



THURBER ENGINEERING LTD.

July 26, 2022

File No.: 32121

Alberta Transportation
Provincial Building
9621-96 Avenue
Peace River, Alberta
T8S 1T4

Attention: Mr. Max Shannon

**ALBERTA TRANSPORTATION GRMP (CON0022164)
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING RESULTS – SPRING 2022**

SECTION C

**SITE PH041: HWY 986:01, DAISHOWA EAST HILL
(STATION 12+000 SITE 5 GULLY AND DITCH)**

Dear Mr. Shannon:

This report provides the results of the annual geotechnical instrumentation monitoring for the above-mentioned site as part of Alberta Transportation's Geohazard Risk Management Program for Peace Region – Peace River District (CON0022164).

It is a condition of this letter report that Thurber's performance of its professional services will be subject to the attached Statement of Limitations and Conditions.

1. FIELD PROGRAM AND INSTRUMENTATION STATUS

Two slope inclinometers (SI-1 and SI-2) were read at the Hwy 986:01 Daishowa East Hill site on June 12, 2022, by Mr. Niraj Regmi, G.I.T. and Mr. Jayden Del Cid, both of Thurber Engineering Ltd.

The SIs were read using two RST Digital Inclinometer probes with 2 ft. wheelbases and RST Pocket PC readouts. Inclinometer reading depths were defined as per cable markings with respect to the top of the inclinometer casing.

2. DATA PRESENTATION

2.1 General

SI plots for A and B directions are included in Appendix A. Where movement has been recorded the resultant plot (X direction, if applicable) and rate of movement have also been provided. A slope inclinometer reading summary table is provided below.



2.2 Zones of Movement

Zones of new movement were not observed in the SIs since the previous readings in the spring of 2021.

Zones of movements are summarized in Table PH041-1 below. Table PH041-1 also provides a historical account of the total movement, the depth of movement and the maximum rate of movement that has occurred in the SIs since initialization.



**TABLE PH041-1
 SPRING 2021 – DAISHOWA EAST HILL (12+000)
 SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: June 12, 2022

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-1	Dec. 1, 1995	52.5 mm over 0.1 m to 1.9 m depth in 11° direction	16.5 mm/yr between May 1997 and May 1998	Operational	July 8, 2021	1.4	1.5	7.5
		31.4 mm over 1.9 m to 4.9 m depth in 11° direction	4.6 mm/yr between May 1997 and May 1998			0.9	1.0	1.6
		15.7 mm over 4.9 m to 7.4 m depth in 47° direction	3.3 mm/yr between May and September 2014			0.8	0.9	0.8
		7.8 mm over 7.4 m to 8.6 m depth in 47° direction	5.1 mm/yr Between October and December 1997			0.2	0.3	0.1
SI-2	Apr. 9, 1996	13.8 mm over 5.6 m to 8.6 m depth in 52° direction	2.9 mm/yr in December 1996	Operational	July 8, 2021	0.9	0.9	<-0.1
		14.1 mm over 13.5 m to 14.7 m depth in 9° direction	1.8 mm/yr in October 2005			0.7	0.7	0.2

Drawing 32121-PH041 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.



3. INTERPRETATION OF MONITORING RESULTS

Slope inclinometer SI-1 showed a rate of movement of 1.5 mm/yr over 0.1 m to 1.9 m depth, a rate of movement of 1.0 mm/yr over 1.9 m to 4.9 m depth, a rate of movement of 0.9 mm/yr over 4.9 m to 7.4 m depth and a rate of movement of 0.3 mm/yr over 7.4 m to 8.6 m depth since the spring of 2021 readings. The measured rates of movement in SI-1 have been oscillating but show a general trend of approximately 1 mm/yr since 2009 (0.1 m to 1.9 m depth). Slope inclinometer SI-2 showed rates of movement of 0.9 mm/yr and 0.7 mm/yr over 5.6 m to 8.6 m depth and 13.5 m to 14.7 m depth, respectively, since the spring of 2021 readings. The measured rates of movement in SI-2 have shown a steady trend of approximately 0.5 to 1 mm/yr since 2007 in both zones.

4. RECOMMENDATIONS

4.1 Future Work

The instruments should be read again in the spring of 2023.

4.2 Instrumentation Repairs

No instrumentation repairs are required at this time.



5. CLOSURE

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.
Principal | Senior Geotechnical Engineer

Bruce Nestor, P.Eng.
Geotechnical Engineer
/jf

Attachments:

- Statement of Limitations and Conditions
- Appendix A
 - Field Inspector's report
 - Site Plan Showing Approximate Instrument Locations (Drawing No. 32121-PH041)
 - SI Reading Plots



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.

