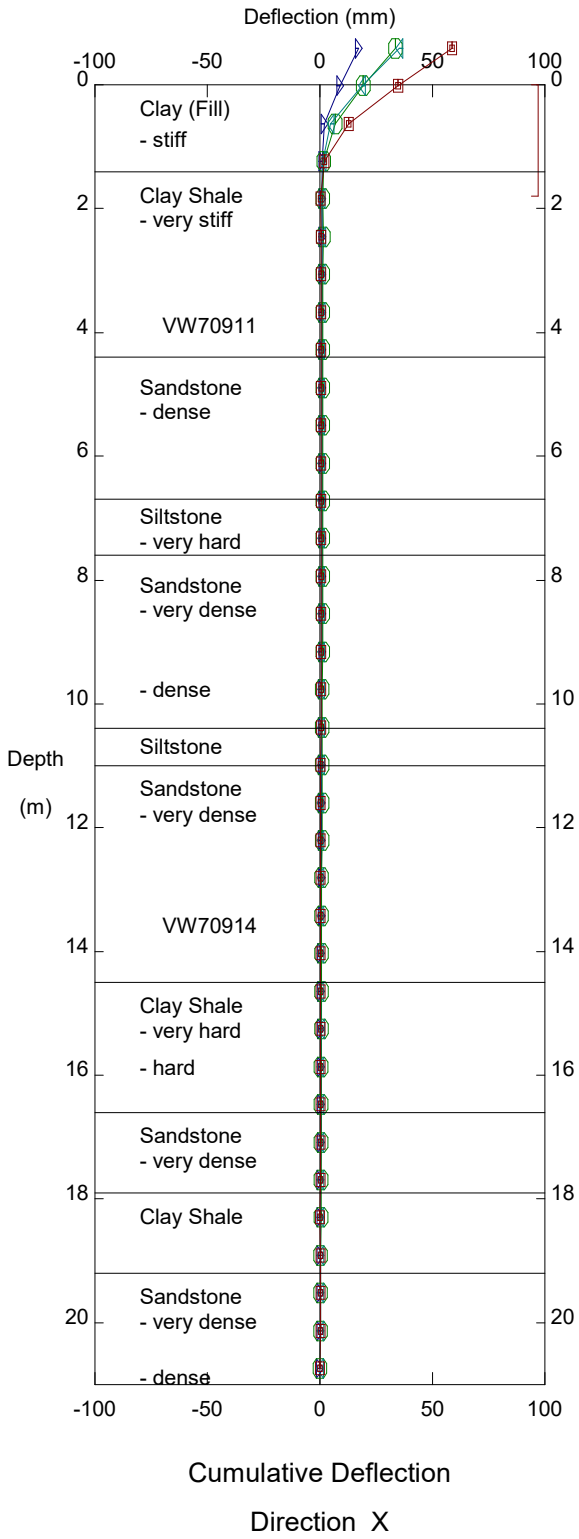


NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinometer SI20-2

Alberta Transportation

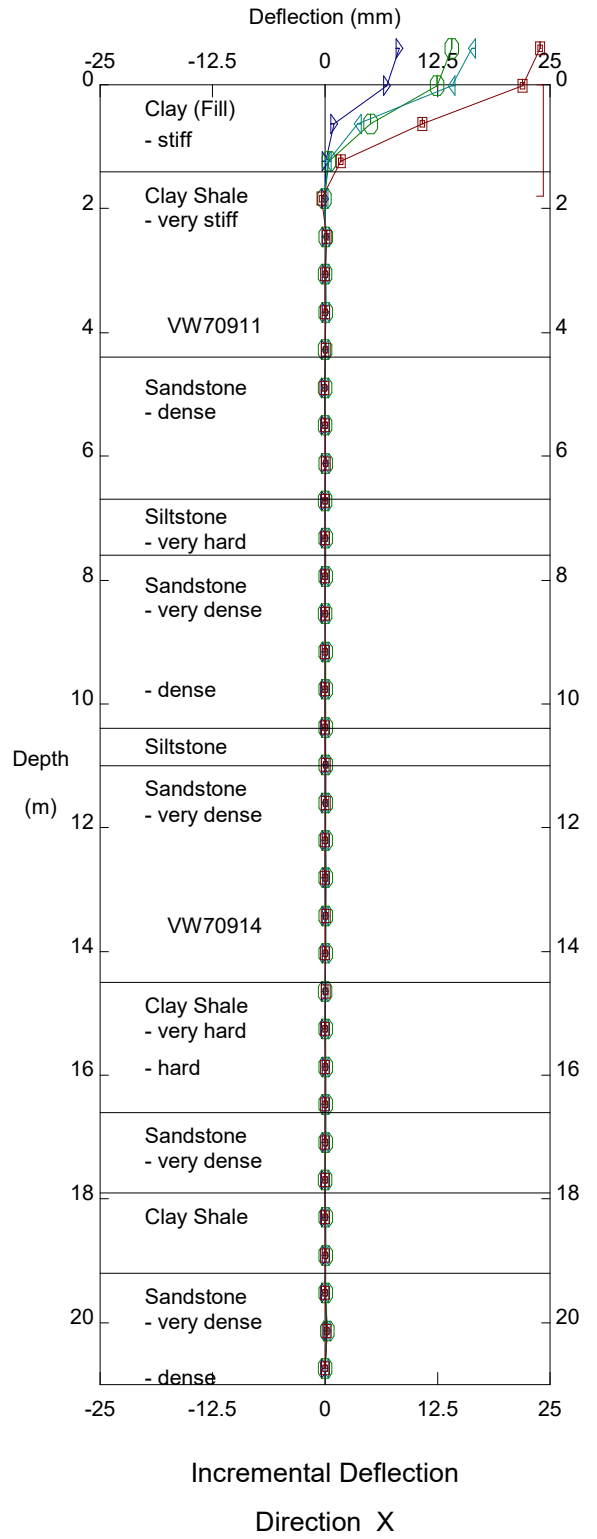
Sets marked * include zero shift and/or rotation corrections.

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- LEGEND
- Initial 5 Jun 2022
 - 25 Sep 2022
 - 3 Jun 2023*
 - 7 Oct 2023
 - 14 Jun 2024*

