



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 PH032: HWY 744:04, JUDAH HILL (MAKEOUT 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

From March 2014 to May 2015, two anchored tangent pile walls (KM 58 and Makeout) were constructed at the Hwy 744:04 Makeout Slide site. Four slope inclinometers (PK15, PK36, PK54 and PK80) were installed at the KM 58 pile wall and two slope inclinometers (PM12 and PM24) were installed at the Makeout pile wall. Ten load cells (VC1850, VC1853, VC1855, VC1856, VC1857, VC1858, VC1859, VC1860, VC1861 and VC1862) were installed in selected anchors at the KM 58 pile wall and five load cells (VC1848, VC1849, VC1851, VC1852 and VC1854) were installed on selected anchors at the Makeout pile wall. The load cells were wired to a RST DT2040 datalogger at each of the pile walls. Additionally, there are two pneumatic piezometers (PN13-32-1S and PN13-32-1D) upslope of the KM 58 wall which were installed during the 2013 geotechnical investigation completed prior to the construction of the pile wall.

The slope inclinometers, pneumatic piezometers and load cell dataloggers were read 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 two RST Digital Inclinator probes with 2 ft wheelbases and RST Pocket PC readouts. Inclinator 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. The load cell datalogger files were uploaded to a laptop using RST Multichannel DTLINK software.

2. DATA PRESENTATION

2.1 General

SI plots for A and B directions are presented in Appendix A and are summarized below. Where movement has been recorded, the resultant plot (X direction, if applicable) and rate of movement have also been provided.

2.2 Zones of Movement

No zones of new movement were observed in the SIs since the last set of readings in the spring of 2022. Zones of movement in the SIs have been defined over the length of the pile and over the combined length of the pile and waler cap beam.

Zones of movement are summarized in Table PH032-1 below. This table also provides a historical account of the total movement, the depth of movement, and the maximum rate of movement that has occurred at this site since the initialization of the slope inclinometers.



**TABLE PH032-1
FALL 2022 – HWY 744:04 JUDAH HILL (MAKEOUT SLIDE)
SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: September 28, 2022

INSTRUMENT #	DATE INITIALIZED (AFTER CONSTRUCTION)	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)
KM 58 WALL								
PK15	July 2, 2015	3.8 over 2.1 m to 13.7 m depth in 274° direction	17.3 in July 2015	Operational	June 14, 2022	1.6	5.3	6.1
		3.1 over 0.3 m to 13.7 m depth in 274° direction	29.1 in July 2015			0.6	2.0	3.0
PK36	July 2, 2015	4.3 over 2.6 m to 16.6 m depth in 318° direction	3.4 in October 2020	Operational	June 14, 2022	0.2	0.5	-0.3
		2.9 over 0.1 to 16.6 m depth in 318° direction	8.0 in September 2016			No discernible movement	N/A	-12.8
PK54	July 2, 2015	10.6 over 2.8 m to 20.4 m depth in 313° direction	12.0 in October 2020	Operational	June 14, 2022	<0.1	0.3	-2.6
		9.2 over 0.3 m to 20.4 m depth in 313° direction	13.3 in October 2020			0.1	0.4	-1.8

Drawings 32121-PH032-1~3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site



**TABLE PH032-1 – CONTINUED...
FALL 2022 – HWY 744:04 JUDAH HILL (MAKEOUT 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)
PK80	July 2, 2015	7.5 over 2.4 m to 20.0 m depth in 249° direction	-15.3 in July 2015	Operational	June 14, 2022	0.3	1.0	0.8
		5.5 over 0.5 m to 20.0 m depth in 249° direction	-20.7 in July 2015			No discernible movement	N/A	-10.8
MAKEOUT WALL								
PM12	July 3, 2015	0.1 over 2.2 m to 19.2 m depth in 316° direction	-41.3 in July 2015	Operational	June 14, 2022	No discernible movement	N/A	-7.8
		-1.9 over 0.3 m to 19.2 m depth in 316° direction	-52.8 in July 2015			No discernible movement	N/A	-8.6
PM24	July 3, 2015	1.5 over 2.1 m to 19.2 m depth in 298° direction	-27.4 in July 2015	Operational	June 14, 2022	No discernible movement	N/A	-3.5
		0.3 over 0.3 m to 19.2 m depth in 298° direction	-33.4 in July 2015			No discernible movement	N/A	-3.9

Drawings 32121-PH032-1~3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site



**TABLE PH032-2
FALL 2022 – HWY 744:04 JUDAH HILL (MAKEOUT 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 (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER ELEVATION (m)	PREVIOUS GROUNDWATER ELEVATION JUNE 14, 2022 (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN13-32-1S	November 30, 2013	9.14	499.84	Operational	493.56 in September 2022	1.3	493.56	490.83	2.70
PN13-32-1D	November 30, 2013	18.29	499.84	Operational	482.46 in December 2013	4.3	481.99	482.00	-0.01

Drawings 32121-PH032-1~3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site



**TABLE PH032-3
FALL 2022 – HWY 744:04 JUDAH HILL (MAKEOUT SLIDE)
LOAD CELL INSTRUMENTATION READING SUMMARY**

Date Monitored: September 28, 2022

ANCHOR NUMBER	LOAD CELL SERIAL #	DESIGN LOAD / LOCK-OFF LOAD (kN)	MAXIMUM RECORDED LOAD (kN)	RECORDED LOAD ⁽¹⁾ (SEPT 28, 2022) (kN)	PREVIOUS RECORDED LOAD ⁽¹⁾ (JUNE 14, 2022) (kN)	CHANGE IN LOAD SINCE PREVIOUS READING (kN)
KM 58 WALL						
K15M	VC1862	178/177	189.99 on April 3, 2022	175.94	180.00	-4.06
K15L	VC1858	239/231	259.39 on January 16, 2022	253.07	251.64	1.43
K36M	VC1856	233/199	207.69 on January 17, 2022	190.64	191.57	-0.93
K45L	VC1855	292/248	248.50 on April 20, 2015	221.75	220.70	1.05
K54M	VC1857	231/215	195.71 on April 17, 2015	190.58	190.49	0.09
K54L	VC1853	292/248	239.61 on April 10, 2015	234.52	231.24	3.28
K55U	VC1850	274/272	275.28 on April 17, 2015	238.43	241.18	-2.75
K79U	VC1859	274/272	250.27 on April 16, 2015	214.69	213.03	1.66
K79M	VC1860	231/215	214.85 on January 26, 2022	200.57	200.27	0.30
K80L	VC1861	292/248	261.61 on March 18, 2022	254.33	253.66	0.67

Drawings 32121-PH032-1~3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site

(1) Load cell data is recorded twice daily with datalogger on site. Dataloggers are uploaded twice annually during instrumentation readings. See Figure PH032-3 for combined historical instrument readings.



**TABLE PH032-3 – CONTINUED...
FALL 2022 – HWY 744:04 JUDAH HILL (MAKEOUT SLIDE)
LOAD CELLS INSTRUMENTATION READING SUMMARY**

Date Monitored: September 28, 2022

ANCHOR NUMBER	LOAD CELL SERIAL #	DESIGN LOAD / LOCK-OFF LOAD (kN)	MAXIMUM RECORDED LOAD (kN)	RECORDED LOAD ⁽¹⁾ (SEPT 28, 2022) (kN)	PREVIOUS RECORDED LOAD ⁽¹⁾ (JUNE 14, 2022) (kN)	CHANGE IN LOAD SINCE PREVIOUS READING (kN)
MAKEOUT WALL						
M12U	VC1854	274/272	277.02 on March 18, 2022	247.01	249.90	-2.89
M12M	VC1849	231/215	213.90 on March 25, 2015	199.50	199.42	0.08
M12L	VC1848	292/248	252.34 on March 18, 2022	245.31	243.73	1.58
M24U	VC1851	274/272	271.81 on March 25, 2015	243.31	246.30	-2.99
M24M	VC1852	231/215	217.10 on March 25, 2015	182.51	185.30	-2.79

Drawings 32121-PH032-1~3 in Appendix A provide a sketch of the approximate location of the monitoring instrumentation for this site

(1) Load cell data is recorded twice daily with datalogger on site. Dataloggers are uploaded twice annually during instrumentation readings. See Figure PH032-4 for combined historical instrument readings.



3. INTERPRETATION OF MONITORING RESULTS

At the KM 58 pile wall, PK15 showed a rate of movement of 5.3 mm/yr over the length of the pile and 2.0 mm/yr over the combined length of the pile and waler since the spring of 2022 readings. Since the completion of construction, PK15 has shown a total cumulative deflection over the length of the pile of 3.8 mm in the downslope direction and a total cumulative movement of 3.1 mm in the downslope direction over the combined length of the pile and waler.

PK36 showed a rate of movement of 0.5 mm/yr over the length of the pile and no discernible movement over the combined length of the pile and waler. Since completion of construction, PK36 has shown total cumulative deflections of 4.3 mm in the downslope direction over the length of the pile and 2.9 mm in the downslope direction over the combined length of the pile and waler.

PK54 showed a rate of movement of 0.3 mm/yr over the length of the pile and a rate of movement of 0.4 mm/yr over the combined length of the pile and waler. Since the completion of construction, PK54 has shown total cumulative movements of 10.6 mm in the downslope direction over the length of the pile and 9.2 mm in the downslope direction over the combined length of the pile and waler.

PK80 showed a rate of movement of 1.0 mm/yr over the length of the pile and no discernible movement over the combined length of the pile and waler. Since completion of construction, PK80 has shown 7.5 mm of total cumulative movement in the downslope direction over the length of the pile and 5.5 mm in the downslope direction over the combined length of the pile and waler.

The SIs at the KM 58 wall location show a current overall trend of slow downslope movement.

At the Makeout pile wall location, PM12 showed no discernible movement over the length of the pile or the combined length of the pile and waler. Since completion of construction, PM12 has shown total cumulative deflections of 0.1 mm in the downslope direction over the length of the pile and 1.9 mm in the upslope direction over the combined length of the pile and waler.

PM24 showed no discernible movement over the length of the pile or the combined length of the pile and waler. Since completion of construction, PM24 has shown total cumulative movements of 1.5 mm in the downslope direction over the length of the pile and 0.3 mm in the downslope direction over the combined length of the pile and waler.

The SIs at the Makeout wall location have not indicated a clear trend of downslope movement since the end of construction, however, there have been minor seasonal changes in the wall displacement.

Pneumatic piezometer PN13-32-1S showed an increase in groundwater level of 2.70 m since the spring of 2022 readings. The current water level reading in PN13-32-1S is the highest since the instrument was initialized. PN13-32-1D showed a decrease in groundwater level of 0.01 m since the spring of 2022 readings. Pneumatic piezometer results are summarized in Table PH032-2, and are plotted in Figures PH032-1 (by elevation) and PH032-2 (by depth below ground surface) in Appendix A.



The load cells are connected to two dataloggers that are programmed to take two readings per day. Since the spring of 2022 readings, the load cells at the KM 58 wall showed a mix of increases and decreases in measured load, ranging from a decrease of 4.06 kN in VC1862 (anchor K15M) to an increase of 3.28 kN in VC1862 (anchor K54L). The anchors at the KM 58 wall show an overall trend of slowly increasing load, with seasonally higher loads during the winter months. The peak loads measured in the load cells correspond to frost penetration, and the peak anchor loads in some of the anchors appear to follow a period of extreme cold weather in late December 2021 to early January 2022. It should also be noted that load cell VC1858 (anchor K15L) is showing loads that are higher than the SLS design load.

At the Makeout wall, the load cells showed a mix of increases and decreases in measured load ranging from a decrease of 2.99 kN in VC1851 (anchor M24U) to an increase of 1.58 kN in VC1848 (anchor M12L). The load cells at the Makeout wall have shown an overall trend of relatively stable loads since the end of construction, with seasonably higher loads during the winter months.

The load cell information is summarized in Table PH032-3. The load cell average loads and temperatures are plotted for the KM 58 and Makeout walls on Figures PH032-3 and PH032-4, respectively, in Appendix A. The design and lock-off loads for each anchor are shown in the legends of the figures.

Overall, the SI and load cell data indicates that the pile walls have been effective at mitigating the landslide movements at this site and the measured deflections and anchor loads are within expected ranges. However, since the instruments at the KM 58 pile wall are showing a trend of downslope movement, combined with gradually increasing anchor loads, the instruments here should be monitored closely to ensure that the downslope movement doesn't begin to accelerate.