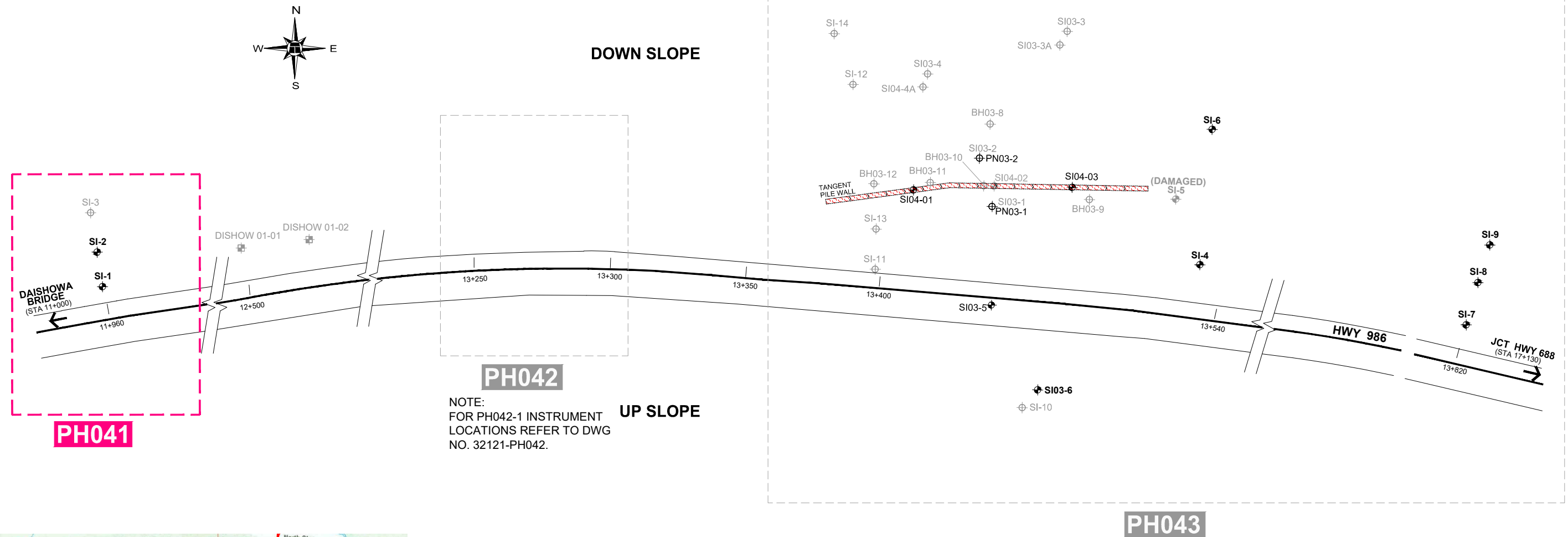


**ALBERTA TRANSPORTATION GRMP (CON0022164)
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING RESULTS**

SPRING 2022

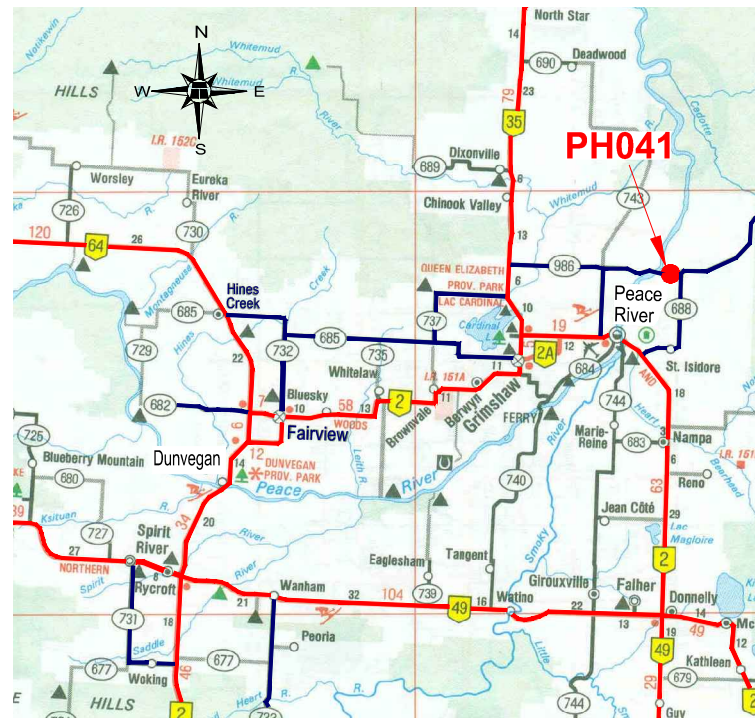
**APPENDIX A
DATA PRESENTATION**

**SITE PH041: HWY 986:01, DAISHOWA EAST HILL
(STATION 12+000 SITE 5 GULLY AND DITCH)**



PH042
 NOTE:
 FOR PH042-1 INSTRUMENT
 LOCATIONS REFER TO DWG
 NO. 32121-PH042.

PH043



SITE MAP
 NOT TO SCALE

SITE PLAN
 NOT TO SCALE

LEGEND :

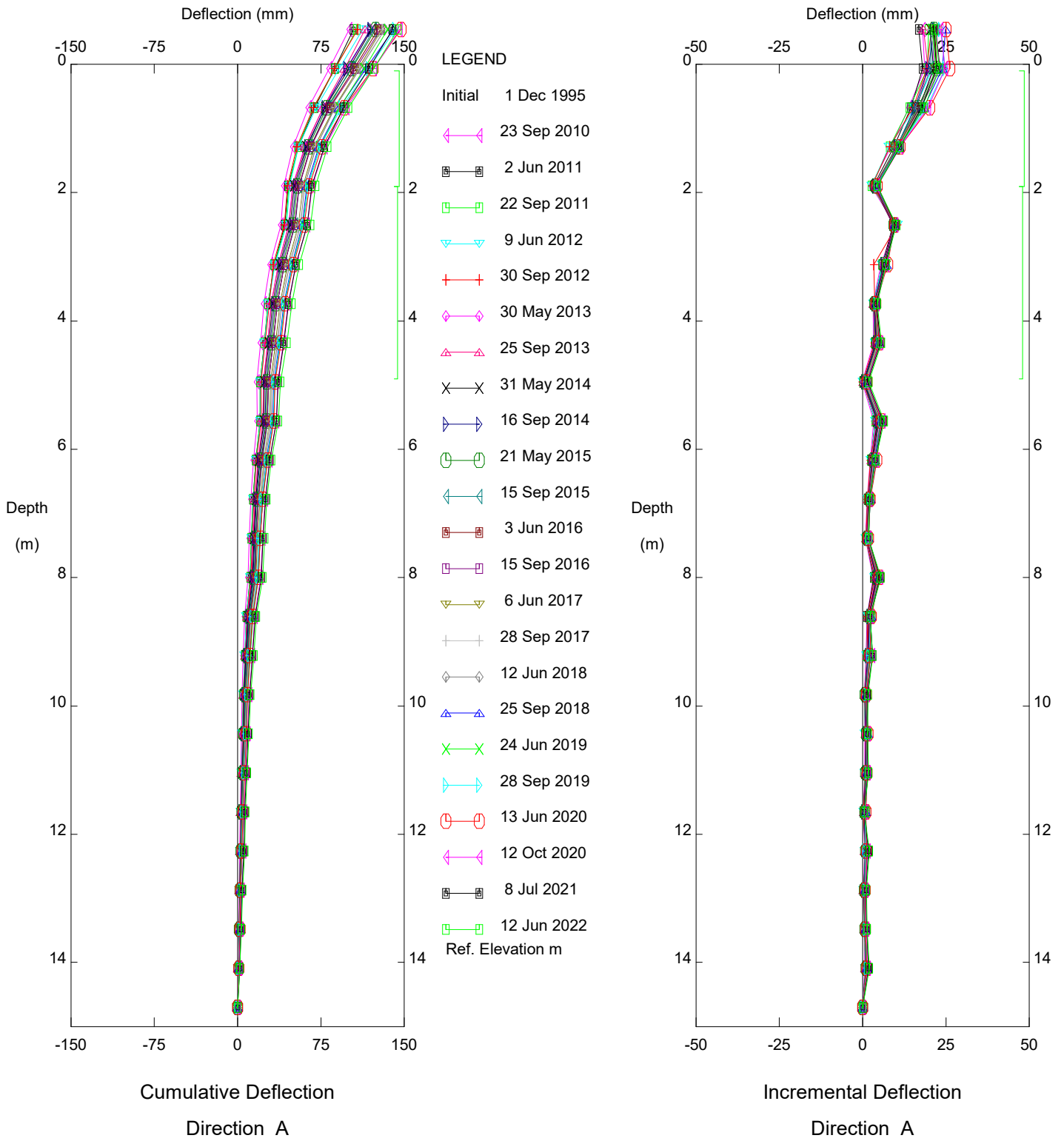
- ⊕ SLOPE INCLINOMETERS
(currently using)
- ⊞ SLOPE INCLINOMETERS
(Installed in 2001, not in use)
- ⊙ SLOPE INCLINOMETER
(not in use)
- PN PNEUMATIC PIEZOMETER

NOTES :

1. BASE PLAN COPIED FROM "GAEA ENGINEERING" DRAWING (DATED MAY. 1997)
2. LOCATIONS OF 2003 SLOPE INDICATORS OBTAINED FROM AMEC DRAWING NO. : EG08628.37-002.dwg DATED MARCH 2004.