Ref. Elevation m
skew = 330deg

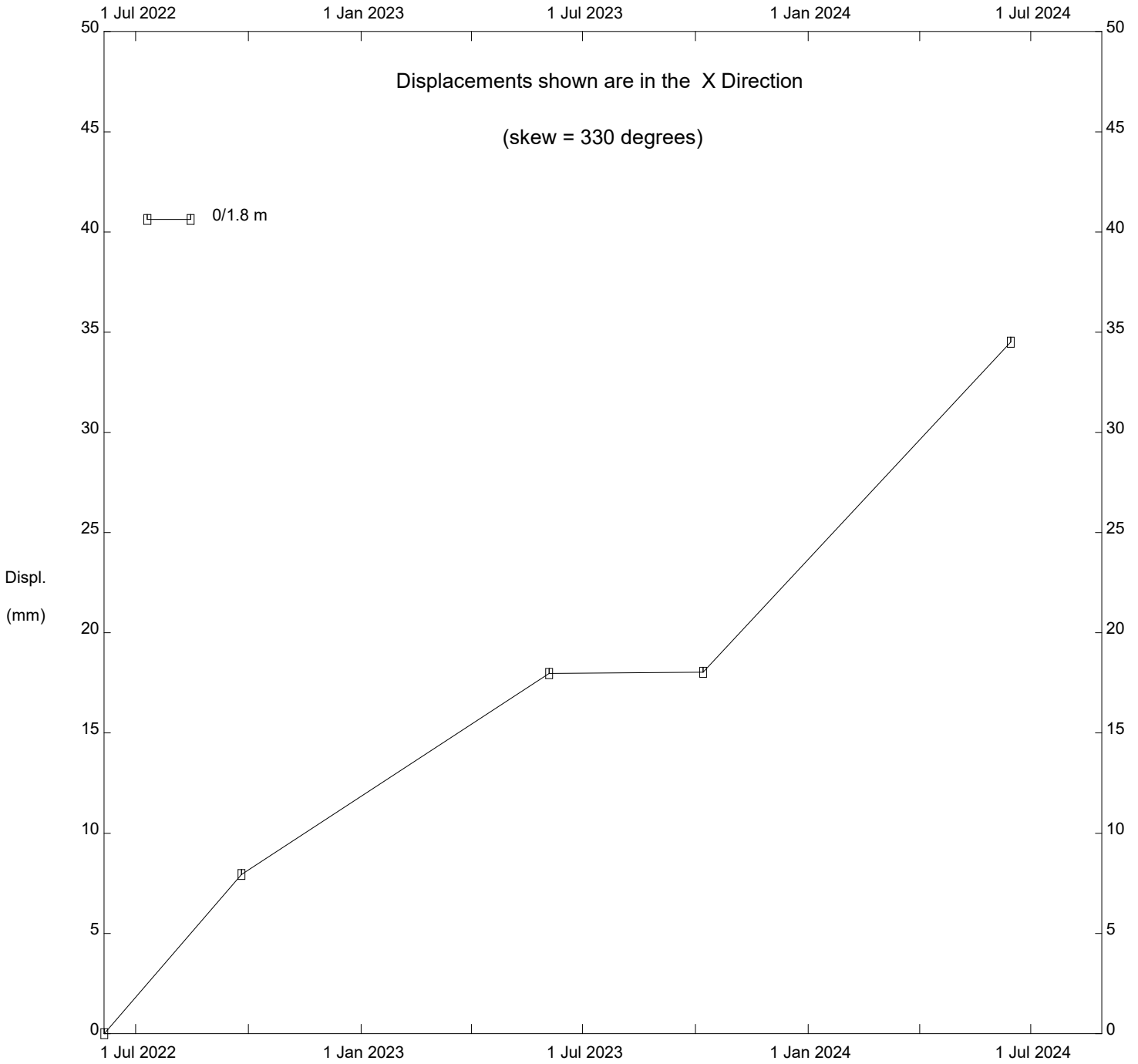


NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinometer SI20-2

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