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
/jf

Attachments:

- Statement of Limitations and Conditions
- Appendix A
 - Field Inspector's report
 - Site Plan Showing Approximate Instrument Locations (Drawings No. 32121-PH032-1, 32121-PH032-2, and 32121-PH032-3)
 - SI Reading Plots
 - Figure PH032-1 (Piezometric Elevations)
 - Figure PH032-2 (Piezometric Depths)
 - Figure PH032-3 (Load Cell Data for Km 58 Pile Wall)
 - Figure PH032-4 (Load Cell Data for Makeout Pile Wall)



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 PH032: HWY 744:04, JUDAH HILL (MAKEOUT SLIDE)

**ALBERTA TRANSPORTATION
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (PH032)
FALL 2022**

Location: Makeout Slide - Judah Hill (HWY 744:04 C1 57.924)	Readout: RST PN C108 Unit 1
File Number: 32121	Casing: 2.75
Probe: RST SI SET 5R	Temp: 26
Cable: RST SI SET 5R	Read by: KTC/NKR

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-		
PK15	483237	6229841	28-Sep-22	1.21	48 to 2	245	381	-367	541	-555	5R/5R	
PK36	483225	6229863	28-Sep-22	0.80	56 to 2	310	-202	217	-40	23	5R/5R	
PK54	483214	6229882	28-Sep-22	1.20	70 to 2	300	700	694	-156	137	5R/5R	
PK80	483199	6229909	28-Sep-22	0.99	68 to 2	225	-412	428	214	-236	5R/5R	
PM12	483157	6229989	28-Sep-22	1.18	66 to 2	275	-855	865	826	-848	5R/5R	
PM24	483151	6230002	28-Sep-22	1.22	66 to 2	260	495	-481	506	-524	5R/5R	

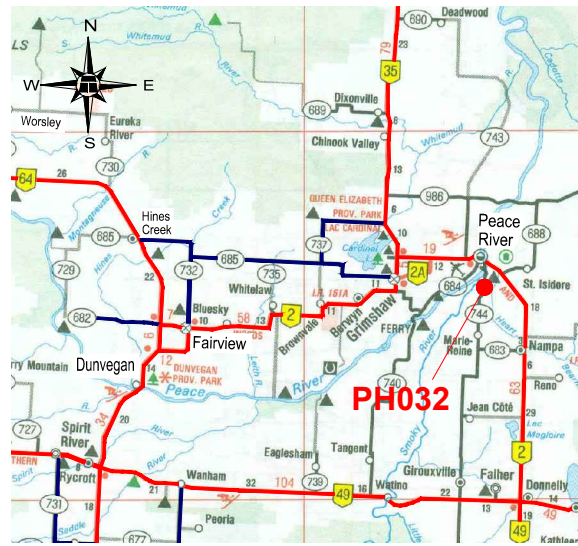
PN#	GPS Location (NAD83)		Date	Reading (kPa)	Identification Number
	Easting (m)	Northing (m)			
PN13-32-1S	483205	6229901	28-Sep-22	27.5-28.7 Fluctuates	35485
PN13-32-1D	483205	6229901	28-Sep-22	4.3	35497

VIBRATING WIRE LOAD CELL (VC) READINGS

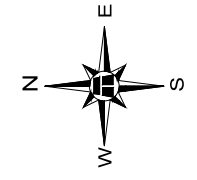
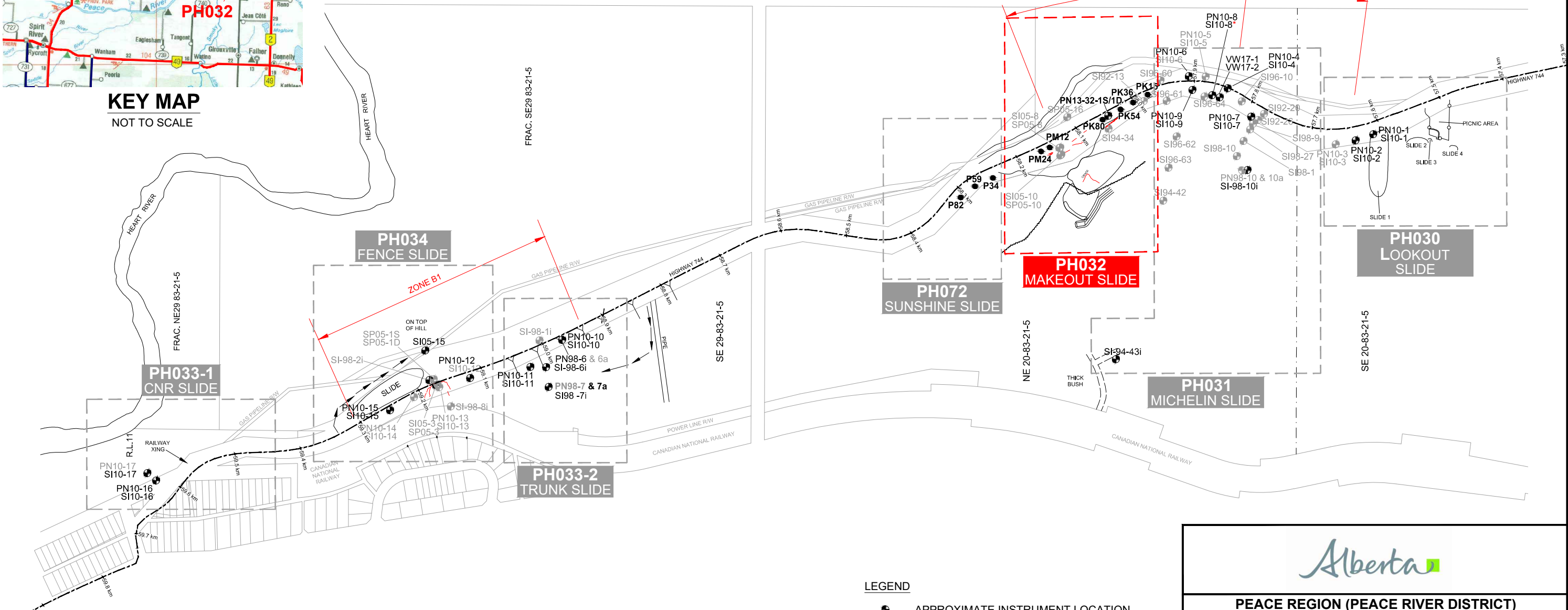
VC #	GPS Location (UTM 11)		Datalogger Serial #	Date	Comment
	Easting (m)	Northing (m)			
VC1850			RST 2034	28-Sep-22	Downloaded
VC1853					Downloaded
VC1855					Downloaded
VC1856					Downloaded
VC1857					Downloaded
VC1858					Downloaded
VC1859					Downloaded
VC1860					Downloaded
VC1861					Downloaded
VC1862					Downloaded
VC1848			RST 2036		Downloaded
VC1849					Downloaded
VC1851					Downloaded
VC1852					Downloaded
VC1854					Downloaded

INSPECTOR REPORT


PN 13-32-1S Reading doesn't stabilize when bypass open, possibly damaged. When bypass closed, reading stabilized at 1.3kPa



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)

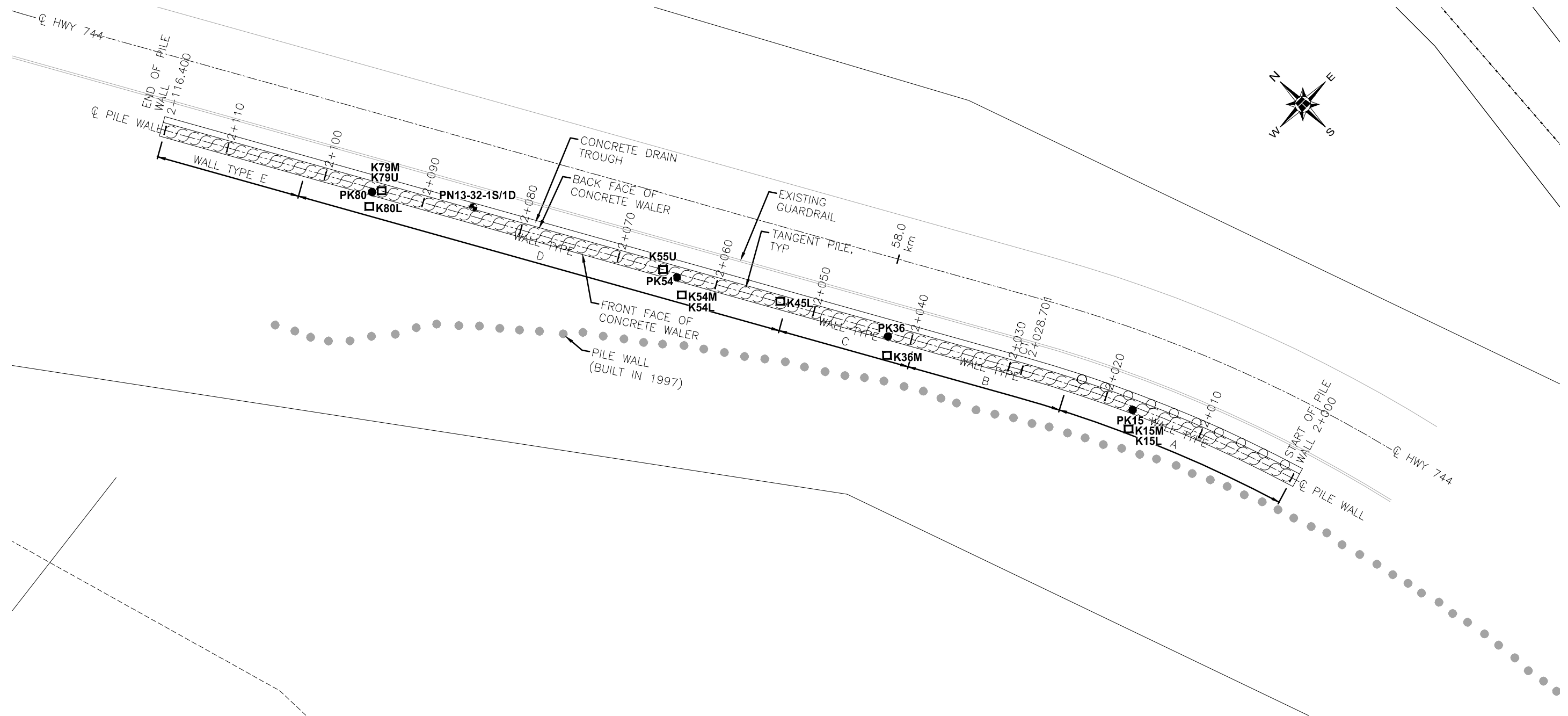
**PH032: HWY 744:04 - JUDAH HILL
(MAKEOUT SLIDE)
INSTRUMENT LOCATIONS**

DWG No. 32121-PH032-1

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



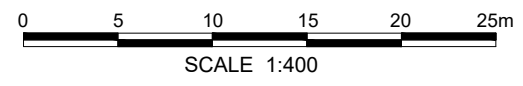
THURBER ENGINEERING LTD.




LEGEND

- APPROXIMATE PILE LOCATION (2016)
- PN APPROX. PNEUMATIC PIEZOMETER LOCATION
- APPROX. LOAD CELL LOCATION
- APPROXIMATE PILE LOCATION (1997)

PILE NO.	NORTHING (m)	EASTING (m)
PK15	6229841.349	483237.014
PK36	6229863.530	483225.073
PK54	6229882.353	483214.478
PK80	6229909.542	483199.175






PEACE REGION (PEACE RIVER DISTRICT)

PH032: HWY 744: 04 - JUDAH HILL (MAKEOUT SLIDE)
km 58 PILE WALL
INSTRUMENT LOCATIONS

DWG No. 32121-PH032-2

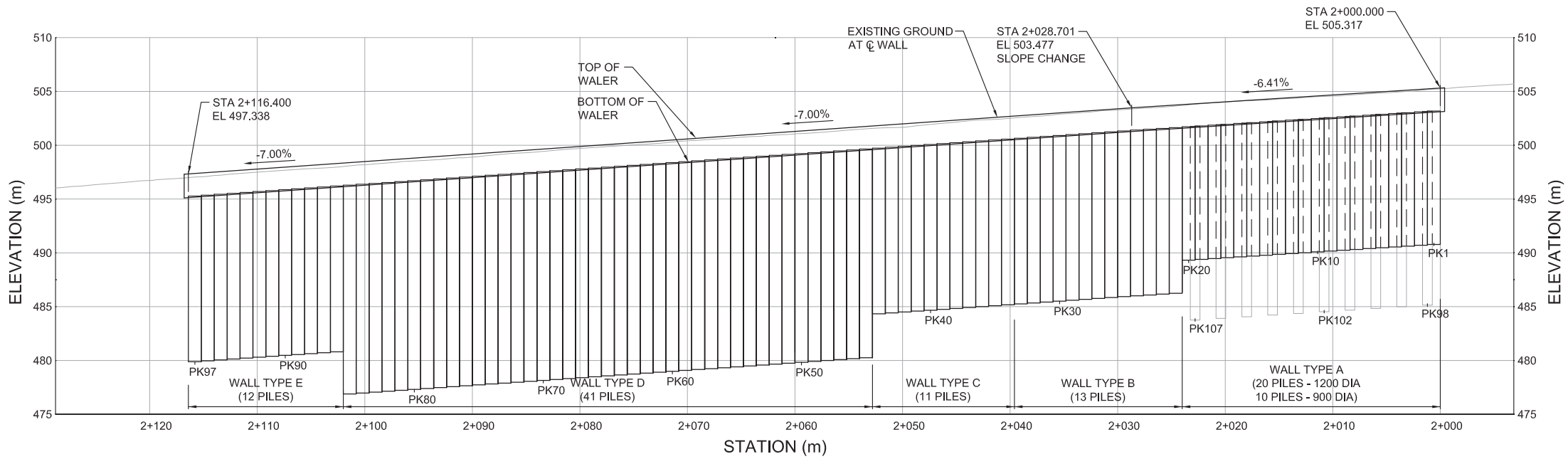
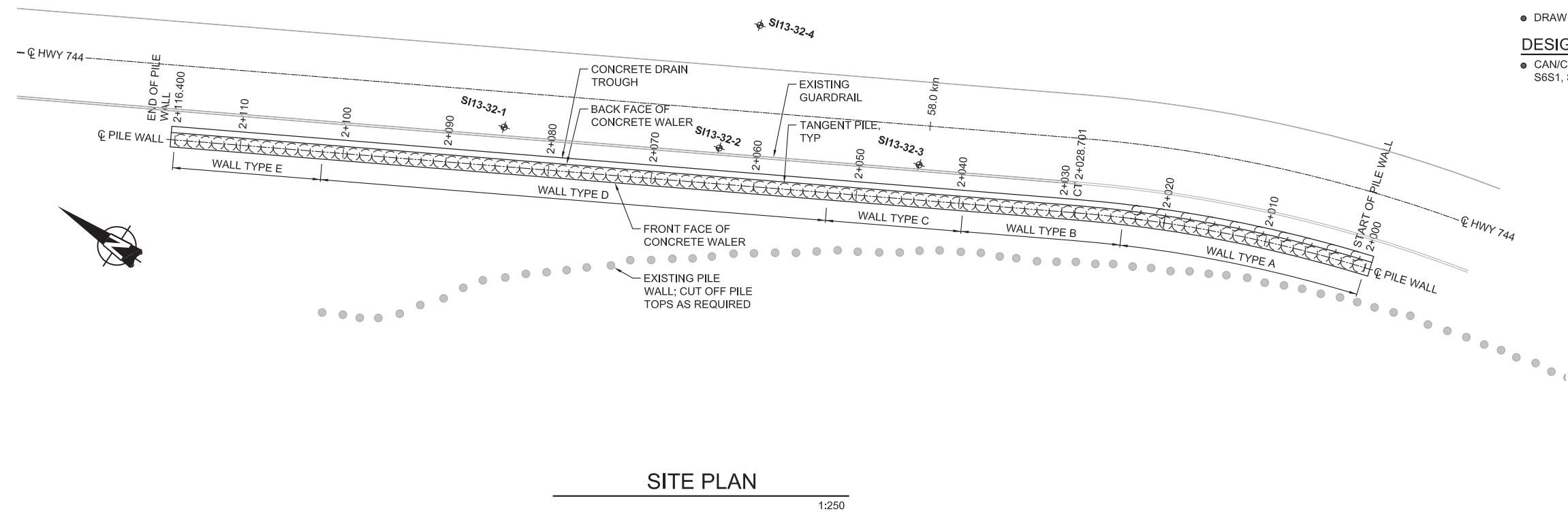
DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	1:400
DATE	SEPTEMBER 2021
FILE No.	32121