PEACE REGION (PEACE RIVER DISTRICT)	
PH041: HWY 986:01 - DAISHOWA EAST HILL (STA. 12+000 SITE 5 GULLY & DITCH EROSION) INSTRUMENT LOCATIONS	
DWG No. 32121-PH041	
DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	N.T.S.
DATE	SEPTEMBER 2021
FILE No.	32121

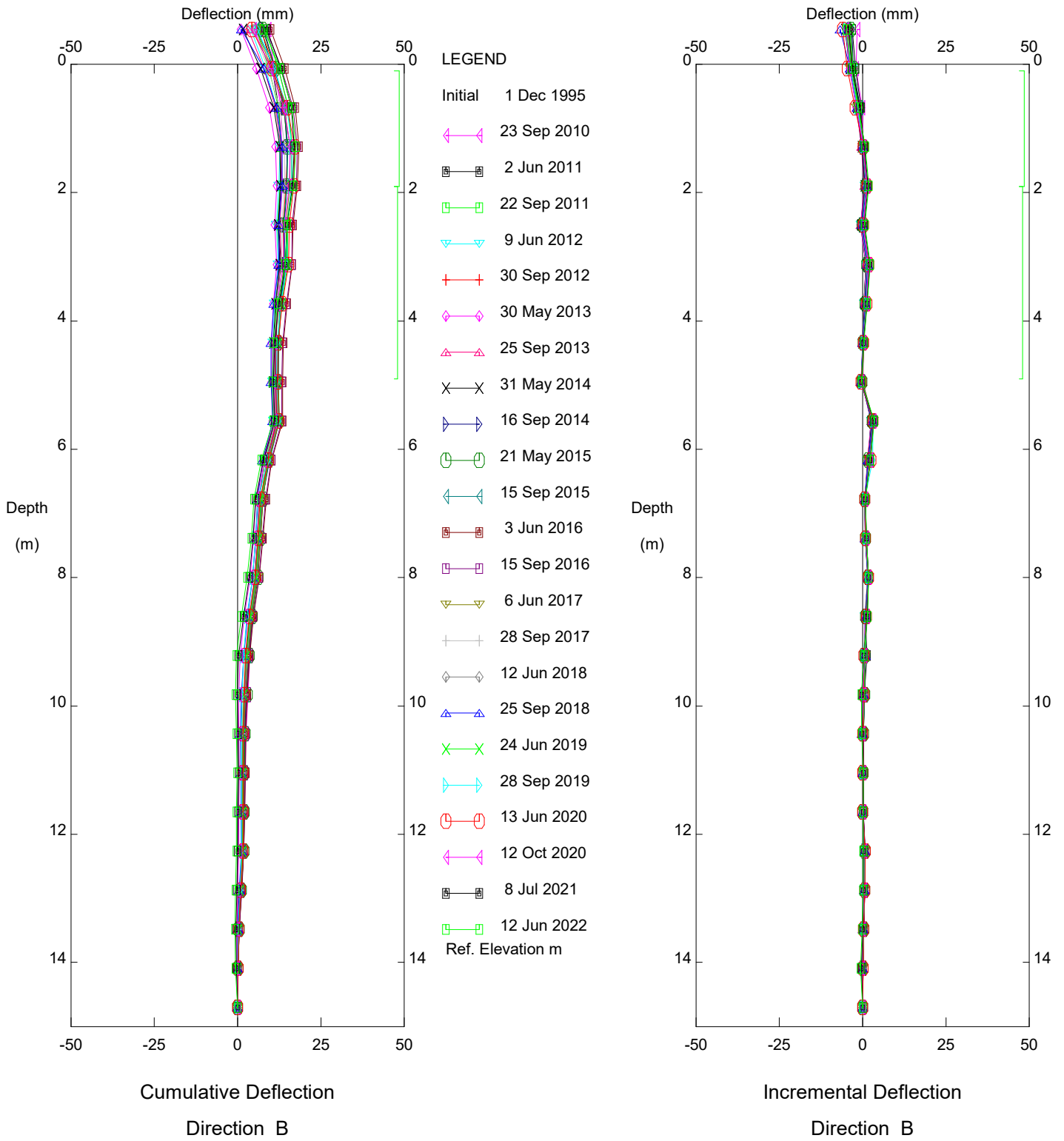
Thurber Engineering Ltd.