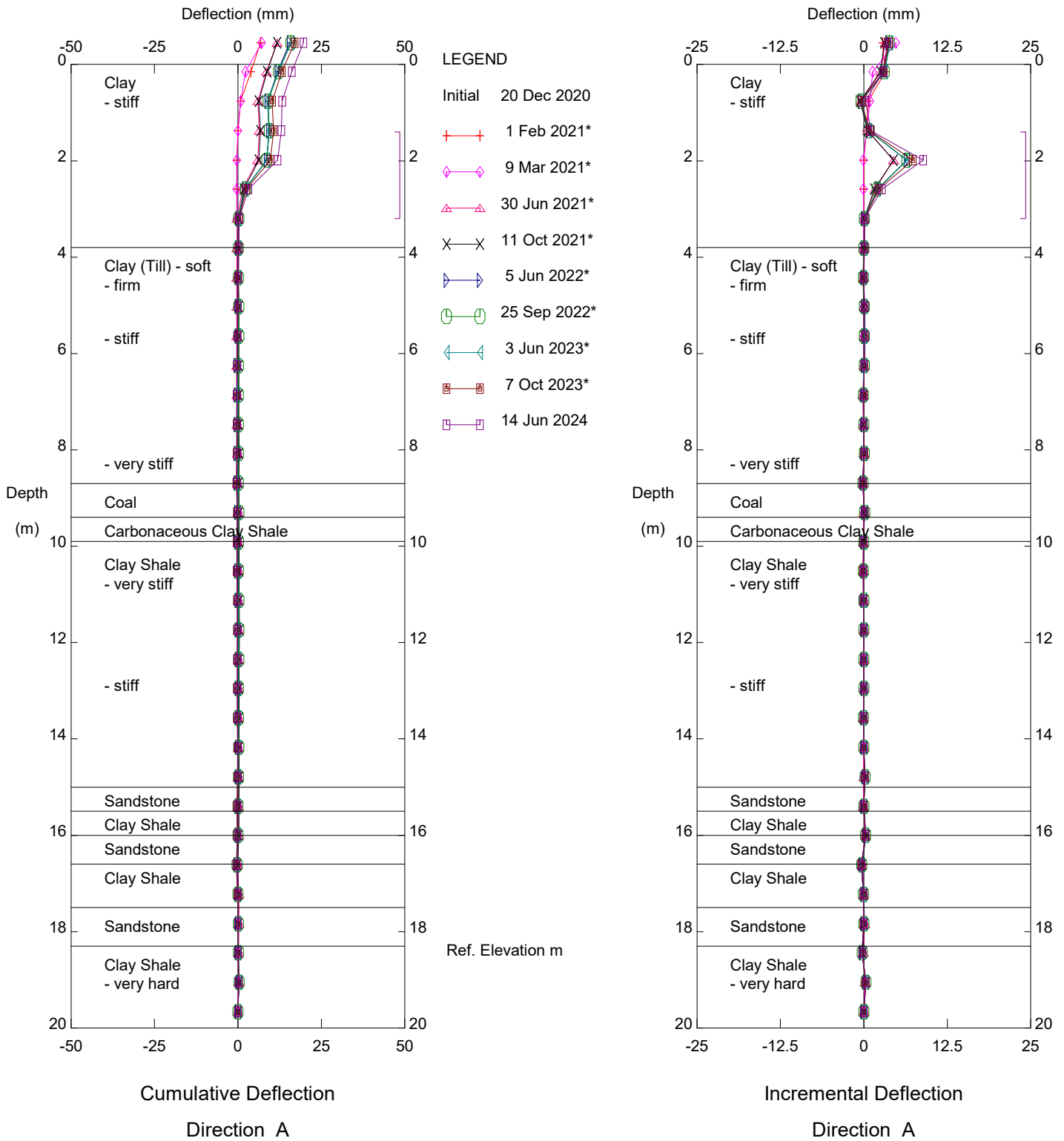
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NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinometer SI20-2