THURBER ENGINEERING LTD.

PLAN DESCRIPTION KM 58 LANDSLIDE PILE RETAINING WALL GENERAL LAYOUT		BAR CODE		RD-19071-C		15153		PH72	
CONTRACT No.		SITE No.		CONTRACT No.		SITE No.		CONTRACT No.	
TITLE SEARCH DATE		GRAPHICS FILE		DATE		DATE		DATE	
MAR 2014		MAR 2014		MAR 2014		MAR 2014		MAR 2014	
BY		DATE		BY		DATE		BY	
SLB		2016-12-16		SLB		2016-12-16		SLB	
SURVEYED		DESIGNED		CHECKED		DRAWN		DATE	
NSR		NSR		NSR		NSR		NSR	
MT/SLB		MT/SLB		MT/SLB		MT/SLB		MT/SLB	
REVISION		REVISION		REVISION		REVISION		REVISION	
NO.		DATE		NO.		DATE		NO.	
1		2016-12-16		1		2016-12-16		1	

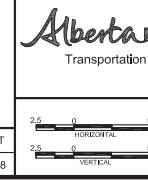
- GENERAL NOTES**
- ALL DIMENSIONS SHOWN ON THE PILE WALL GENERAL LAYOUT ARE GIVEN IN METRES. ALL OTHER PILE WALL DRAWINGS ARE DIMENSIONED IN MILLIMETRES EXCEPT FOR STATIONS AND ELEVATIONS WHICH ARE GIVEN IN METRES.
 - DRAWING SCALES ARE BASED ON PLOTTING FULL SIZE (22"x34")
- DESIGN**
- CAN/CSA S6-06 CANADIAN HIGHWAY BRIDGE DESIGN CODE + SUPPLEMENTS S6S1, S6S2, AND S6S3

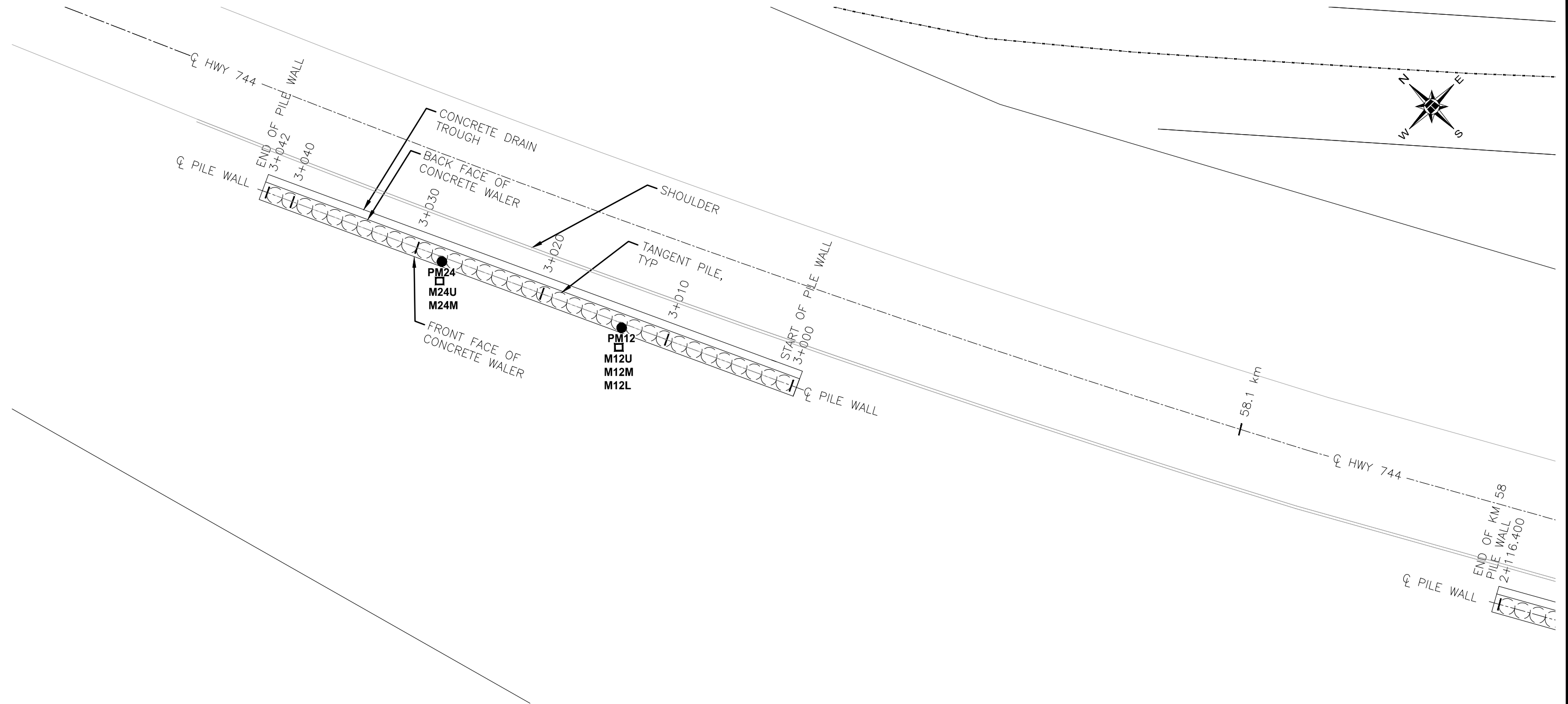


ELEVATION - PILE WALL
SHOWN ALONG PILE WALL CENTRELINE 1:250

THIS RECORD DRAWING INDICATES THAT THE CONSTRUCTED PROJECT SUBSTANTIALLY COMPLIES WITH THE DESIGN DRAWINGS AND ALL APPROPRIATE CONTRACT PLANS AND SPECIFICATIONS.

CONSULTANT JOB No. 15-16-288 PLAN No. RD-19071-C THURBER ENGINEERING LTD. DIALOG		PERMIT TO PRACTICE PERMIT TO PRACTICE DIALOG ALBERTA ARCHITECTURE ENGINEERING INTERIOR DESIGN PLANNING INC. ORIGINAL SIGNED AND STAMPED By: N. S. ROBSON On: DEC 16, 2016 PERMIT NUMBER: P 10020 The Association of Professional Engineers, Geologists and Geophysicists of Alberta	DESIGNER ORIGINAL DOCUMENT STAMPED AND SIGNED BY: S. L. BROWN ON: MAR 7, 2014	FIELD REVIEW ENGINEER ORIGINAL DOCUMENT STAMPED AND SIGNED BY: S. L. BROWN ON: DEC 16, 2016	<p align="center">KM 58 LANDSLIDE PILE RETAINING WALL GENERAL LAYOUT</p> <table border="1"> <tr> <td>REGION</td> <td>SITE No.</td> <td>PLAN No.</td> <td>PROJECT</td> <td>CONTRACT No.</td> <td>SHEET</td> </tr> <tr> <td>PEACE</td> <td>PH72</td> <td>RD-19071-C</td> <td>744:04</td> <td>15153</td> <td>38 of 48</td> </tr> </table>		REGION	SITE No.	PLAN No.	PROJECT	CONTRACT No.	SHEET	PEACE	PH72	RD-19071-C	744:04	15153	38 of 48
REGION	SITE No.	PLAN No.	PROJECT	CONTRACT No.	SHEET													
PEACE	PH72	RD-19071-C	744:04	15153	38 of 48													

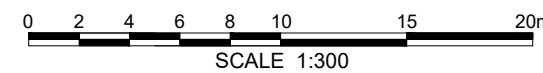





LEGEND

- APPROXIMATE PILE LOCATION
- APPROX. LOAD CELL LOCATION

PILE NO.	NORTHING (m)	EASTING (m)
PM12	6229989.636	483157.061
PM24	6230002.710	483151.024






PEACE REGION (PEACE RIVER DISTRICT)

**PH032: HWY 744: 04 - JUDAH HILL (MAKEOUT SLIDE)
MAKEOUT PILE WALL
INSTRUMENT LOCATIONS**

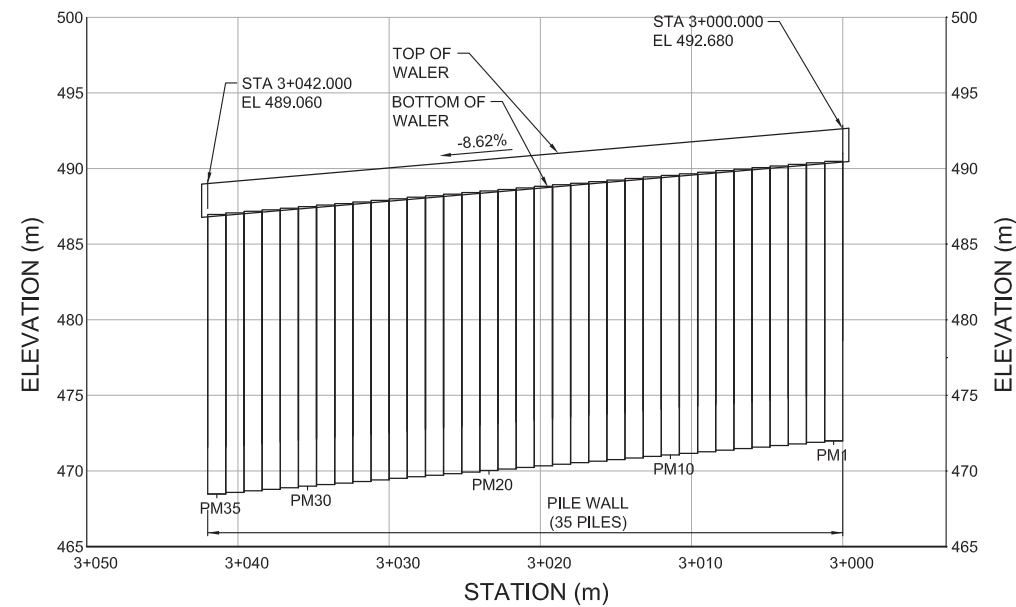
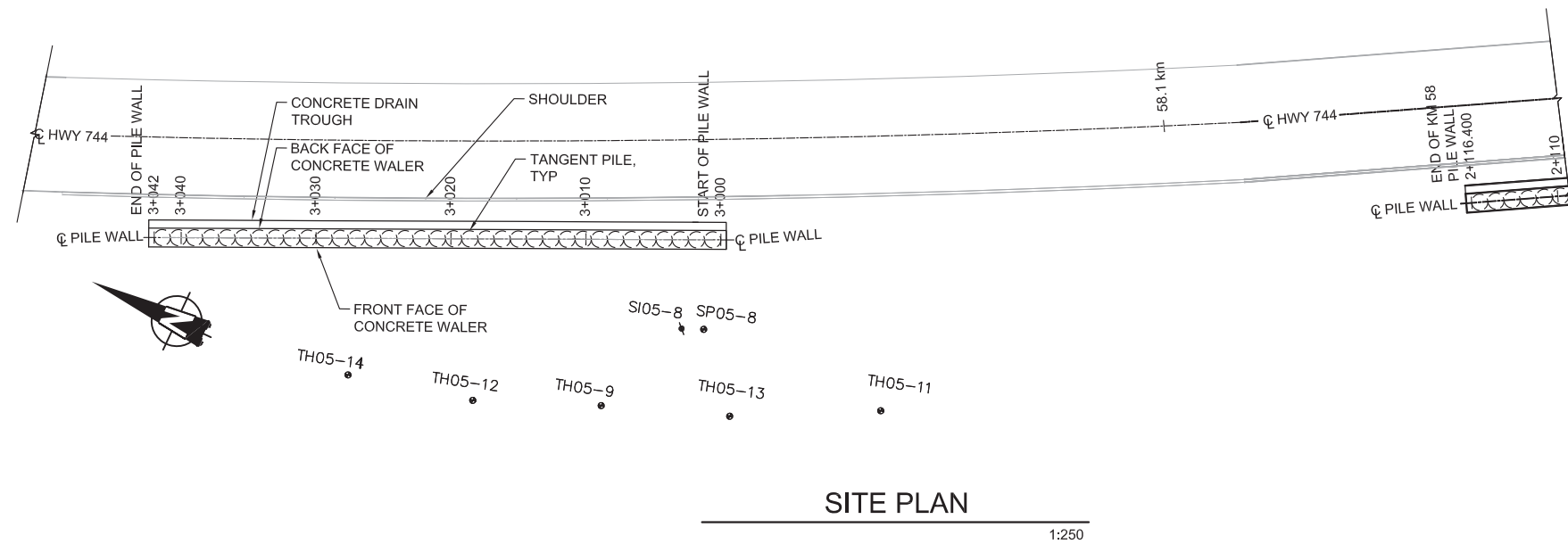
DWG No. 32121-PH032-3

DRAWN BY	ML
DESIGNED BY	BWN
APPROVED BY	DWP
SCALE	1:300
DATE	SEPTEMBER 2021
FILE No.	32121



THURBER ENGINEERING LTD.