HWY 986:01 - STA. 11+960, Inclinometer SI1

Alberta Transportation

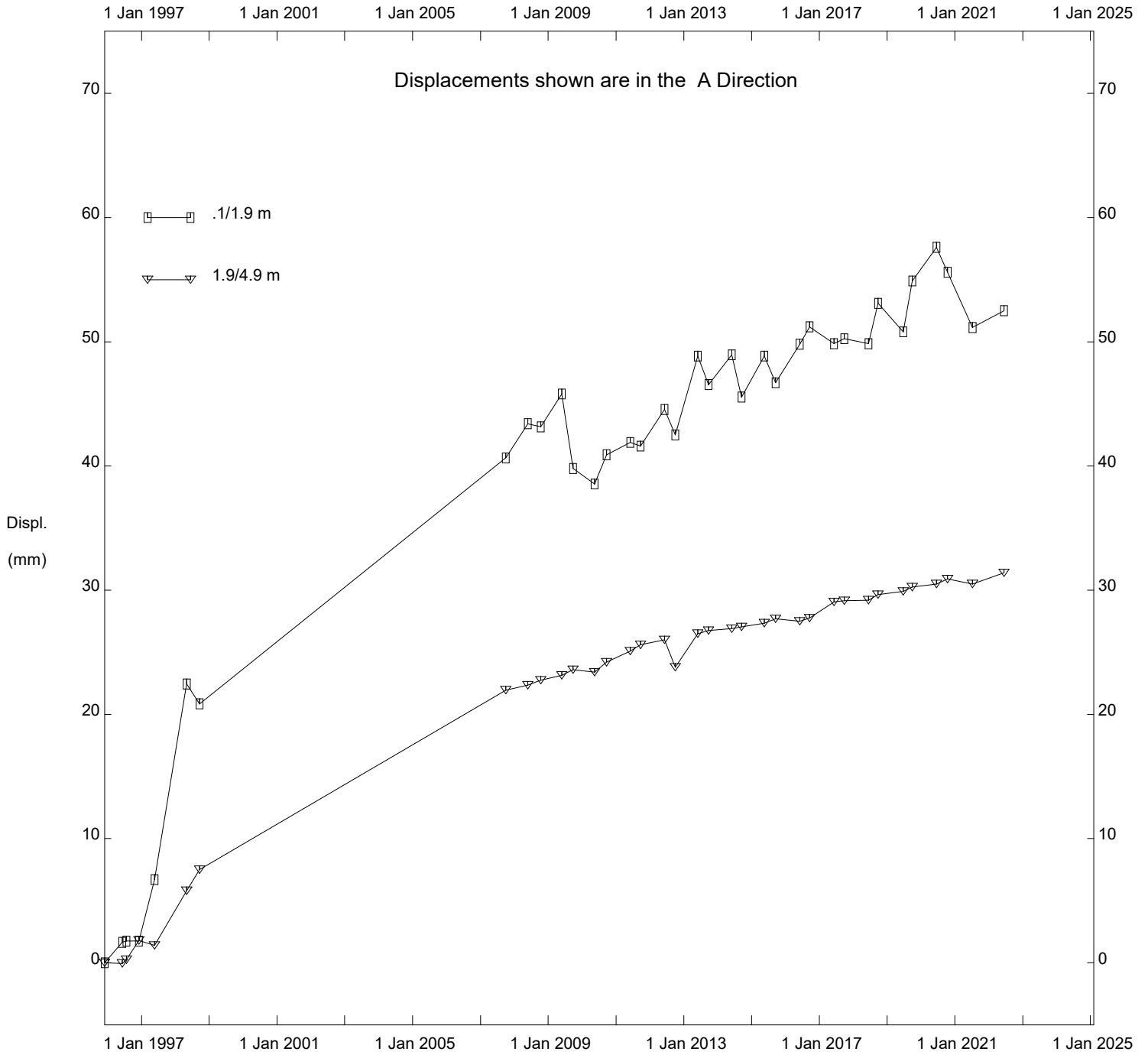
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HWY 986:01 - STA. 11+960, Inclinometer SI1

Alberta Transportation

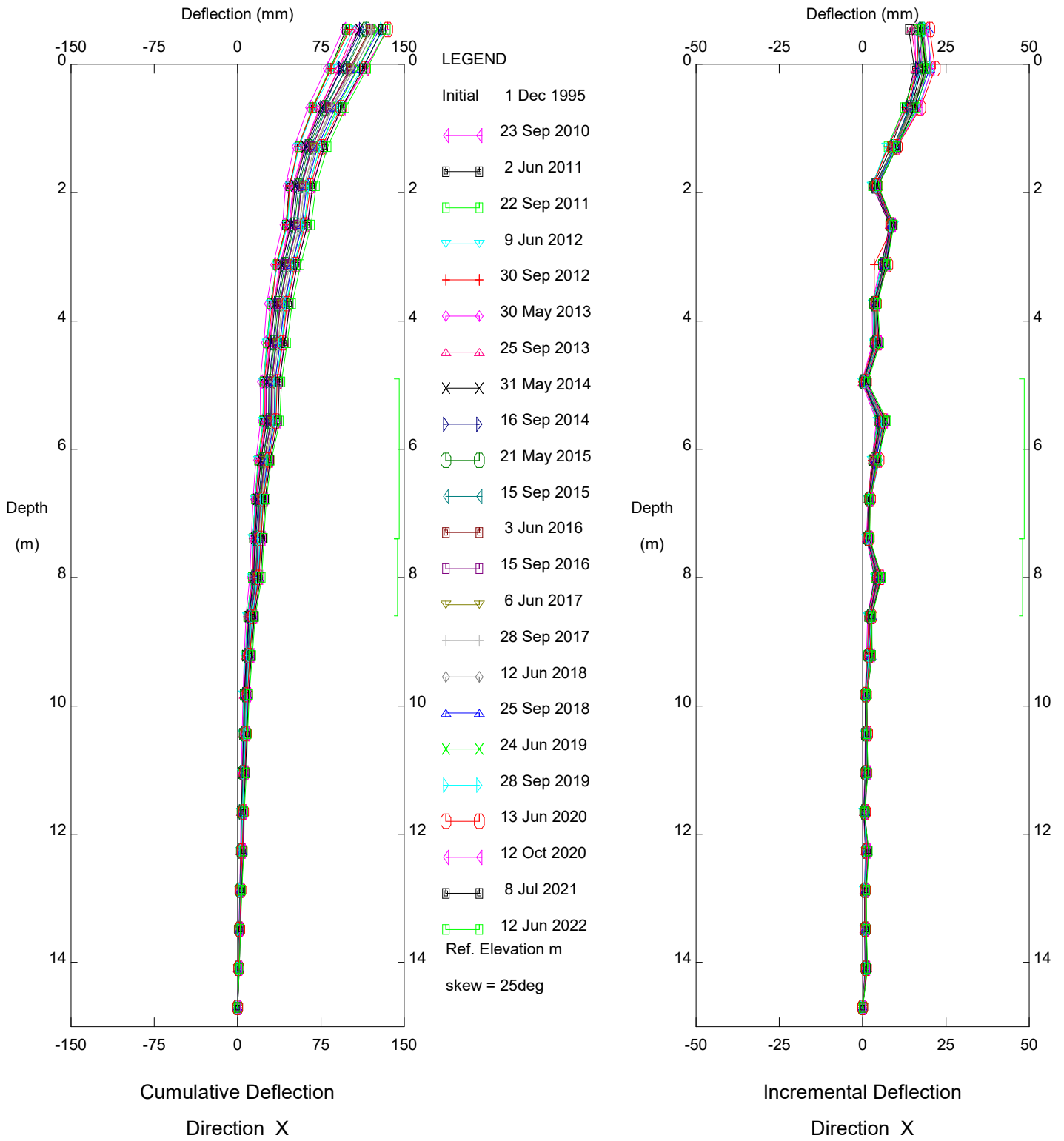
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HWY 986:01 - STA. 11+960, Inclinator S11

