



THURBER ENGINEERING LTD.

November 16, 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 – FALL 2022**

SECTION C

SITE PH034: HWY 744:04, JUDAH HILL (FENCE SLIDE)

Dear Mr. Shannon:

This report provides the results of the bi-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 (SI05-15 and SI10-15) and two pneumatic piezometers (PN10-12 and PN10-15) were read at the Hwy 744:04 Judah Hill Fence Slide site on September 28, 2022, by Mr. Niraj Regmi, G.I.T. and Mr. Kyle Crooymans, both of Thurber Engineering Ltd.

The SIs were read using a RST Digital Inclinometer probe with a 2 ft wheelbase and a RST Pocket PC readout. Inclinometer reading depths were defined as per cable markings with respect to the top of the inclinometer casings. The pneumatic piezometers were read using a RST C108 pneumatic piezometer readout.

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. Piezometer reading plots are also included in Appendix A.



Slope inclinometer and piezometer reading summary tables are provided below. These tables also include instruments deleted from the GRMP program, for reference.

2.2 Zones of Movement

Zones of new movement were not observed in the SIs since the previous readings in the spring of 2022.

Zones of movements are summarized in Table PH034-1 below. Table PH034-1 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 PH034-1
FALL 2022 – HWY 744:04 JUDAH HILL (FENCE SLIDE)
SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: September 28, 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)	RATE OF MOVEMENT (mm/yr)	CHANGE IN RATE OF MOVEMENT SINCE PREVIOUS READING (mm/yr)
<i>SI98-2i</i>	<i>Oct. 26, 2000</i>	<i>Not Known</i>	<i>Not Known</i>	<i>Destroyed</i>	<i>May 18, 2004</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
<i>SI98-8i</i>	<i>Oct. 26, 2000</i>	<i>Not Known</i>	<i>Not Known</i>	<i>Destroyed</i>	<i>Oct. 22, 2005</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
SI05-15	Apr. 27, 2005	No discernible movement	No discernible movement	Operational	June 14, 2022	N/A	N/A	N/A
<i>SI10-12</i>	<i>March 27, 2010</i>	<i>69.4 mm over 2.2 m to 4.6 m depth in 256° direction</i>	<i>23.3 mm/yr in September 2011</i>	<i>Sheared at 4.9 m depth</i>	<i>June 28, 2019</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
<i>SI10-13</i>	<i>March 27, 2010</i>	<i>114.3 mm over 3.4 m to 9.4 m depth in 180° direction</i>	<i>111.2 mm/yr in September 2011</i>	<i>Sheared at 6.4 m depth</i>	<i>June 1, 2014</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
		<i>7.5 mm over 10.7 m to 14.9 m depth in 225° direction</i>	<i>13.1 mm/yr in September 2011</i>			<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
<i>SI10-14</i>	<i>March 27, 2010</i>	<i>70.9 mm over 3.4 m to 6.4 m depth in 230° direction</i>	<i>61.9 mm/yr in September 2011</i>	<i>Sheared at 5.7 m depth</i>	<i>September 16, 2014</i>	<i>N/A</i>	<i>N/A</i>	<i>N/A</i>
SI10-15	March 27, 2010	48.9 mm over 2.4 m to 5.5 m depth in 251° direction	10.7 mm/yr in October 2020	Operational	June 14, 2022	1.5	5.1	0.7

Drawing 32121-PH034 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site



**TABLE PH034-2
FALL 2022 – HWY 744:04 JUDAH HILL (FENCE SLIDE)
PNEUMATIC PIEZOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: September 28, 2022

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER LEVEL BGS (m)	MEASURED PORE PRESSURE (kPa)	CURRENT WATER LEVEL BGS (m)	PREVIOUS WATER LEVEL BGS (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN10-12 (33079)	March 26, 2010	18.0	N/A	Active	17.80 on May 14, 2010	0.6	17.92	17.93	0.01
PN10-13 (33078)	March 26, 2010	13.7	N/A	Blocked	13.45 on September 23, 2010	N/A	N/A	N/A	N/A
PN10-14 (33080)	March 26, 2010	14.5	N/A	Pinched/ Blocked	14.36 on September 23, 2010	N/A	N/A	N/A	N/A
PN10-15 (33092)	March 26, 2010	3.7	N/A	Active	1.66 on September 22, 2011	7.7	2.87	3.21	0.34

Drawing 32121-PH034 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

Notes:
PN - pneumatic piezometer.
BGS - below ground surface.