PLAN DESCRIPTION MAKEOUT LANDSLIDE PILE RETAINING WALL GENERAL LAYOUT	BAR CODE	RD-19078-C	15153	PH72
PLAN No.	CONTRACT No.	SITE No.		
PHOTO No.	TITLE SEARCH DATE	GRAPHICS FILE		
DATE	BY	DESIGNED	CHECKED	DRAWN
MAR 2014	SLB	NSR	MT/SLB	
MAR 2014				
DEC 2016				
REVISION	RECORD DRAWING			
DATE	BY	DATE	BY	DATE
2016-12-16	SLB			



ELEVATION - PILE WALL
SHOWN ALONG PILE WALL CENTRELINE 1:250

THIS RECORD DRAWING INDICATES THAT THE CONSTRUCTED PROJECT SUBSTANTIALLY COMPLIES WITH THE DESIGN DRAWINGS AND ALL APPROPRIATE CONTRACT PLANS AND SPECIFICATIONS.

GENERAL NOTES

- ALL DIMENSIONS SHOWN ON THE PILE WALL GENERAL LAYOUT ARE GIVEN IN METRES. ALL OTHER PILE WALL DRAWINGS ARE DIMENSIONED IN MILLIMETRES EXCEPT FOR STATIONS AND ELEVATIONS WHICH ARE GIVEN IN METRES.
 - DRAWING SCALES ARE BASED ON PLOTTING FULL SIZE (22"x34")
- DESIGN**
- CAN/CSA S6-06 CANADIAN HIGHWAY BRIDGE DESIGN CODE + SUPPLEMENTS S6S1, S6S2, AND S6S3

ITEM	UNIT	TOT EST	AS CONST
REINFORCING STEEL PLAIN	kg	87 570	-
CONCRETE - CLASS C	m ³	100	-
CONCRETE - CLASS PILE	m ³	730	-
DRILLED CONCRETE PILES	DRILL RIG SET-UP	PILE	35
	PILE INSTALLATION	m	644
QUANTITY ESTIMATE			

CONSULTANT

JOB No. 15-16-288 PLAN No. RD-19078-C

DIALOG

PERMIT TO PRACTICE

PERMIT TO PRACTICE
DIALOG ALBERTA ARCHITECTURE ENGINEERING
INTERIOR DESIGN PLANNING INC.
ORIGINAL SIGNED AND STAMPED
By: N. S. ROBSON
On: DEC 16, 2016
PERMIT NUMBER: P 10020
The Association of Professional Engineers,
Geologists and Geophysicists of Alberta

DESIGNER

ORIGINAL DOCUMENT
STAMPED AND
SIGNED BY:
S. L. BROWN
ON: MAR 25, 2014

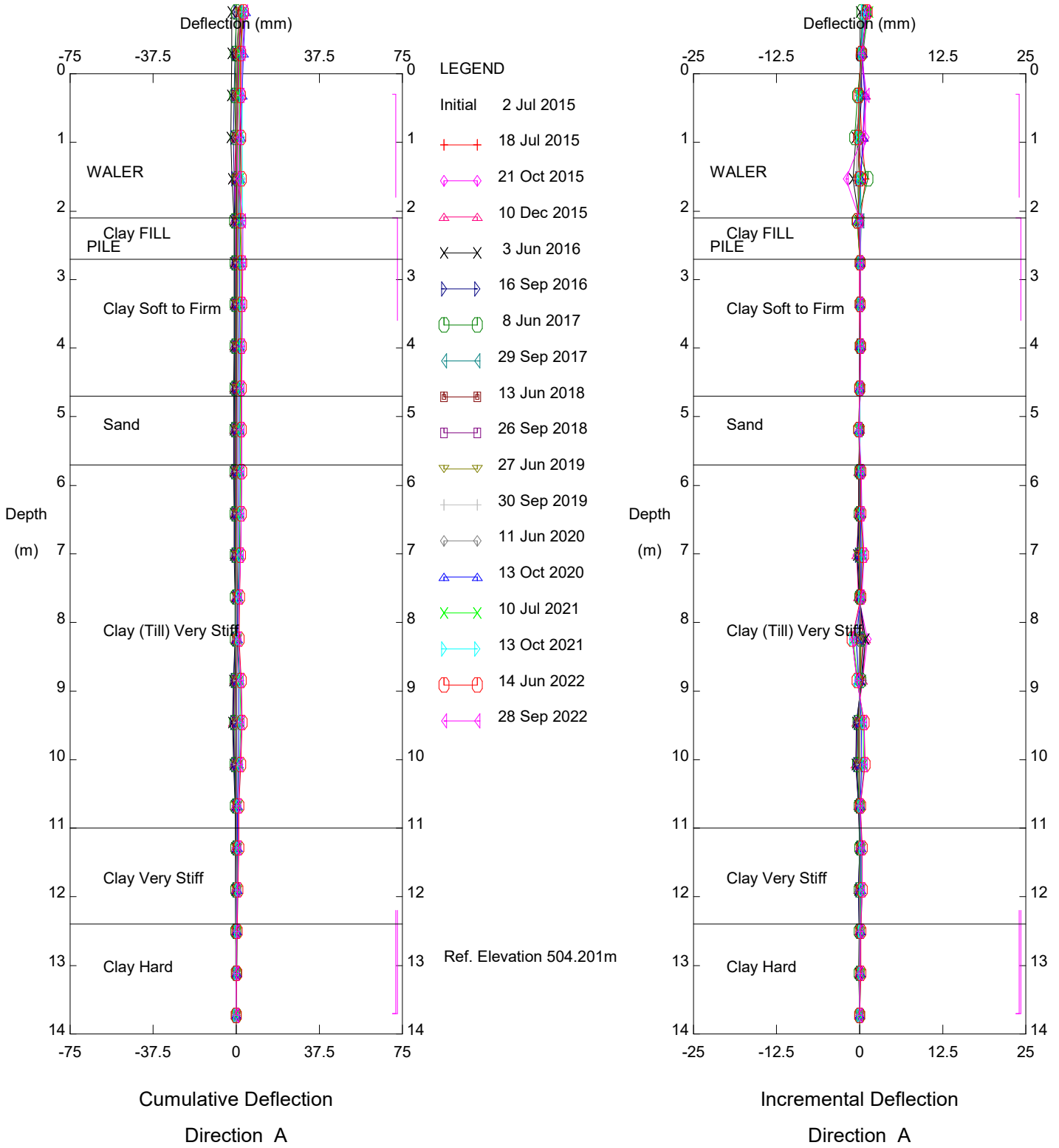
FIELD REVIEW ENGINEER

ORIGINAL DOCUMENT
STAMPED AND
SIGNED BY:
S. L. BROWN
ON: DEC 16, 2016

**MAKEOUT LANDSLIDE
PILE RETAINING WALL
GENERAL LAYOUT**

REGION	SITE No.	PLAN No.	PROJECT	CONTRACT No.	SHEET
PEACE	PH72	RD-19078-C	744204	15153	45 of 48

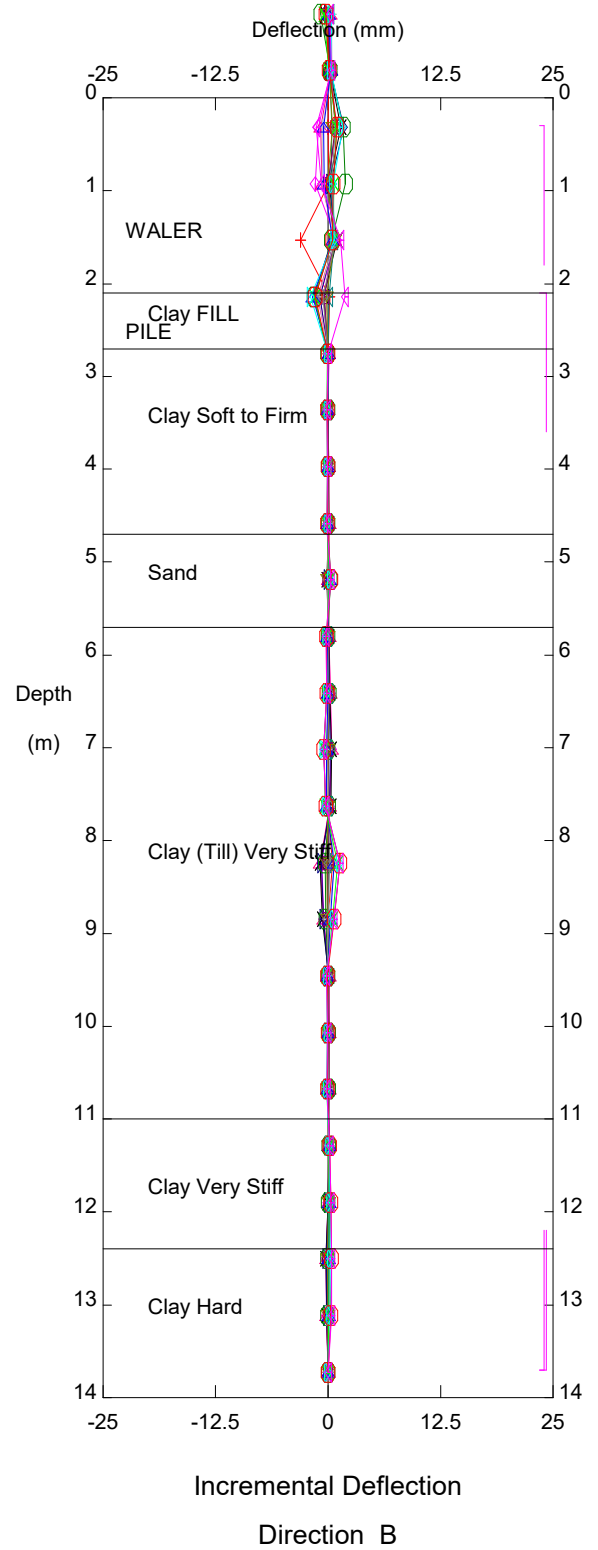
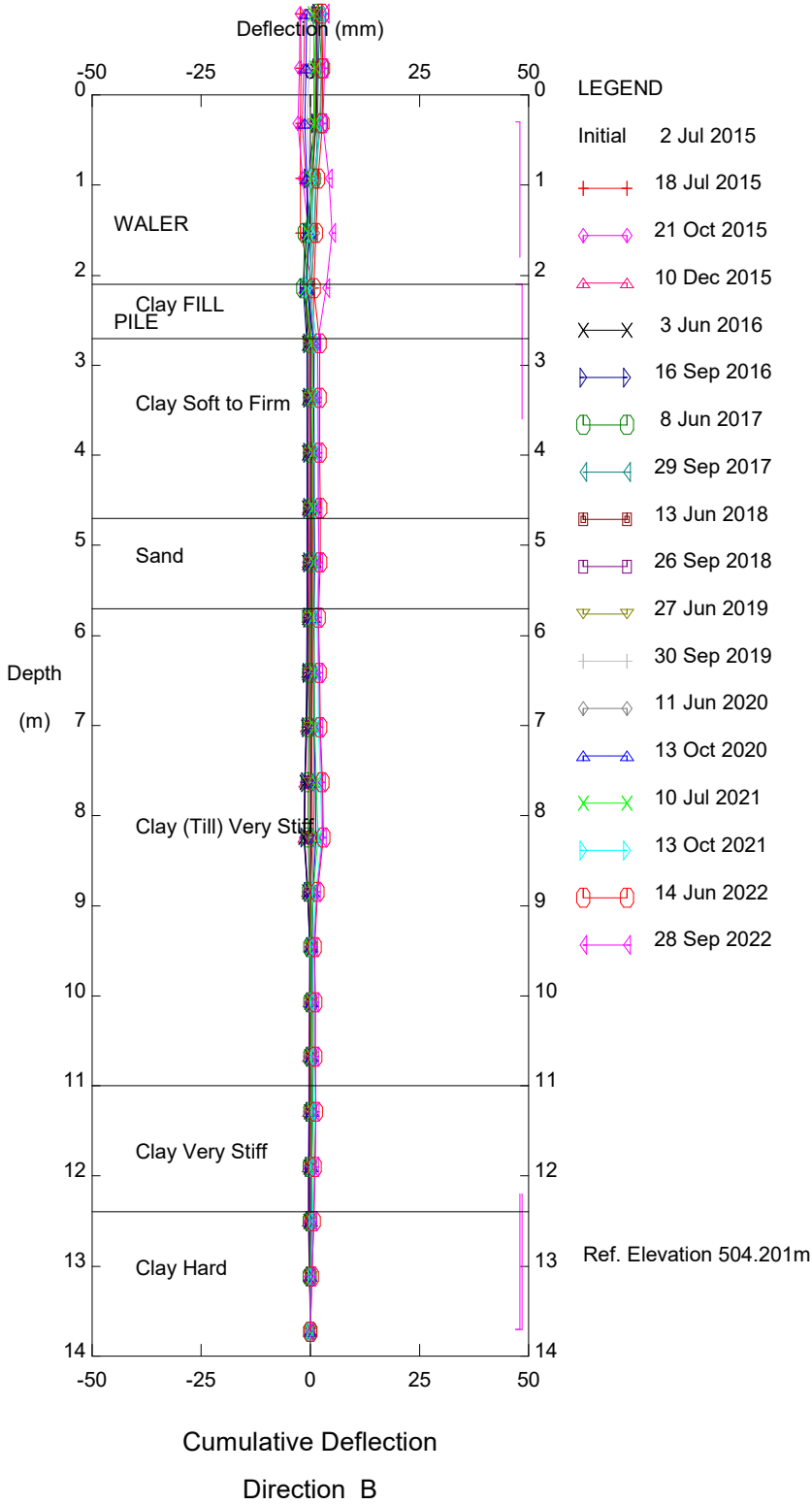
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PH032 KM 58 (Post Construction), Inclinometer PK15