Alberta Transportation

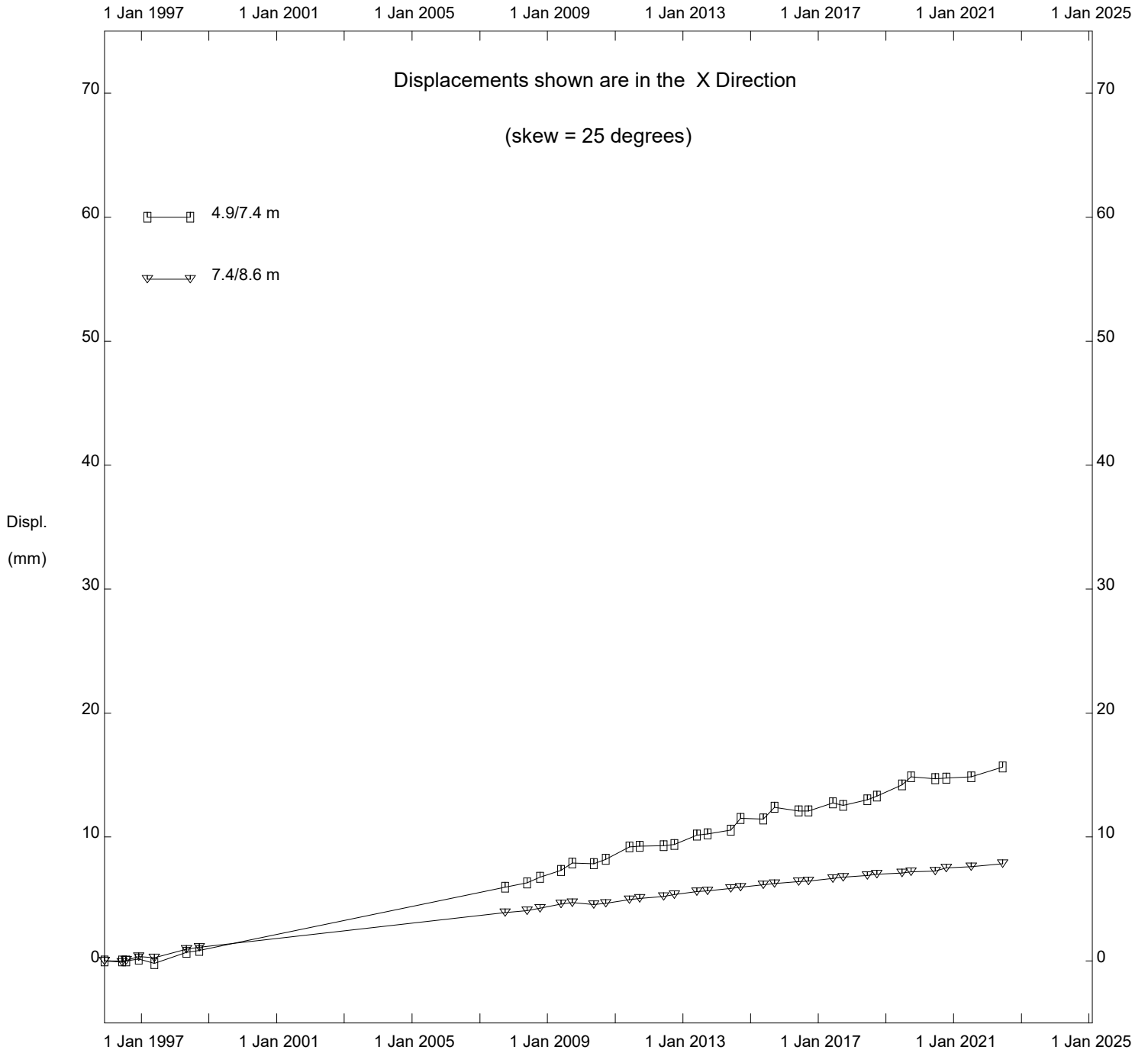
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HWY 986:01 - STA. 11+960, Inclinometer SI1

Alberta Transportation

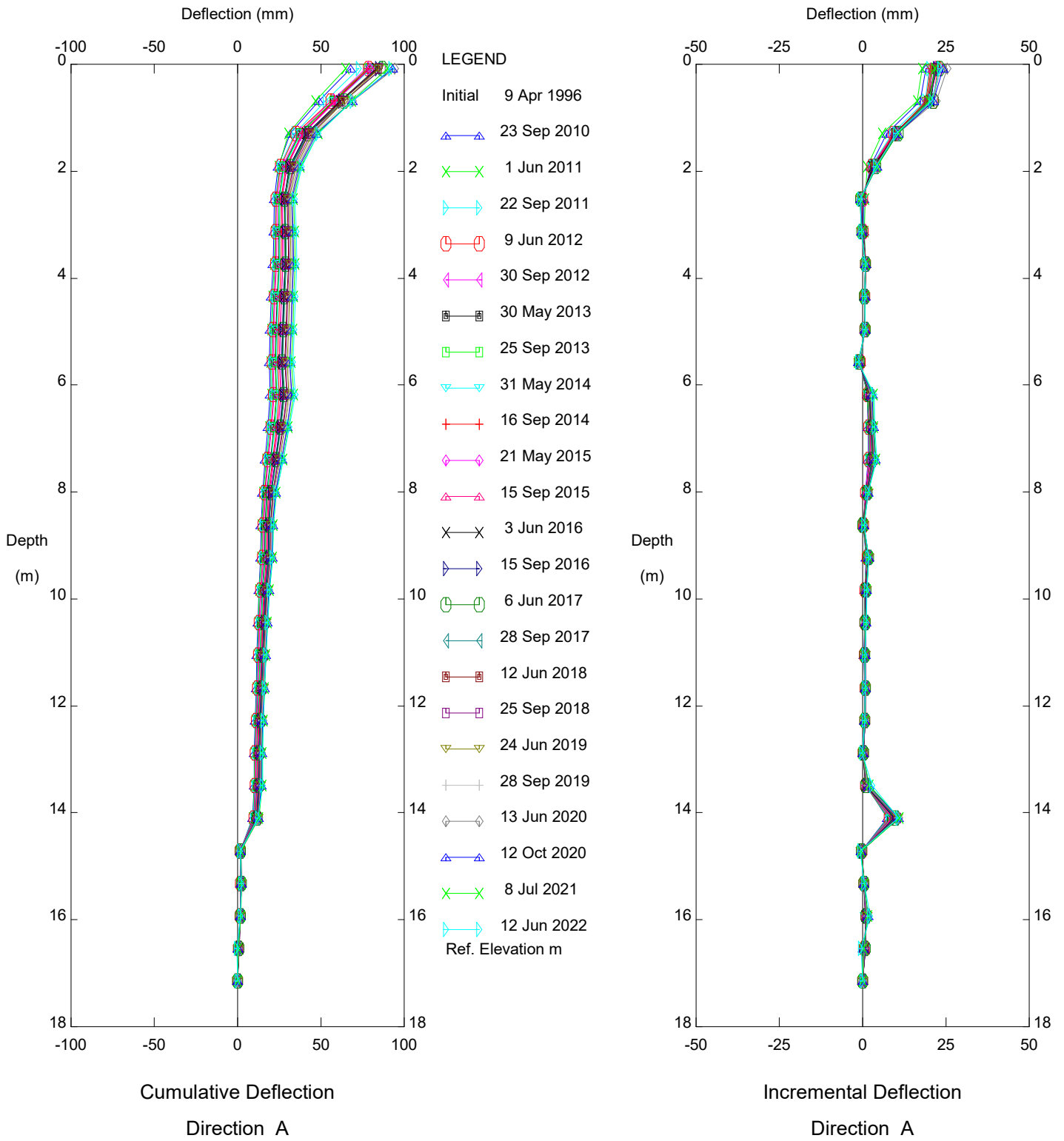
Thurber Engineering Ltd.