3. INTERPRETATION OF MONITORING RESULTS

Slope inclinometer SI05-15 has shown no discernible movement since installation in 2005 at the top of the backslope outside the main slide area.

SI10-15 showed a rate of movement of 5.1 mm/yr over 2.4 m to 5.5 m depth since the spring of 2022 readings. The rate of movement in SI10-15 has shown a small accelerating movement trend over the previous two reading cycles.

Pneumatic piezometers PN10-12 and PN10-15 showed increases in groundwater level of 0.01 m and 0.34 m, respectively, since the spring of 2022 readings. Pneumatic piezometer readings are summarized in Table PH034-2, and are plotted in Figure PH034-1 in Appendix A.

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.
Don Proudfoot, M.Eng., P. Eng.
Principal | Senior Geotechnical Engineer

Bruce Nestor, P.Eng.
Geotechnical Engineer
/sf

Attachments:

- Statement of Limitations and Conditions
- Appendix A
 - Field Inspector's report
 - Site Plan Showing Approximate Instrument Locations (Drawing No. 32121-PH034)
 - SI Reading Plots
 - Figure PH034-1 (Pneumatic Piezometer 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.



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

FALL 2022

**APPENDIX A
DATA PRESENTATION**

SITE PH034: HWY 744:04, JUDAH HILL (FENCE SLIDE)

**ALBERTA TRANSPORTATION
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (PH034)
FALL 2022**

Location: Fence Slide - Judah Hill (HWY 744:04 C1 59.177) File Number: 32121 Probe: RST SET 5R and 8R Cable: RST SET 5R and 8R	Readout: RST PN C 108 Unit 1 Casing: 2.27 Temp: 25 Read by: NKR/KTC
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SLOPE INCLINOMETER (SI) READINGS

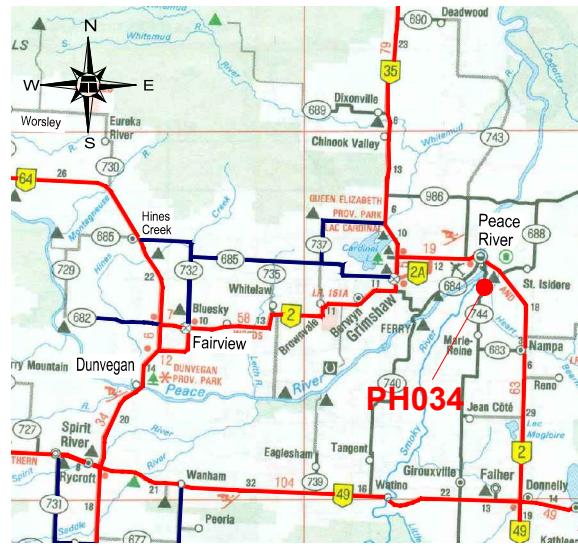
SI#	GPS Location (UTM 11)		Date	Stickup (m)	Depth from top of Casing (ft)	Magn. North A+ Groove	Current Bottom Depth Readings				Probe/ Reel #	Remarks
	Easting (m)	Northing (m)					A+	A-	B+	B-		
SI05-15	482858.86	6230922.58	28-Sep-22	0.25	127 to 3	245	553	-541	2693	-2683	8R/8R	See notes
SI10-15	482770.60	6230978.58	28-Sep-22	0.33	42 to 4	240	14123	-1398	-487	471	5R/5R	