Alberta Transportation

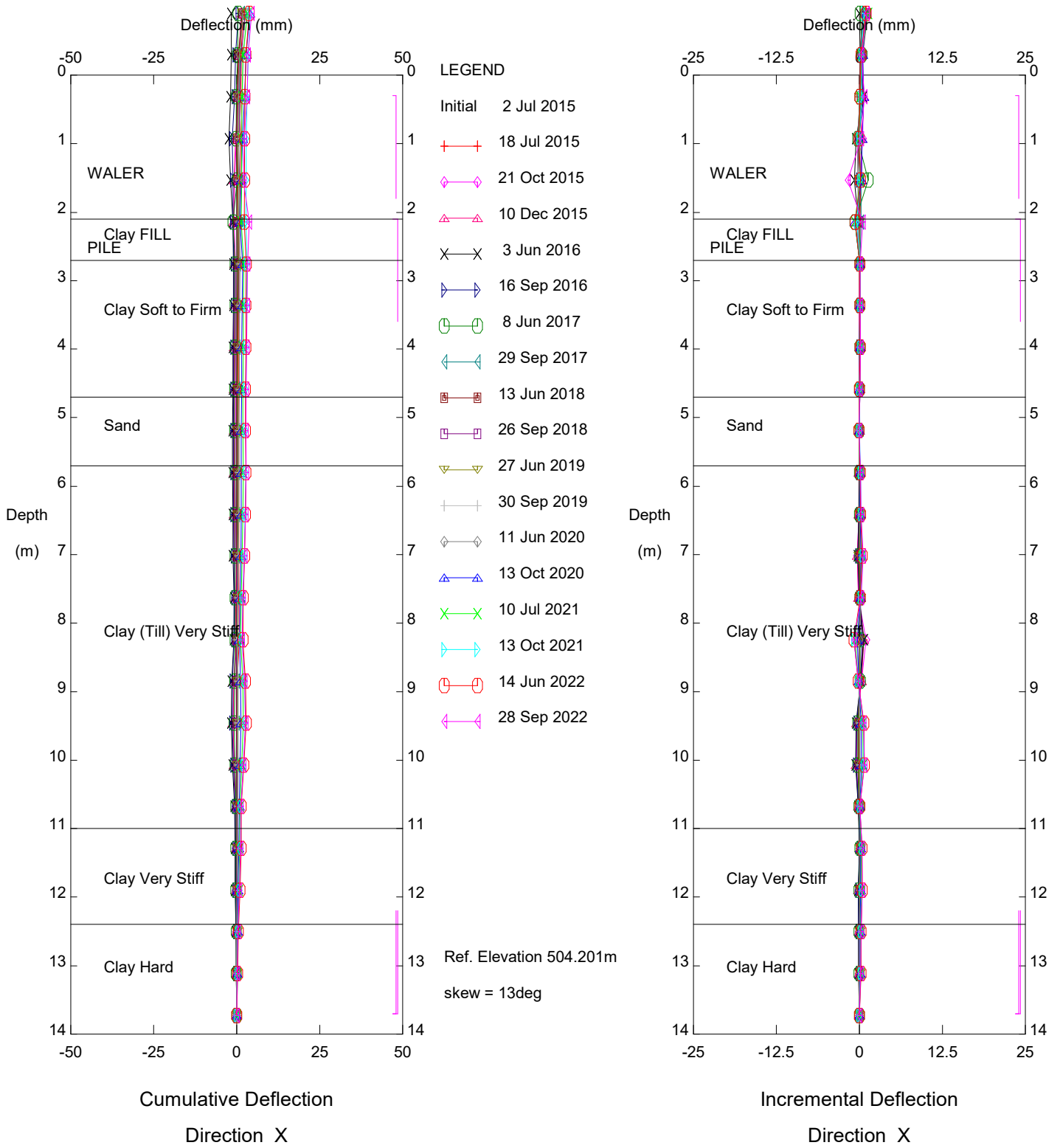
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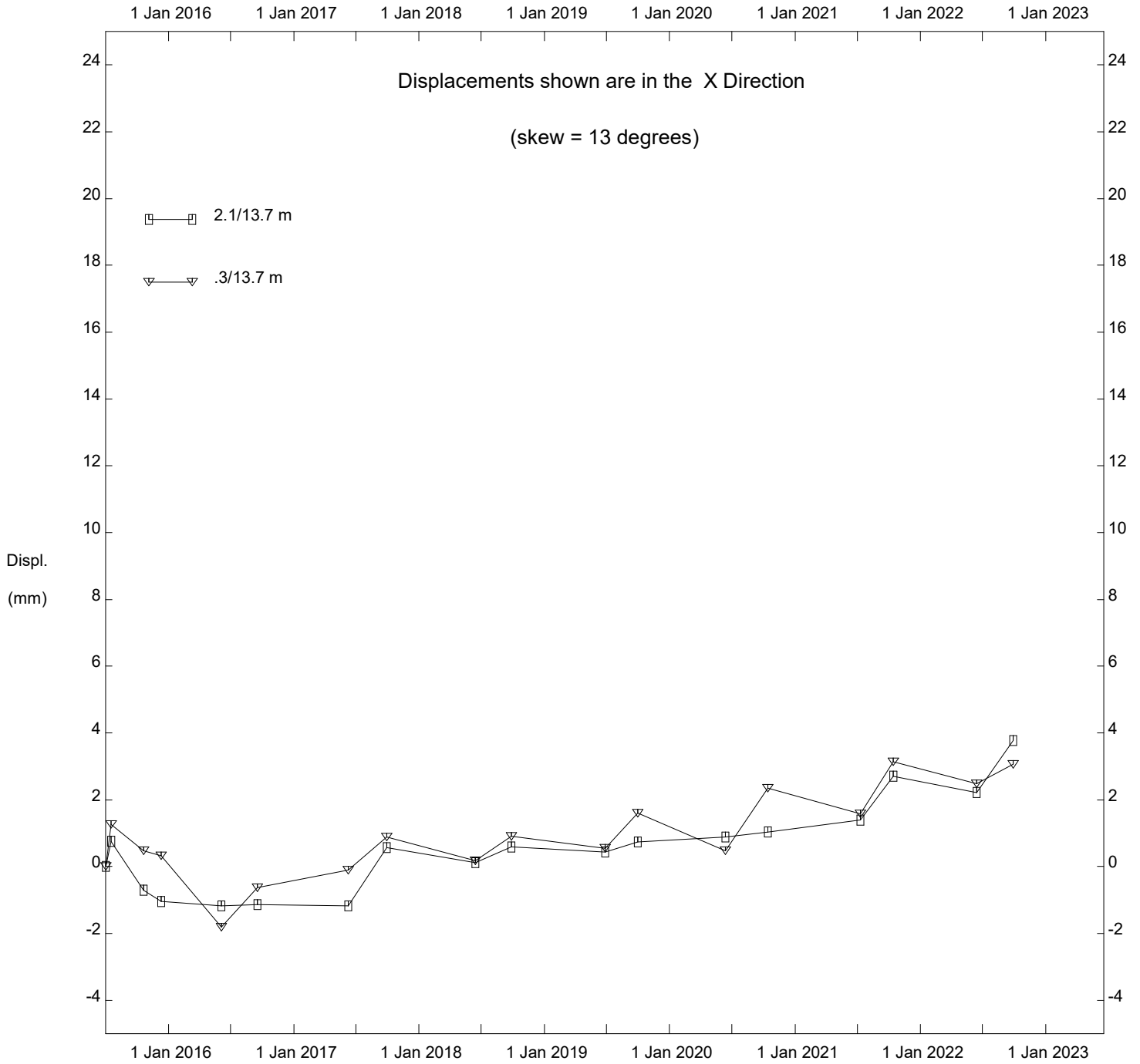
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PH032 KM 58 (Post Construction), Inclinometer PK15