HWY 986:01 - STA. 11+960, Inclinator SI1

Alberta Transportation

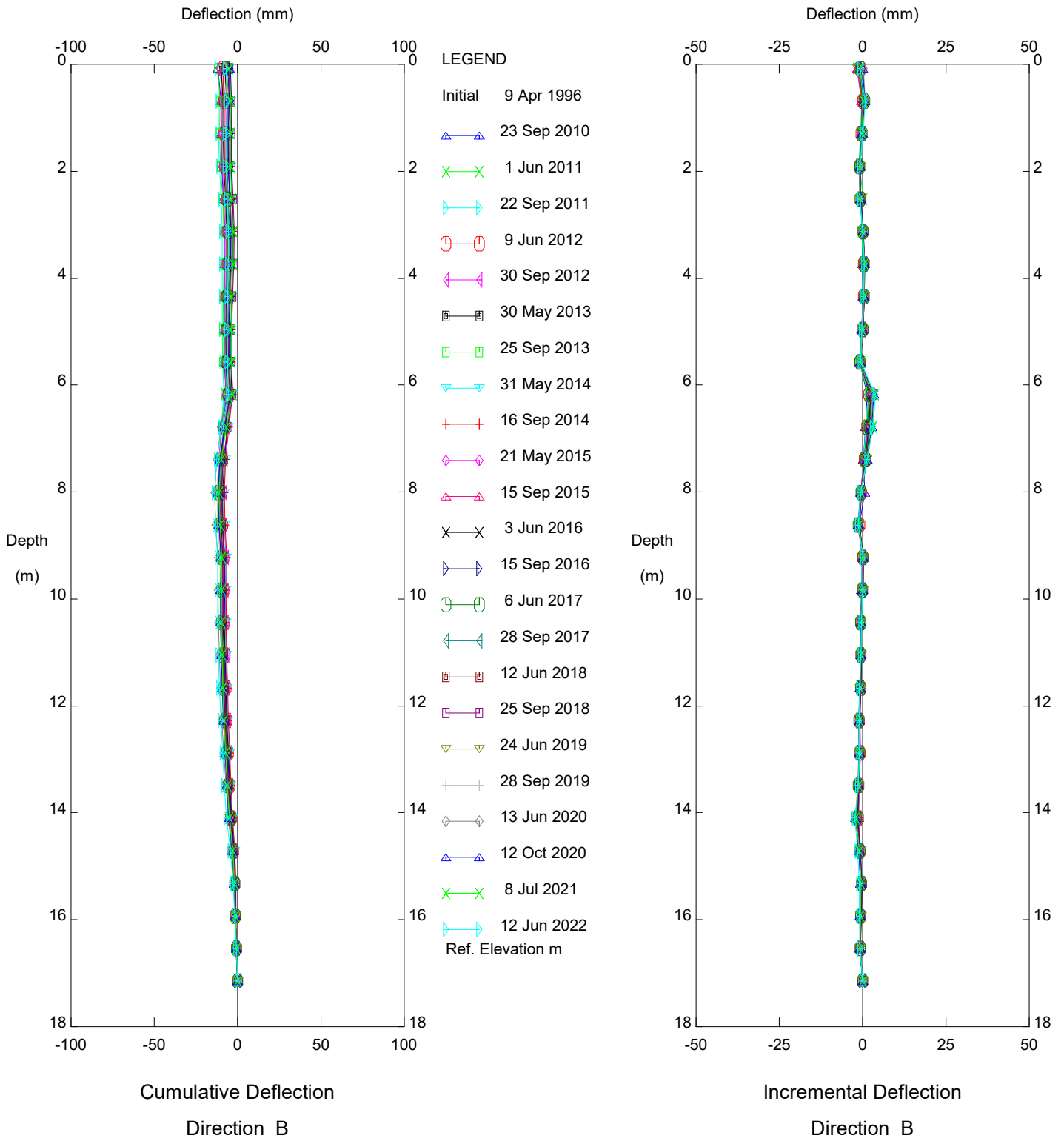
Thurber Engineering Ltd.



HWY 986:01 - STA. 11+960, Inclinometer SI-2

Alberta Transportation

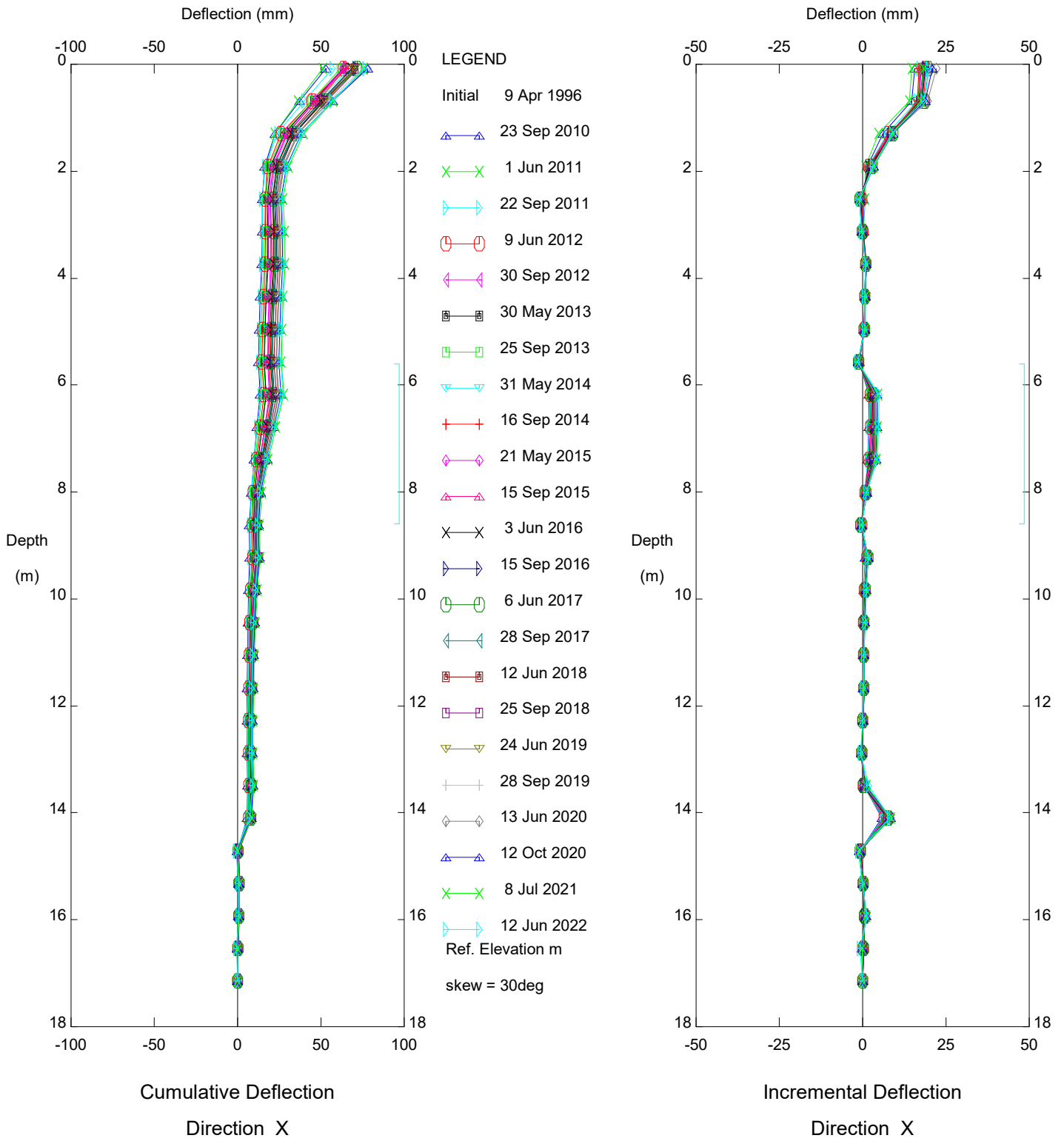
Thurber Engineering Ltd.