PNEUMATIC PIEZOMETER READINGS

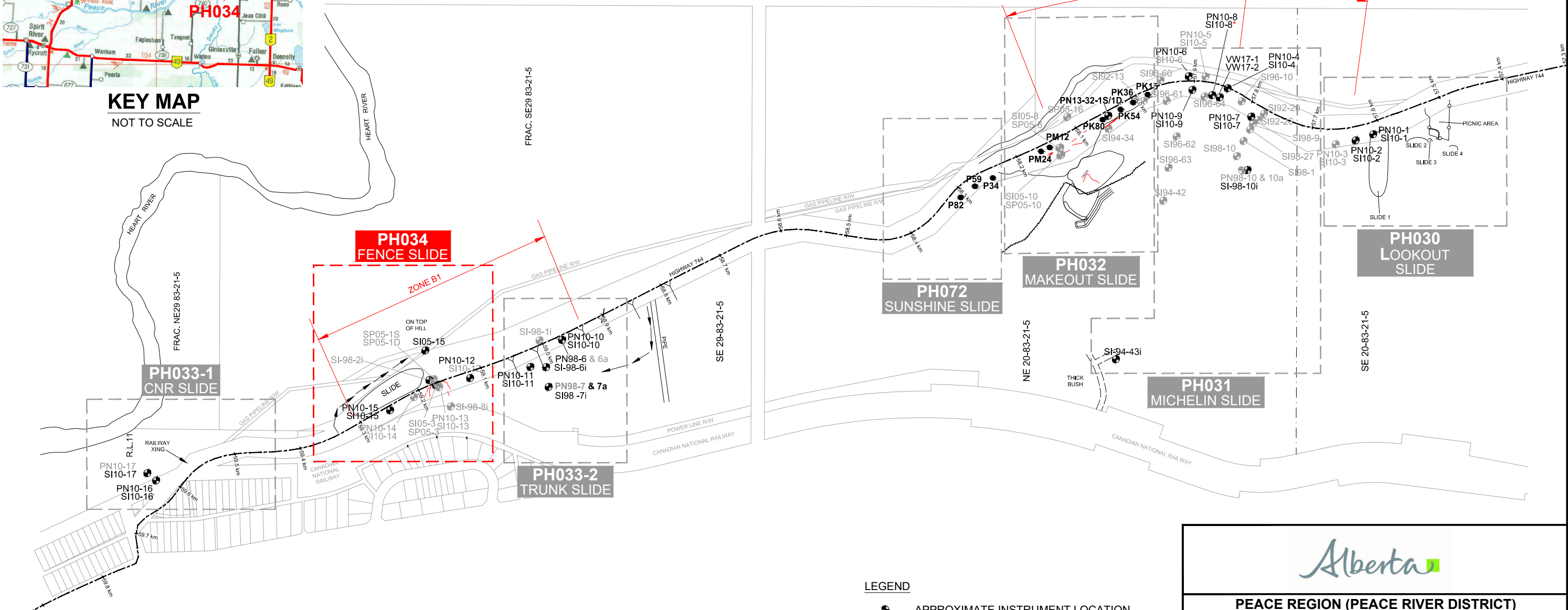
PN#	GPS Location (UTM 11)		Date	Reading (kPa)	Identification Number
	Easting (m)	Northing (m)			
PN10-12	482817.23	6230854.85	28-Sep-22	0.6	33079
PN10-15	482770.60	6230978.58	28-Sep-22	7.7	33092

INSPECTOR REPORT

If using RST probe, need small diameter extension to read.



KEY MAP
NOT TO SCALE



- LEGEND**
- APPROXIMATE INSTRUMENT LOCATION
 - INSTRUMENT NOT IN USE
 - PN PNEUMATIC PIEZOMETER
 - SP STANDPIPE PIEZOMETER
 - SI SLOPE INCLINOMETER
 - VW VIBRATING WIRE PIEZOMETER
 - APPROXIMATE PILE LOCATION




PEACE REGION (PEACE RIVER DISTRICT)

PH034: HWY 744:02 - JUDAH HILL (FENCE SLIDE)