Alberta Transportation

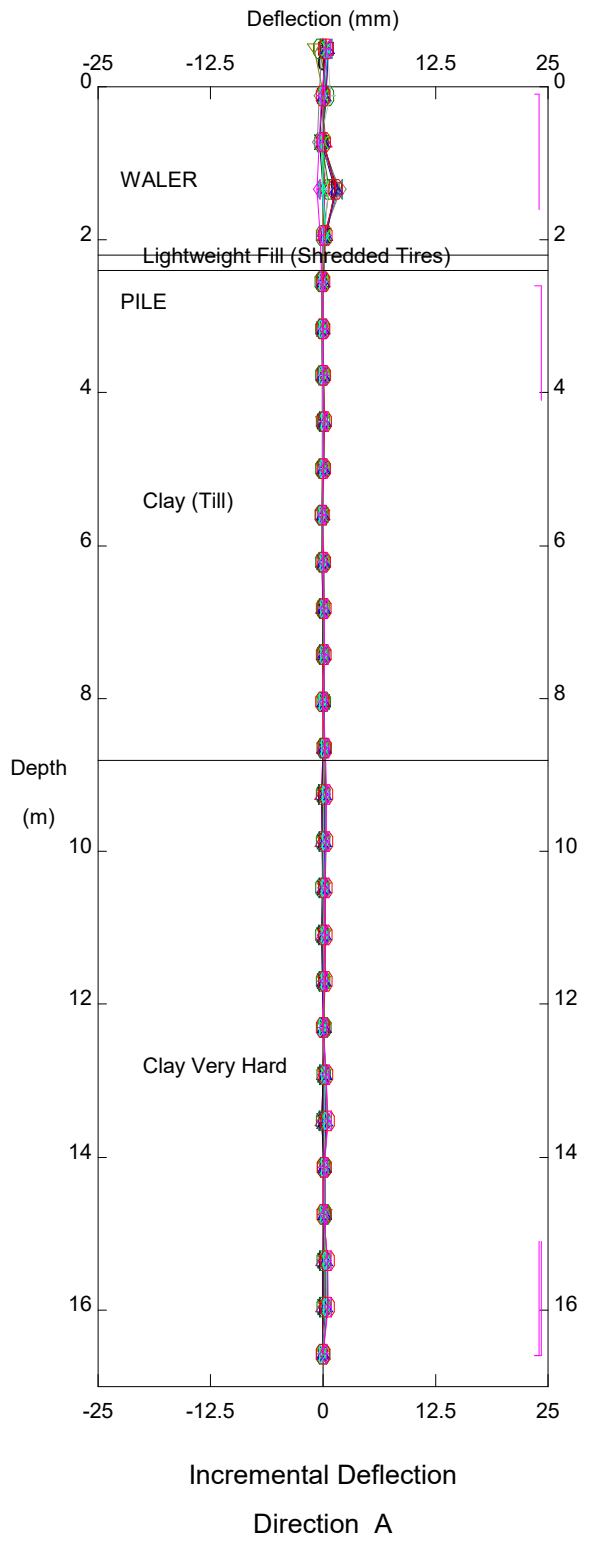
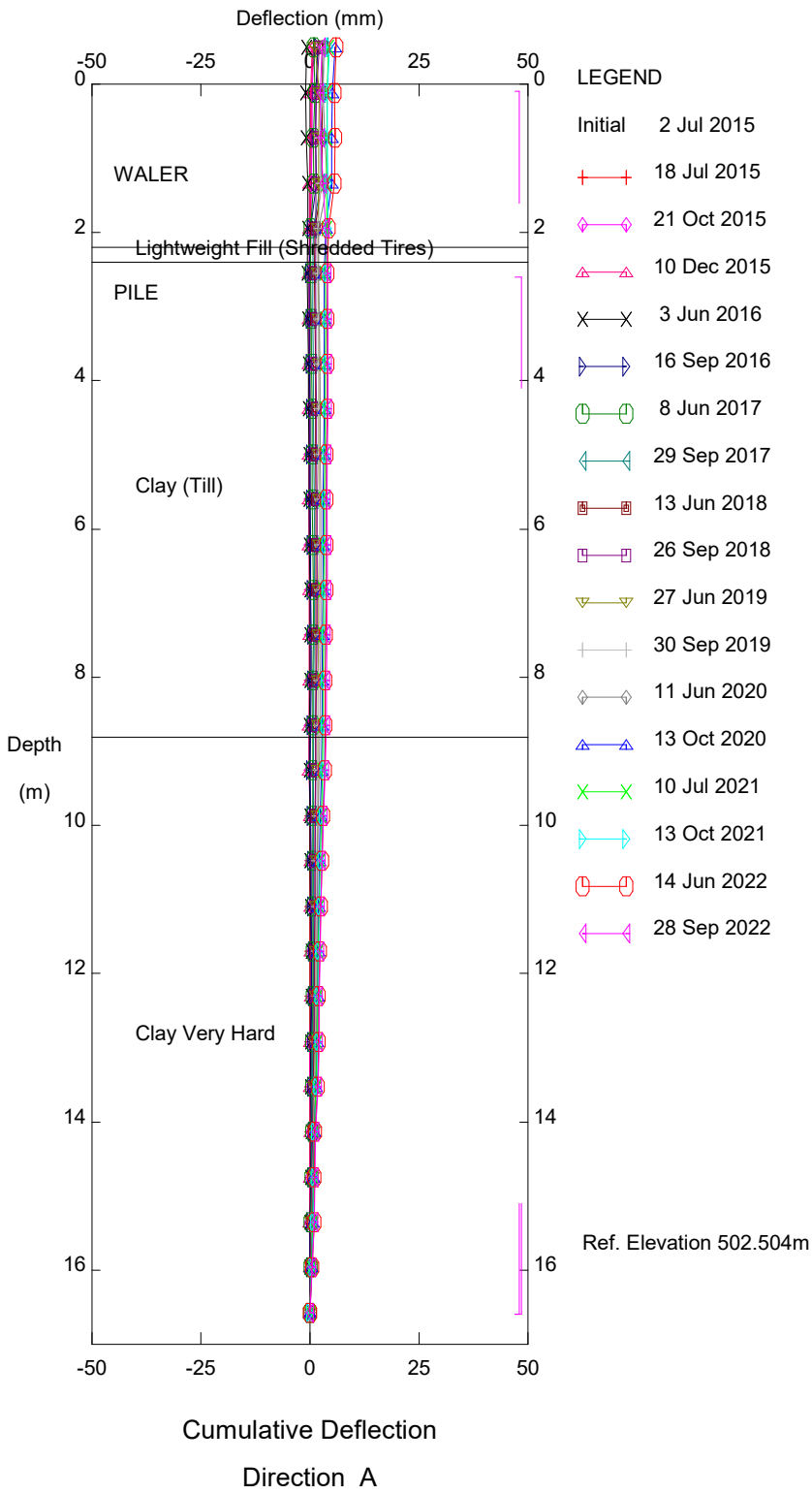
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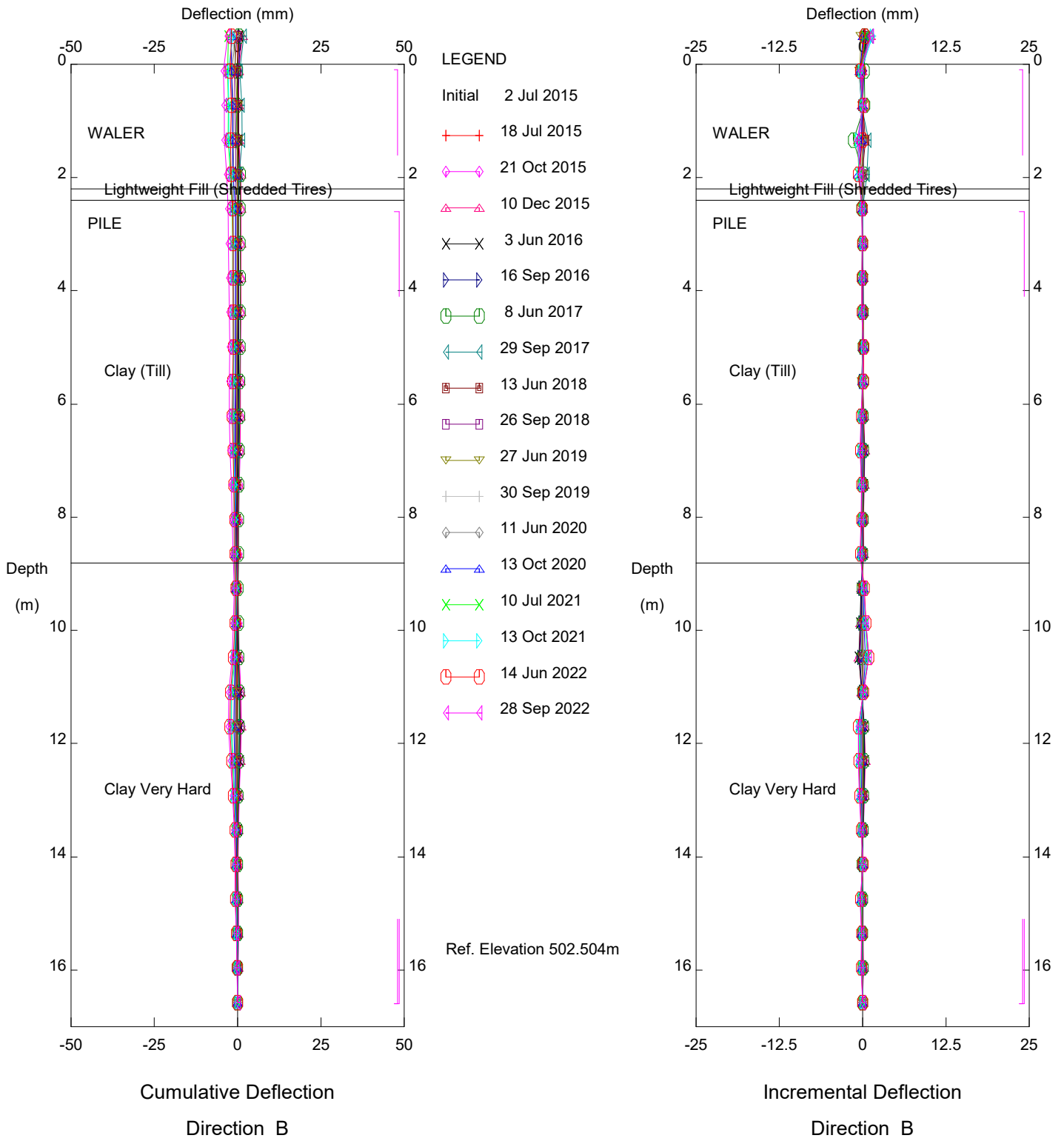
Alberta Transportation

Thurber Engineering Ltd.



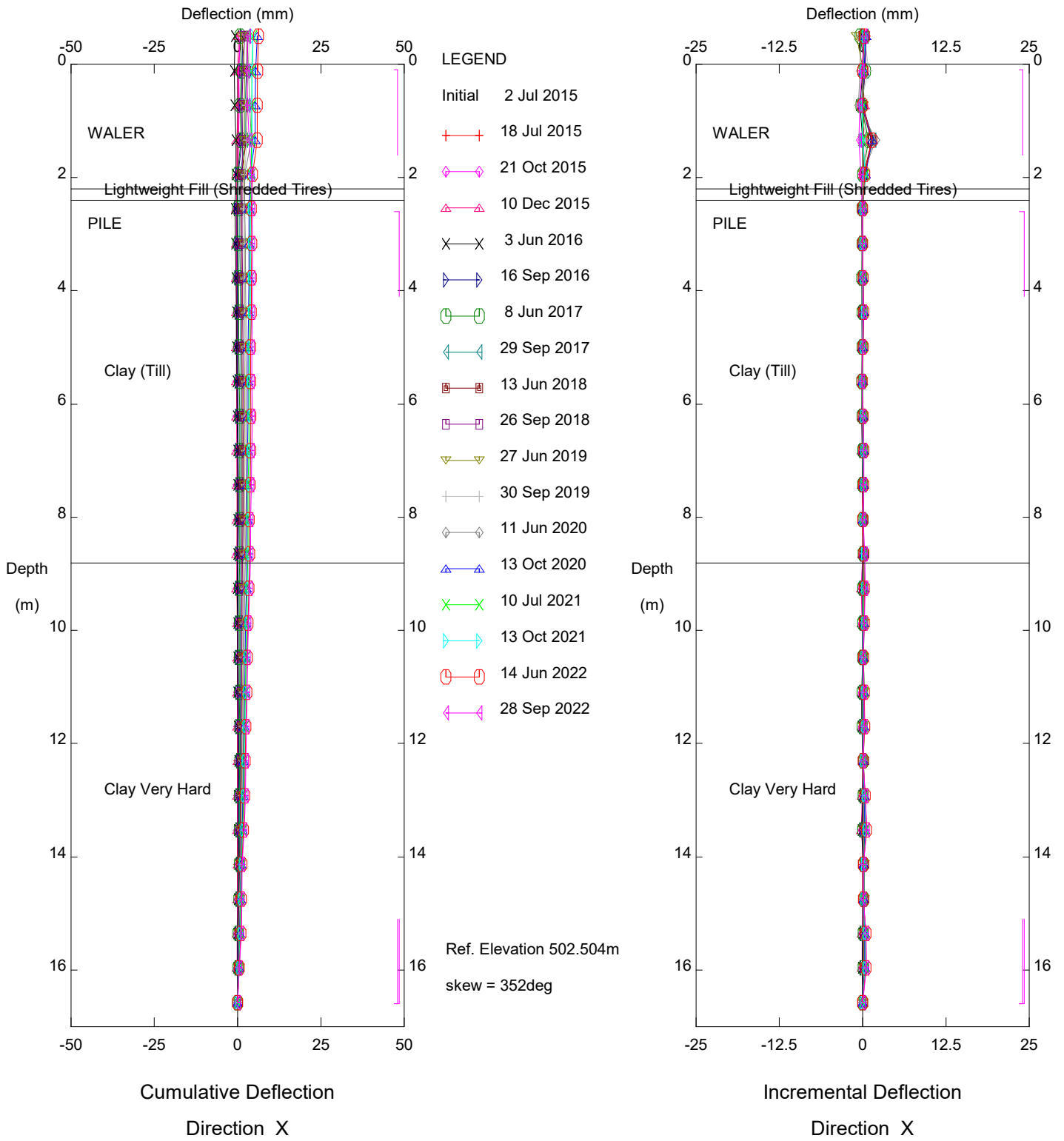
PH032 KM 58 (Post Construction), Inclinometer PK36