HWY 986:01 - STA. 11+960, Inclinator SI-2

Alberta Transportation

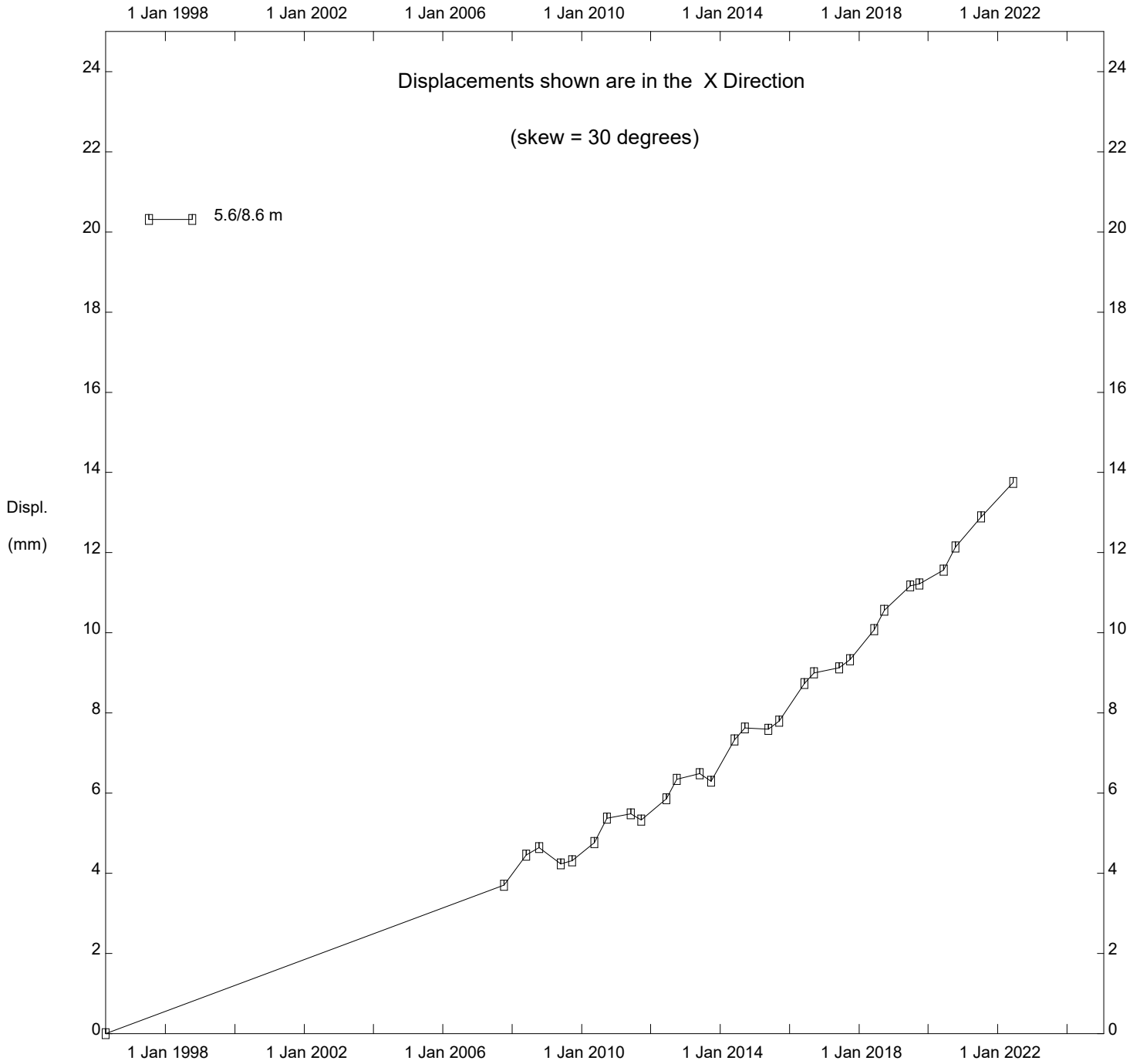
Thurber Engineering Ltd.