INSTRUMENT LOCATIONS

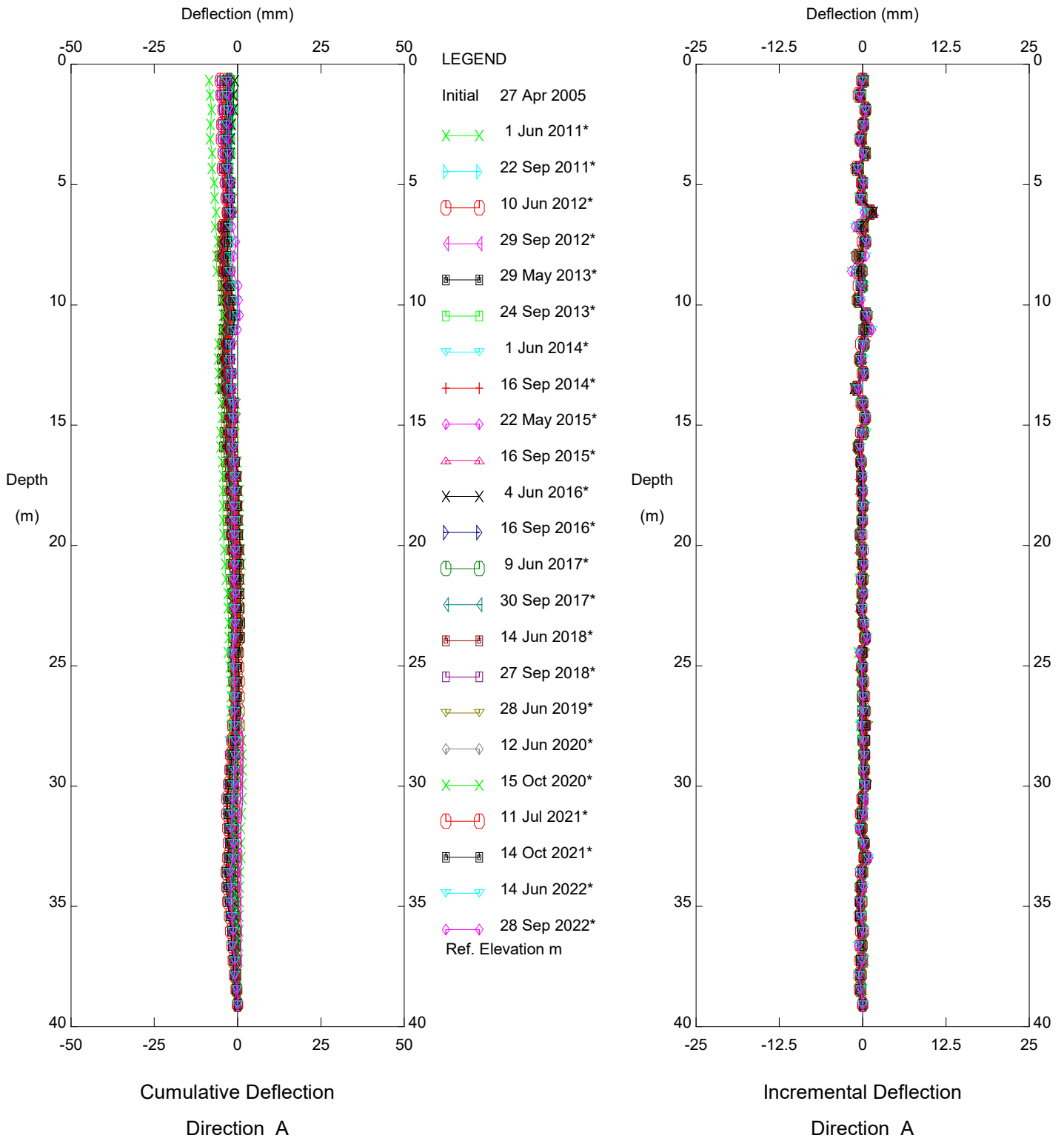
DWG No. 32121-PH034

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	APPROX. 1:6000
DATE	SEPTEMBER 2021
FILE No.	32121



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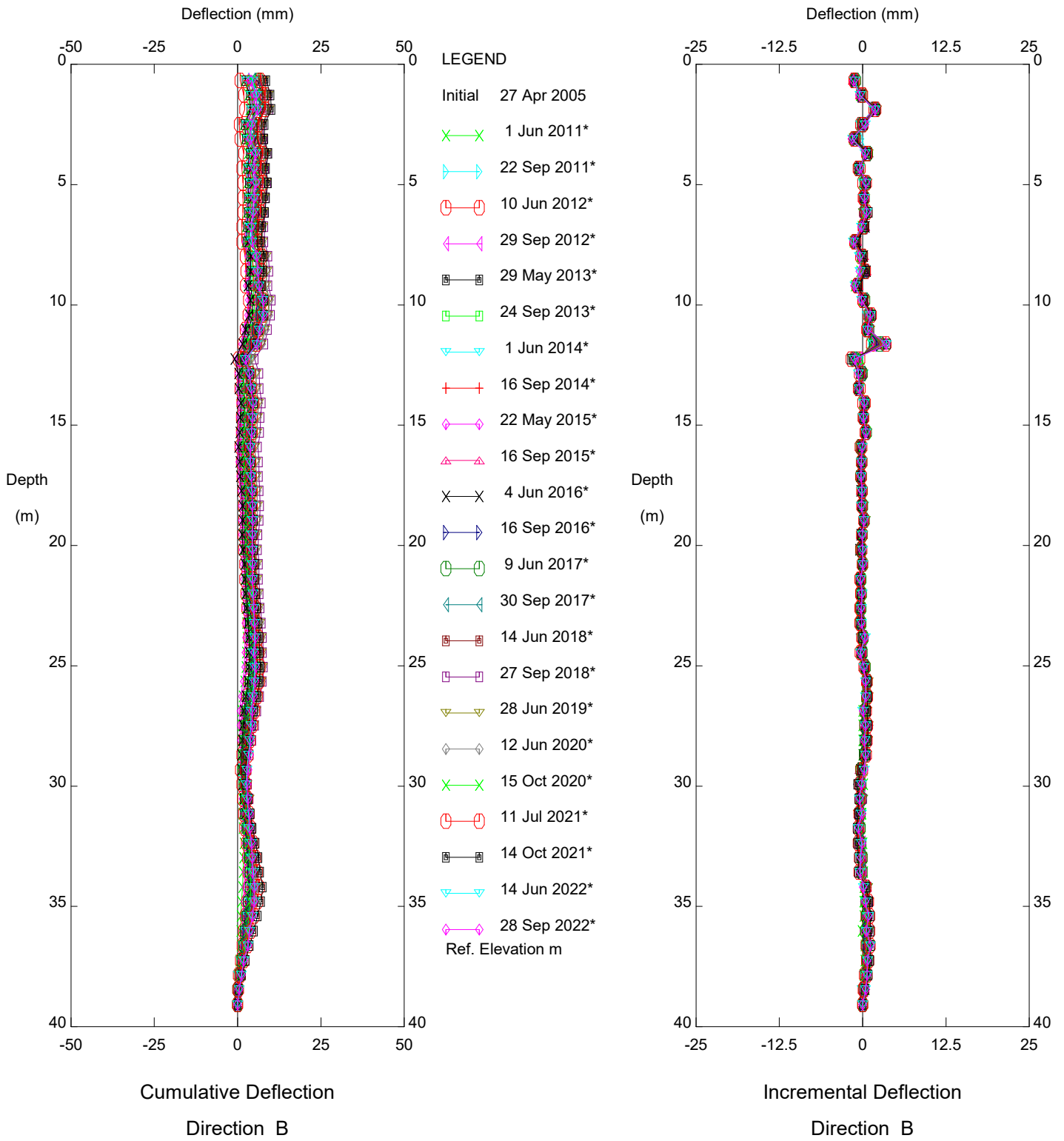