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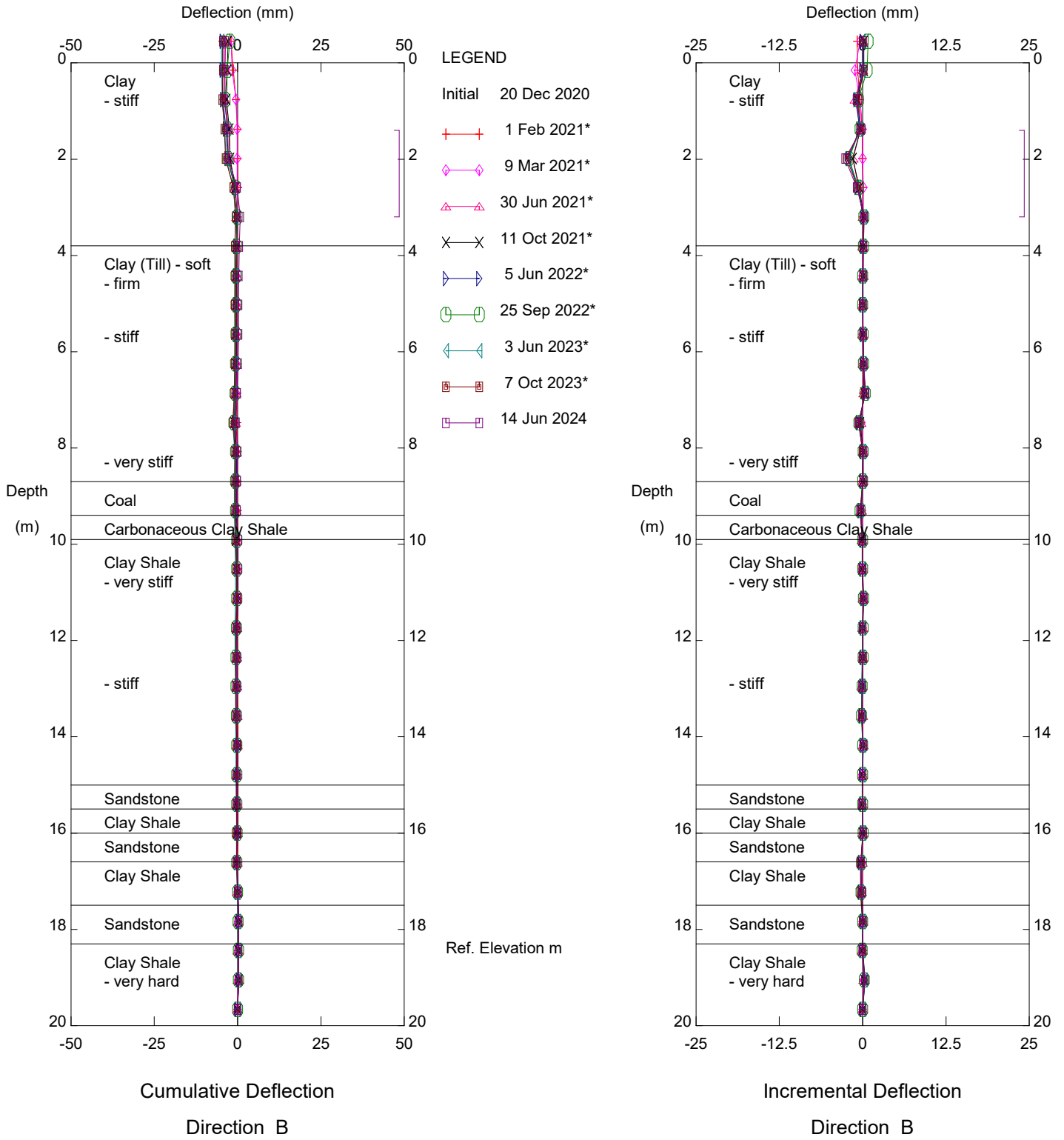


NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinometer SI20-3

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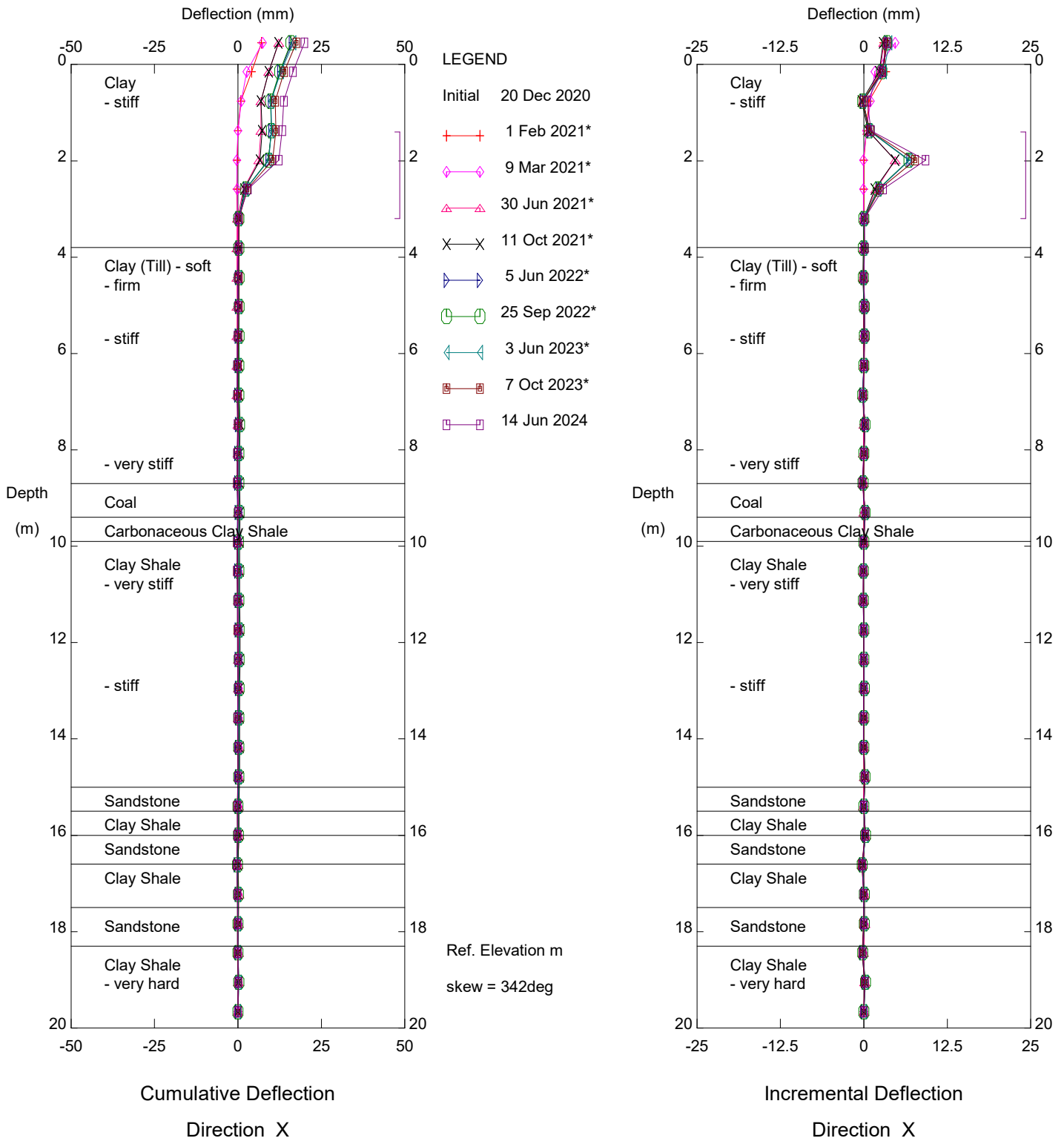


NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinometer SI20-3

Alberta Transportation

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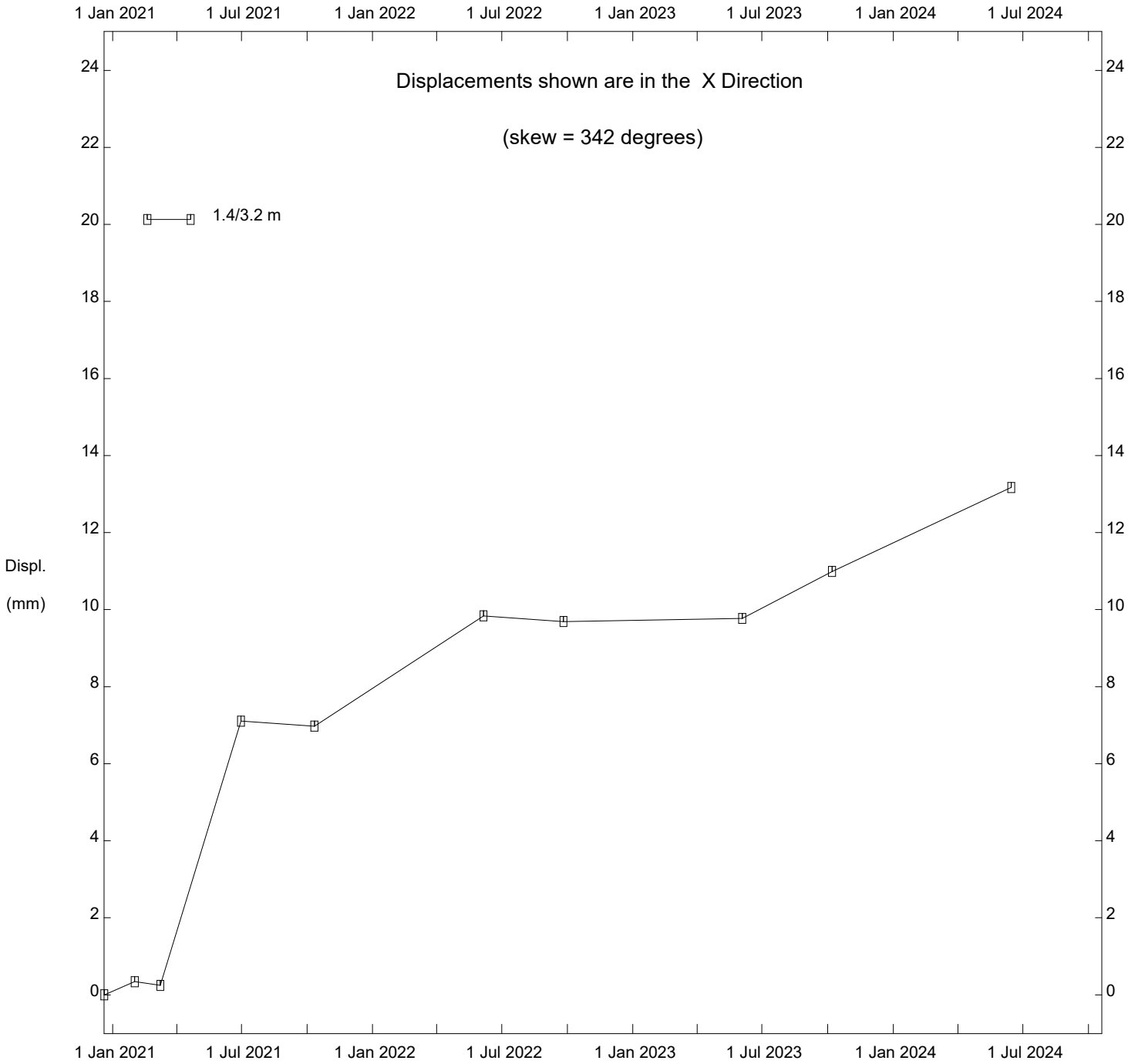


NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinometer SI20-3

Alberta Transportation

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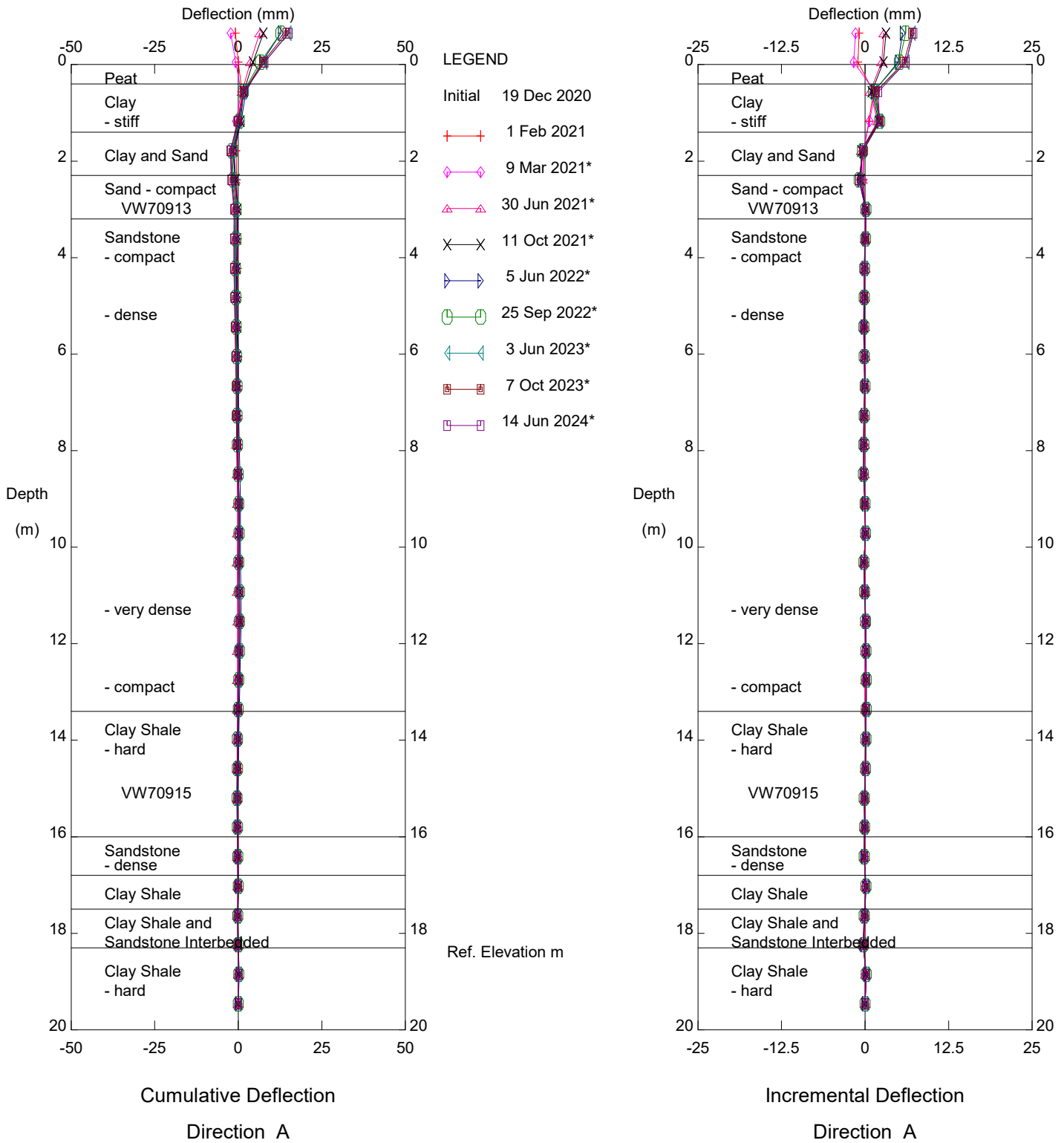
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NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinator SI20-3