Alberta Transportation



PH032 KM 58 (Post Construction), Inclinometer PK36

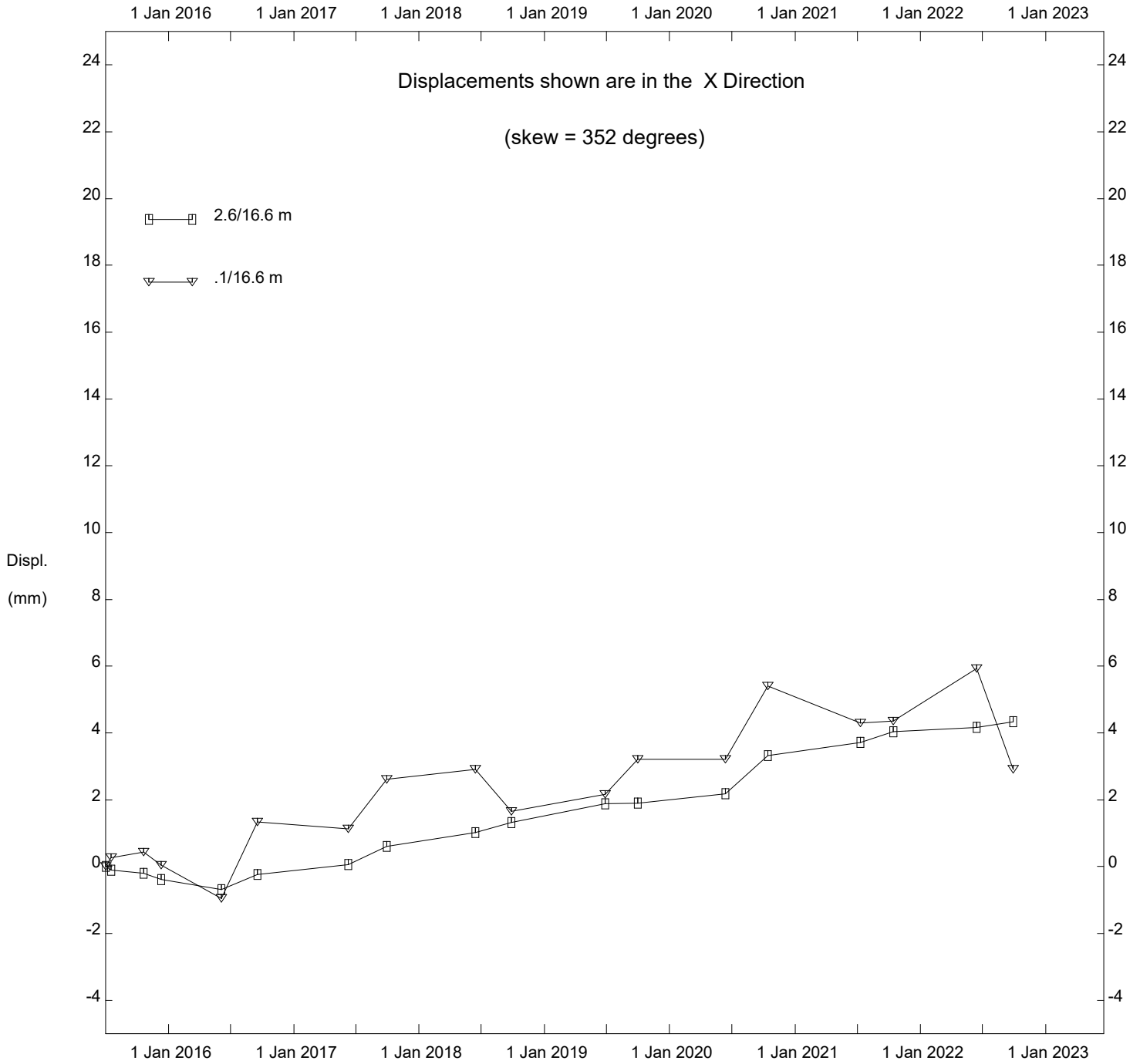
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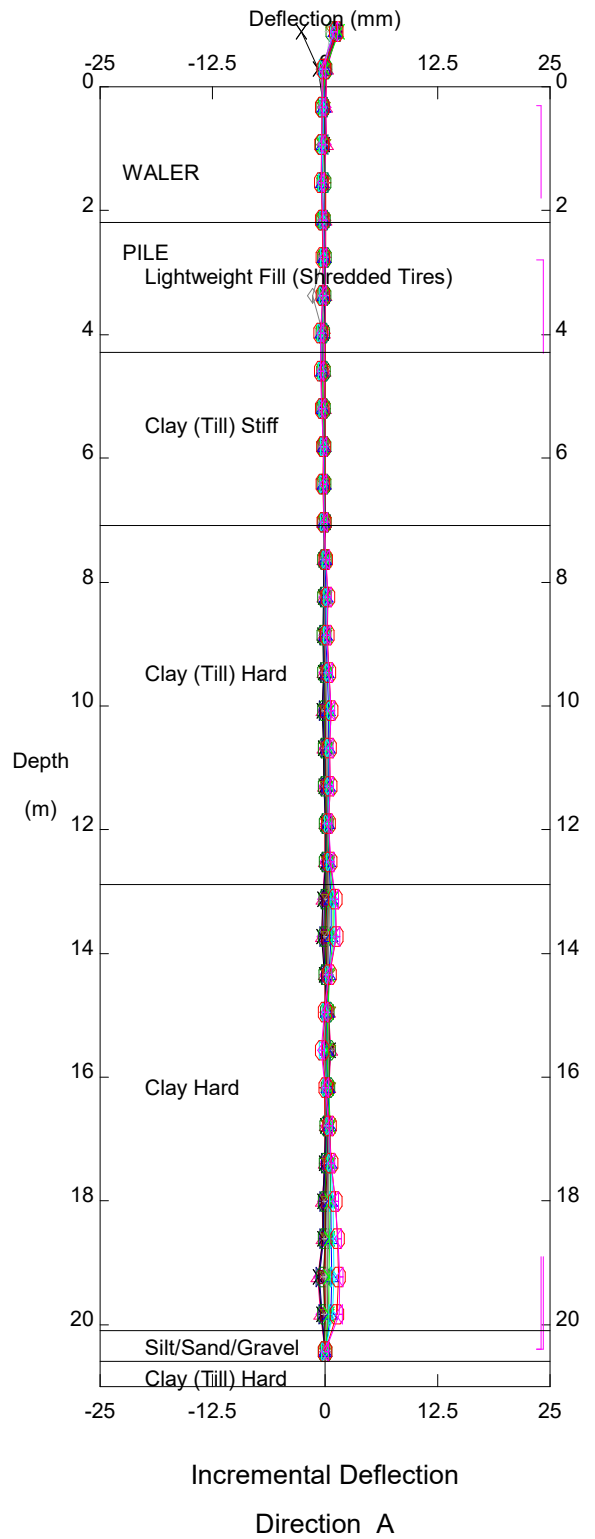
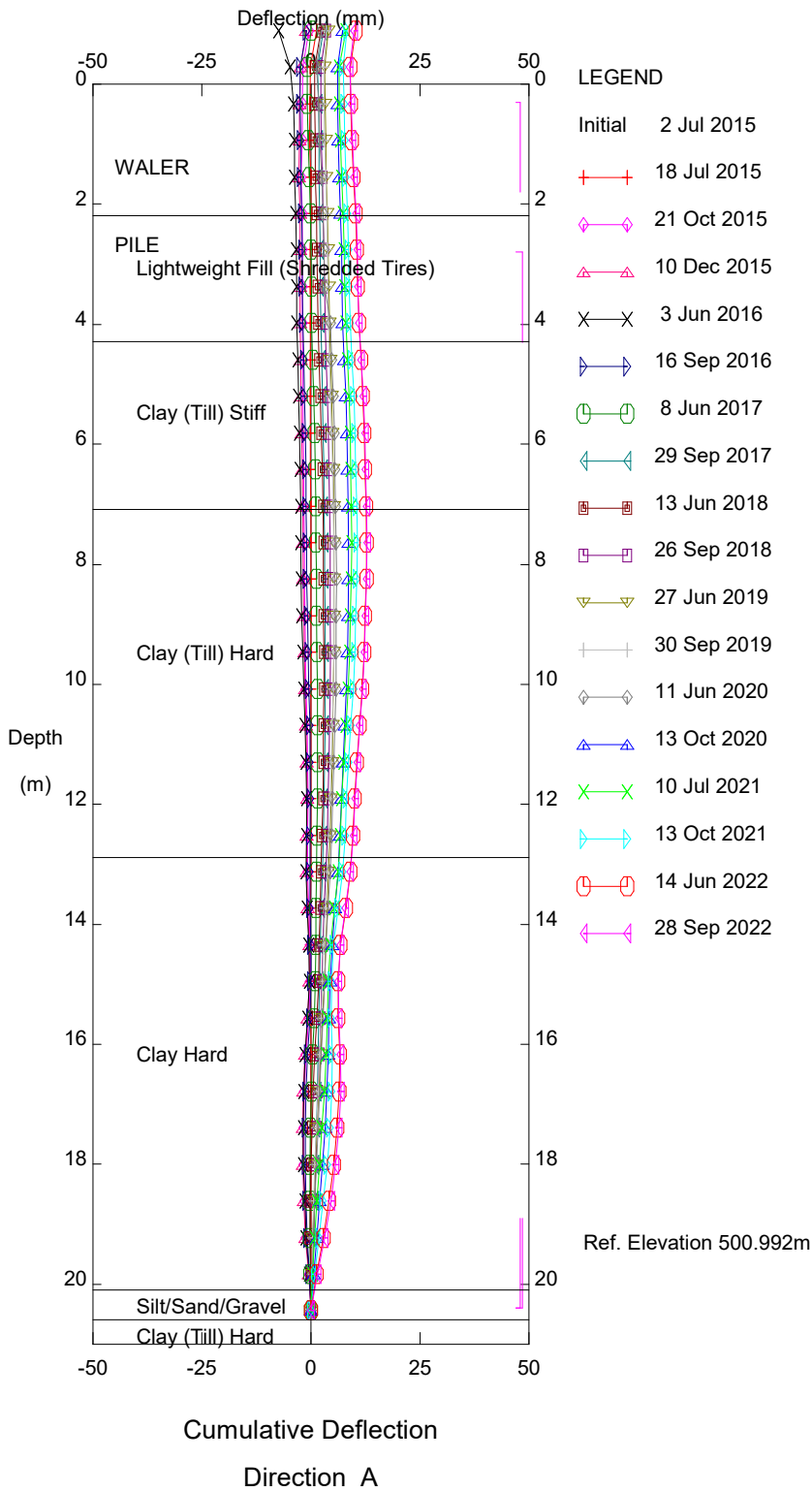
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Thurber Engineering Ltd.



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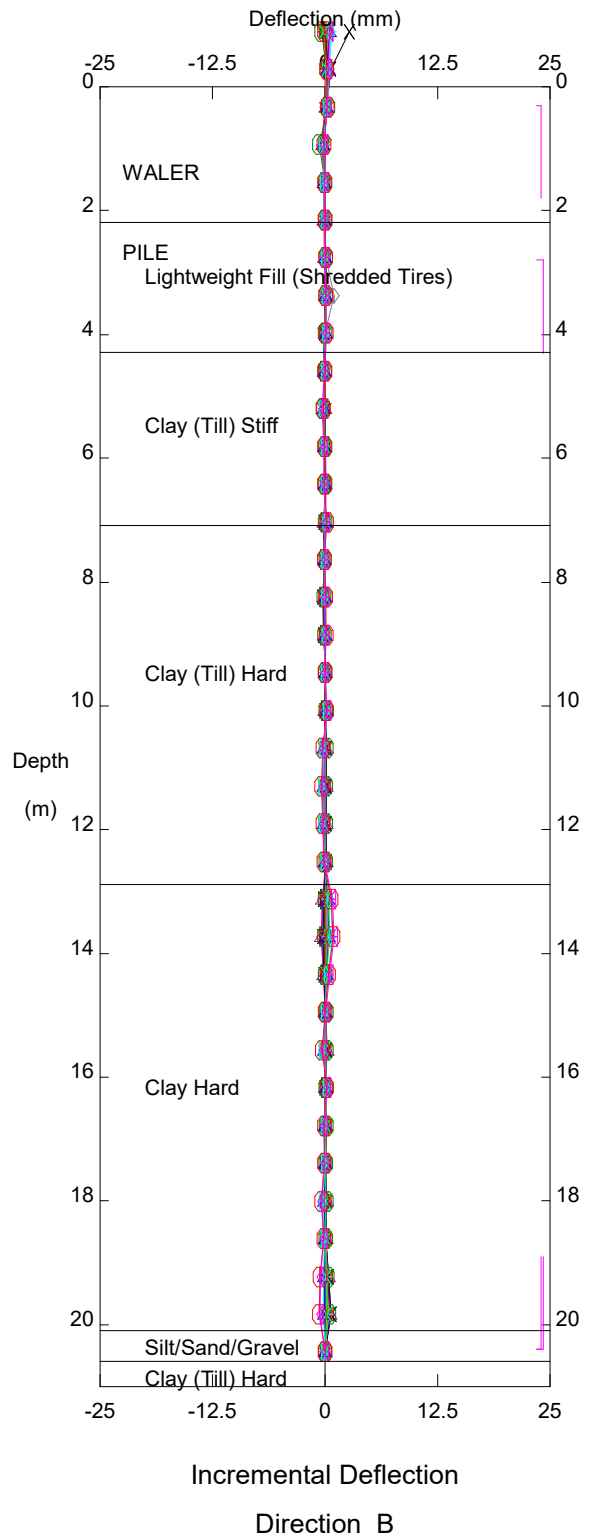
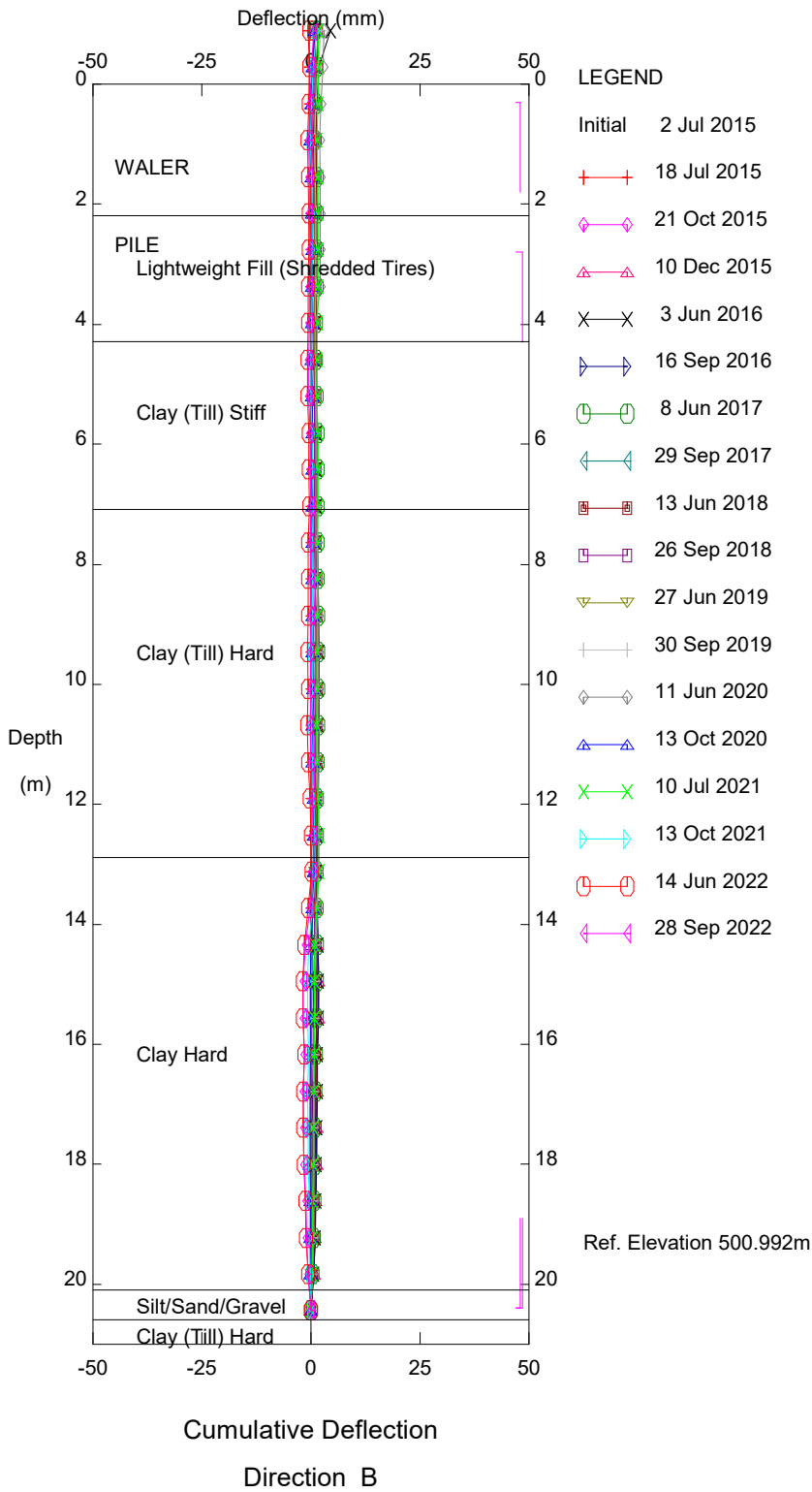
Alberta Transportation