PH034 Judah Hill Fence Slide, Inclinometer SI05-15

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

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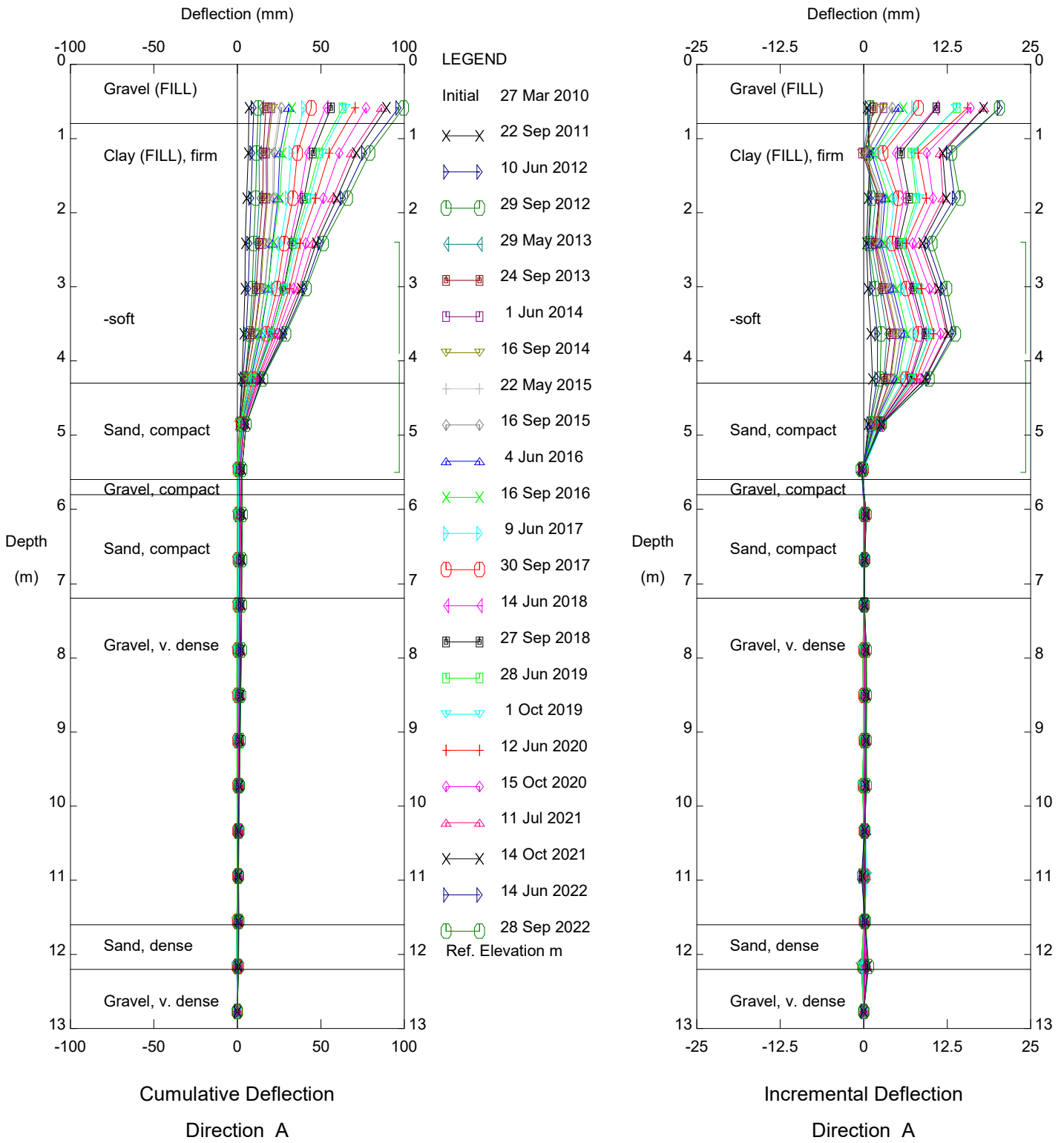