Alberta Transportation

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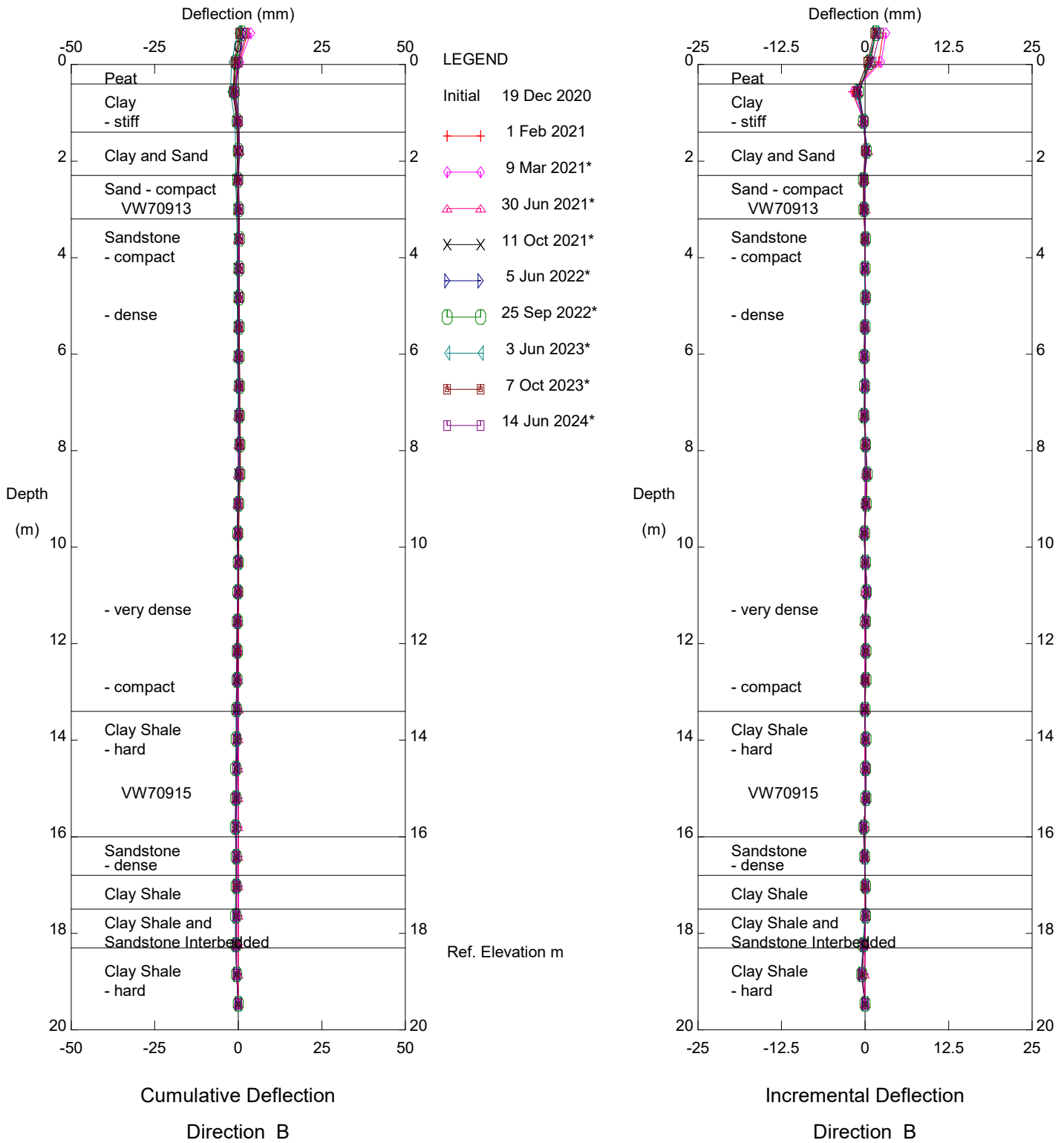


NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinometer SI20-4

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NC006 - Hwy 2:46 Mitsue Lake (km 47.6), Inclinometer SI20-4

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**FIGURE NC006-1
HWY 2:46 MITSUE LAKE SLIDE (KM 47.6)
VIBRATING WIRE PIEZOMETER DATA**