HWY 986:01 - STA. 11+960, Inclinometer SI-2

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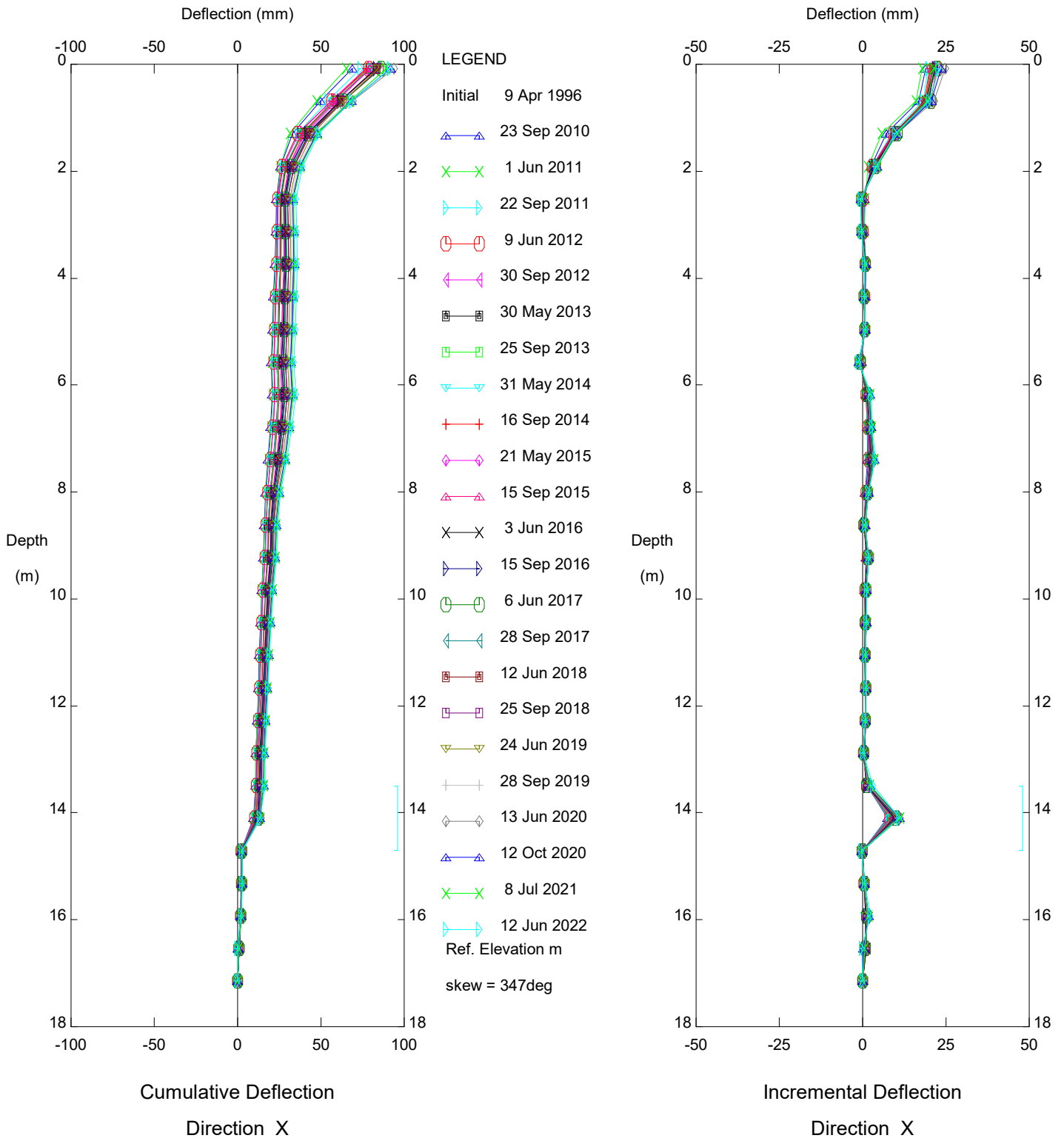
Thurber Engineering Ltd.



HWY 986:01 - STA. 11+960, Inclinator SI-2

Alberta Transportation

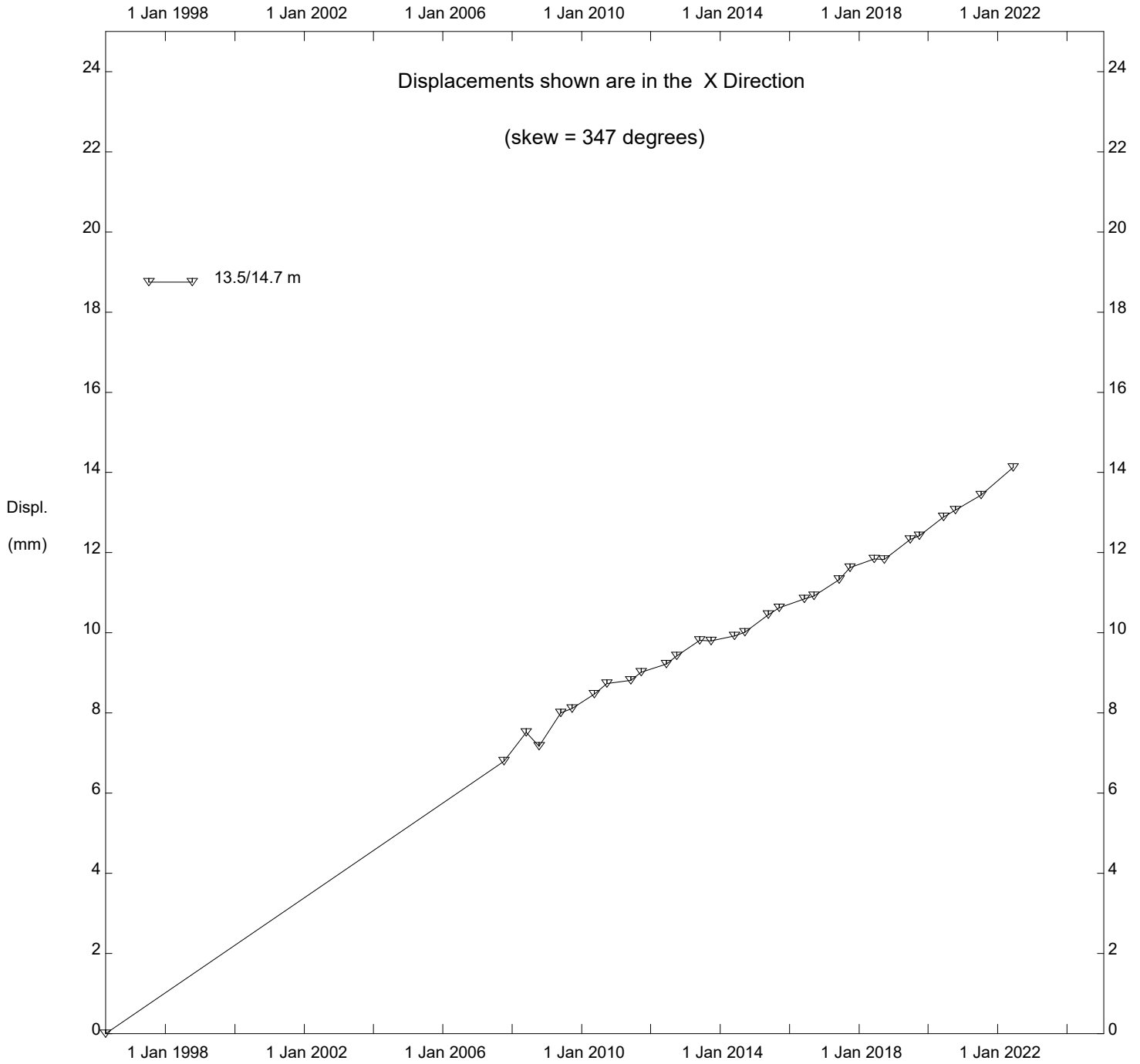
Thurber Engineering Ltd.



HWY 986:01 - STA. 11+960, Inclinometer SI-2

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HWY 986:01 - STA. 11+960, Inclinator SI-2

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