PH034 Judah Hill Fence Slide, Inclinometer SI05-15

Alberta Transportation

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

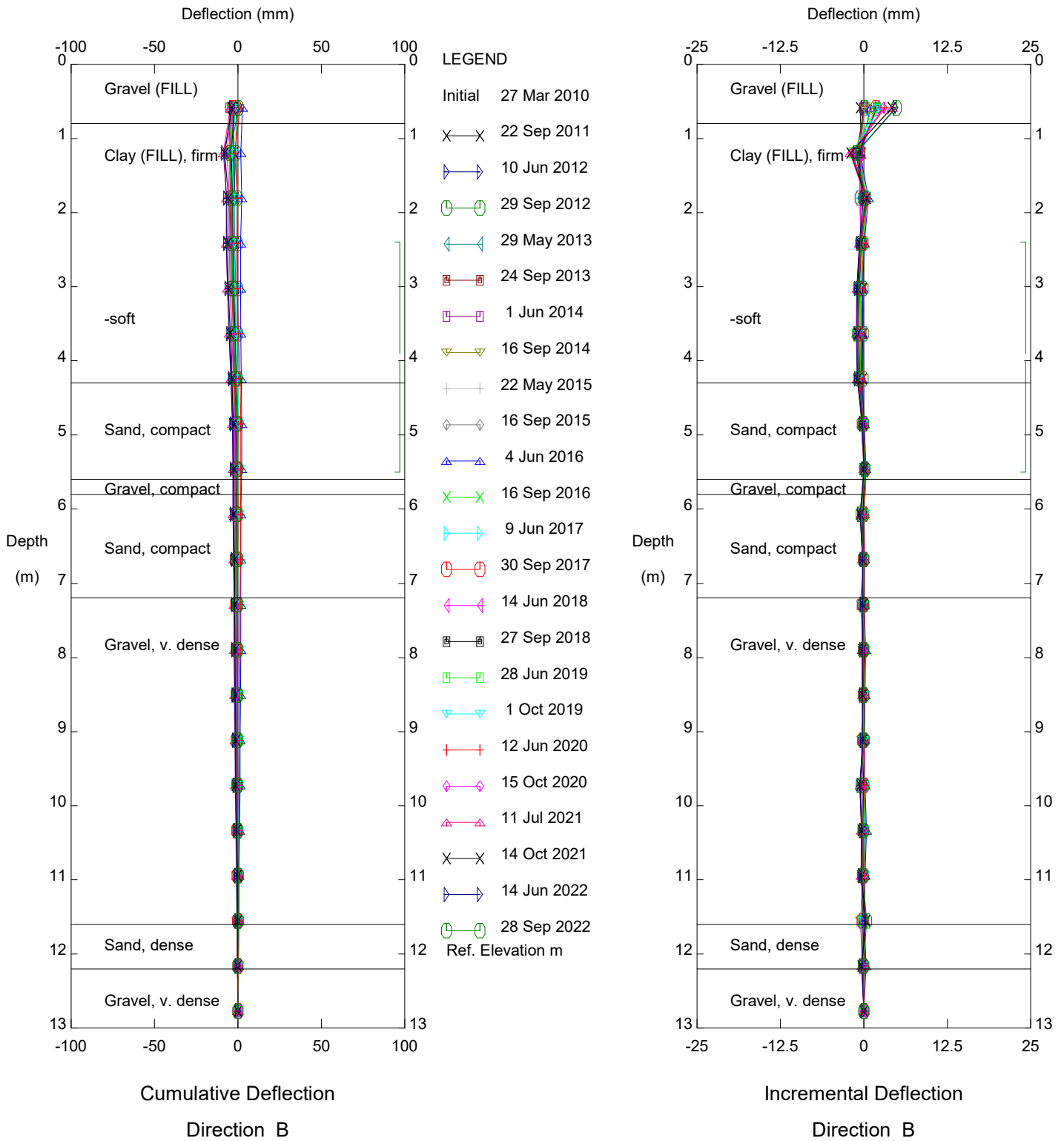
Thurber Engineering Ltd.



PH034 Judah Hill Fence Slide, Inclinometer SI10-15

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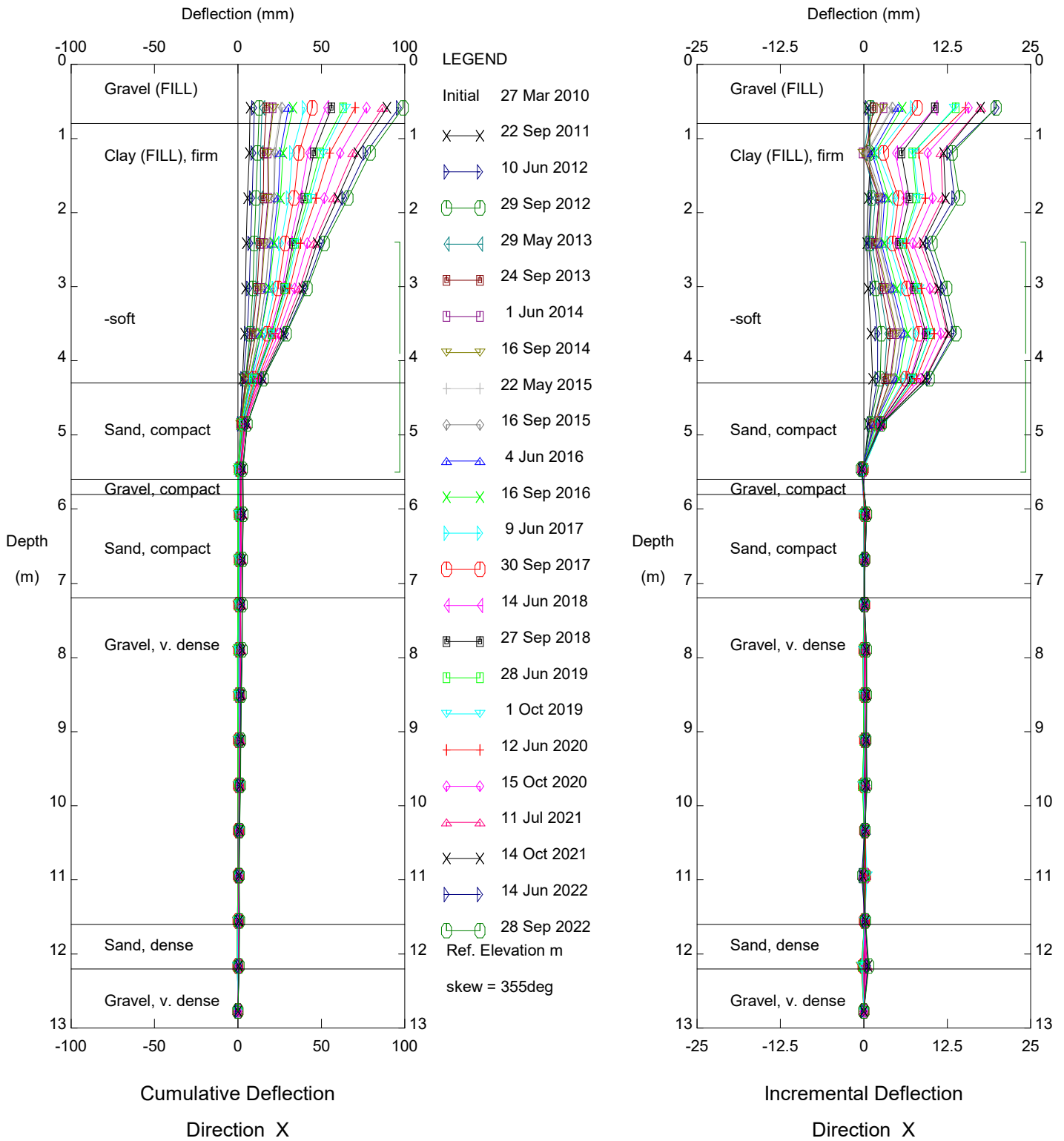
Thurber Engineering Ltd.



PH034 Judah Hill Fence Slide, Inclinometer SI10-15

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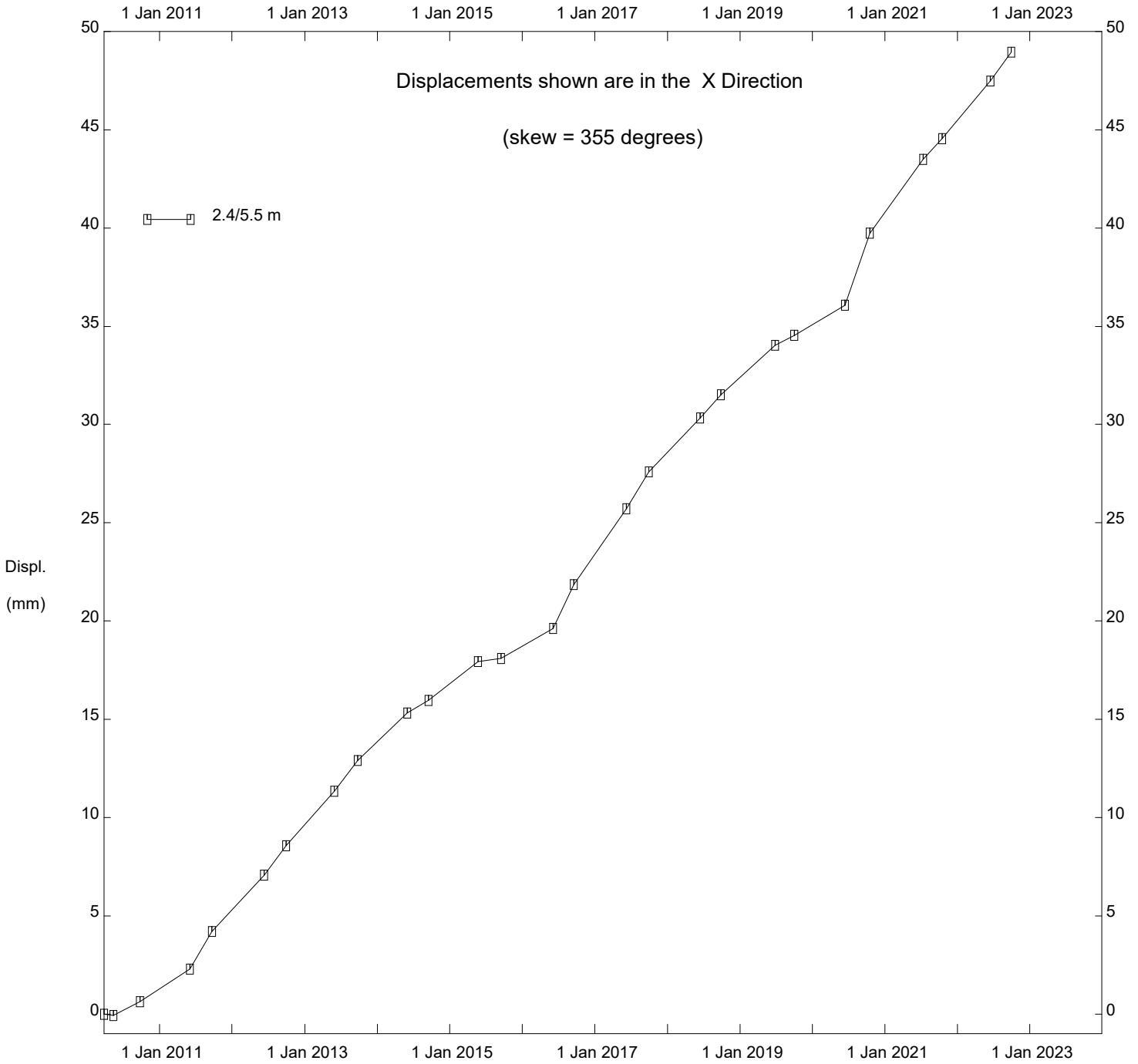
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PH034 Judah Hill Fence Slide, Inclinometer SI10-15

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PH034 Judah Hill Fence Slide, Inclinometer SI10-15

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**FIGURE PH034-1
PIEZOMETER DATA FOR HWY 744:04, JUDAH HILL (FENCE SLIDE)**