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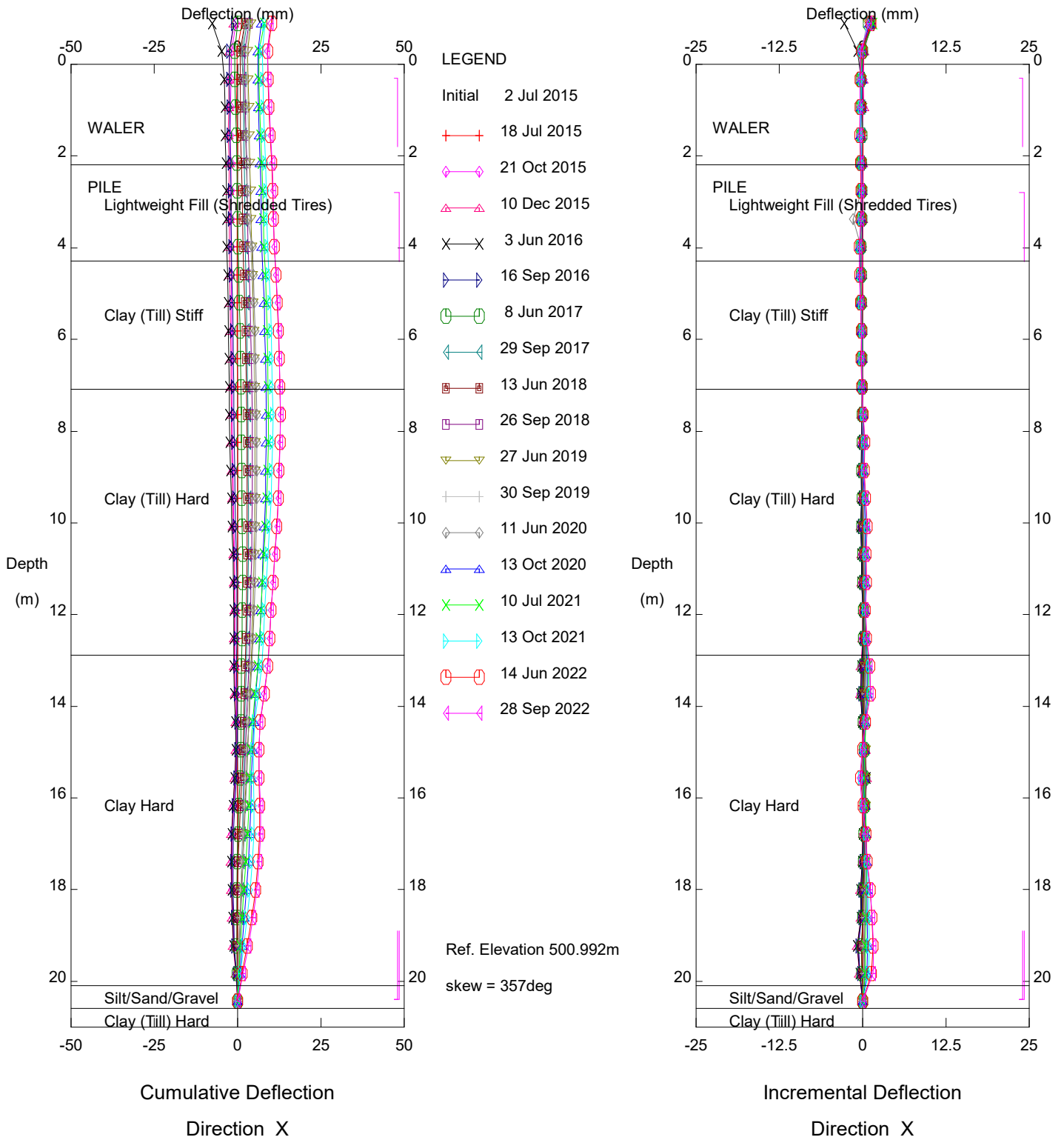
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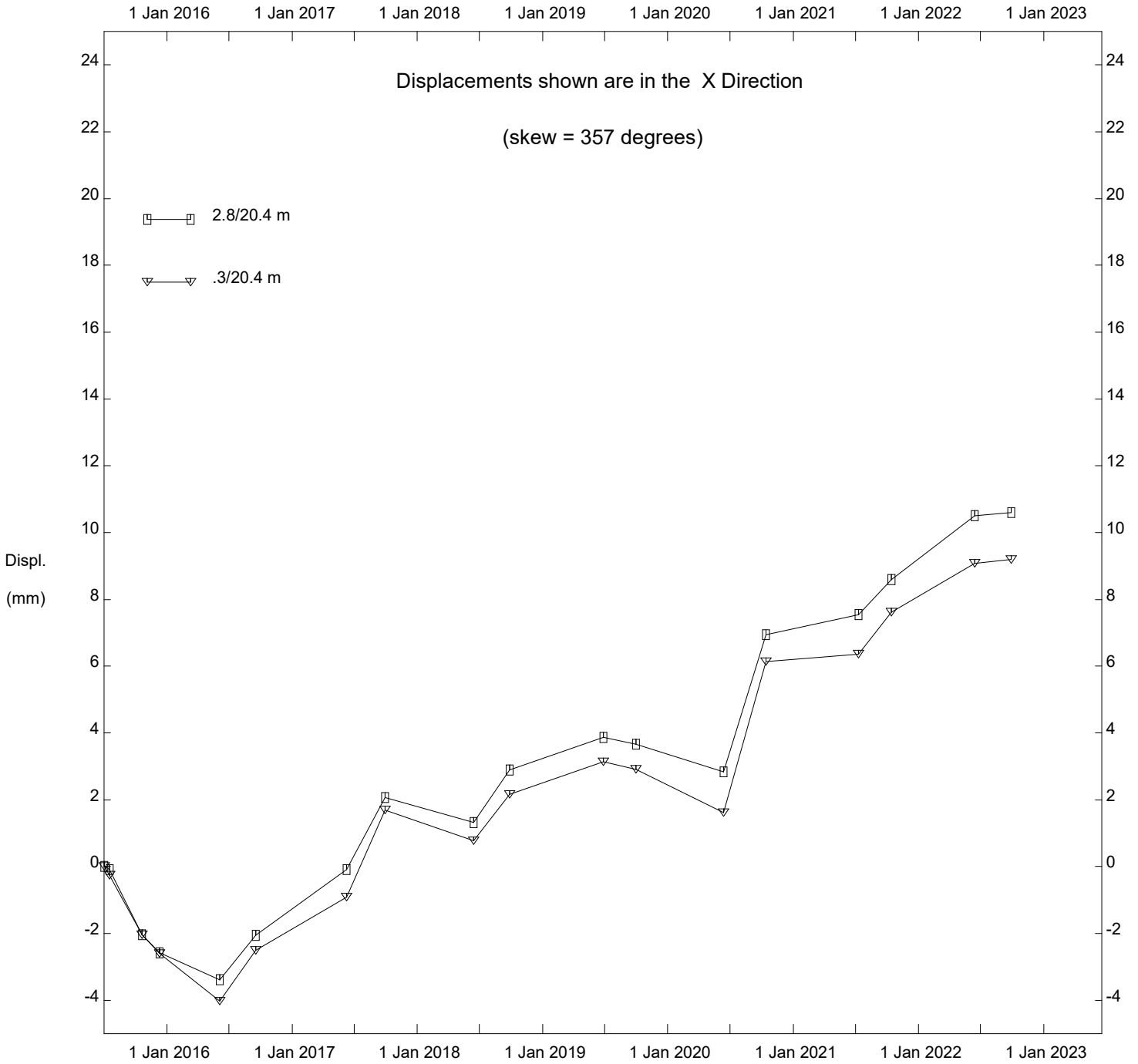
Alberta Transportation

Thurber Engineering Ltd.



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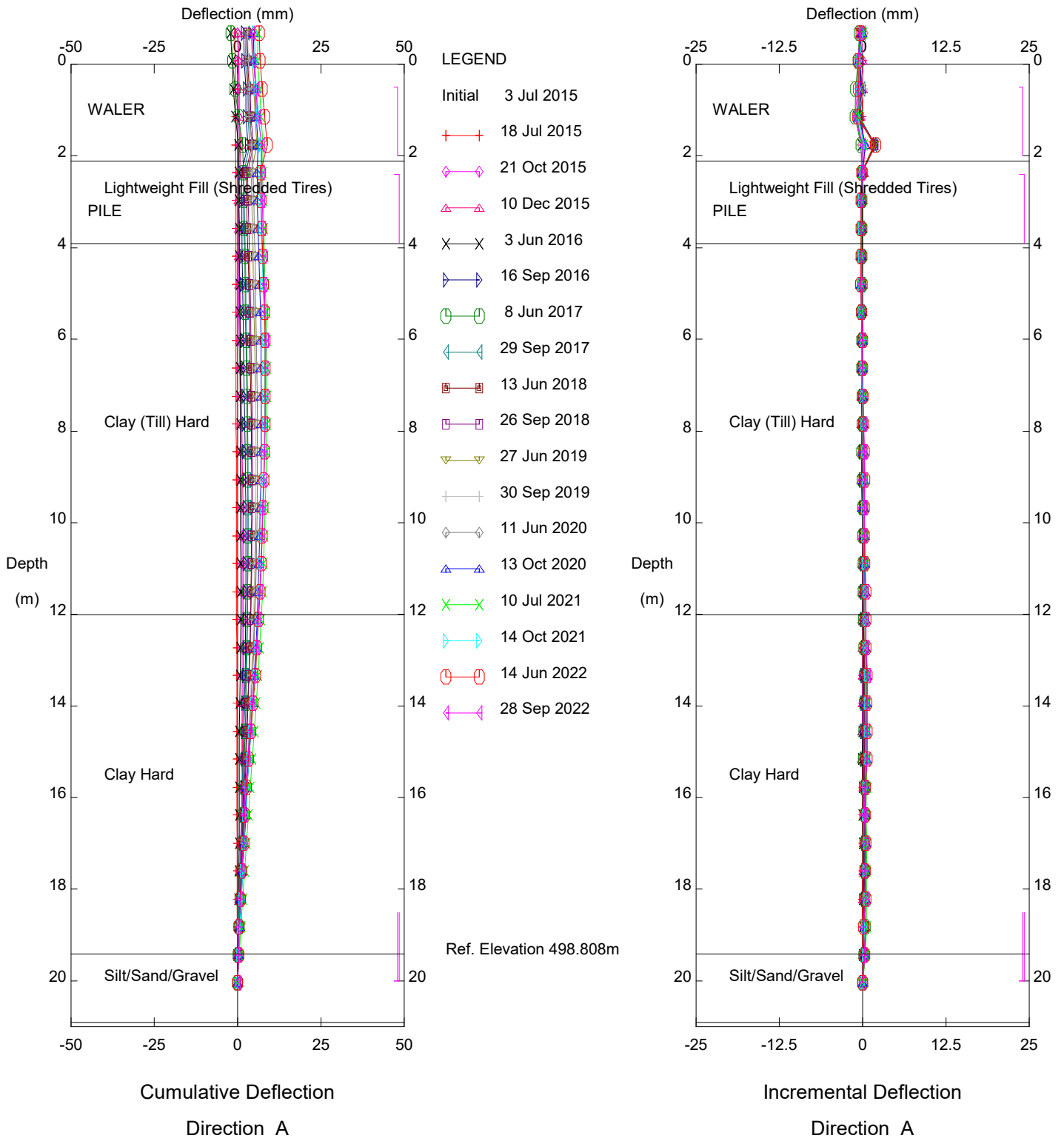
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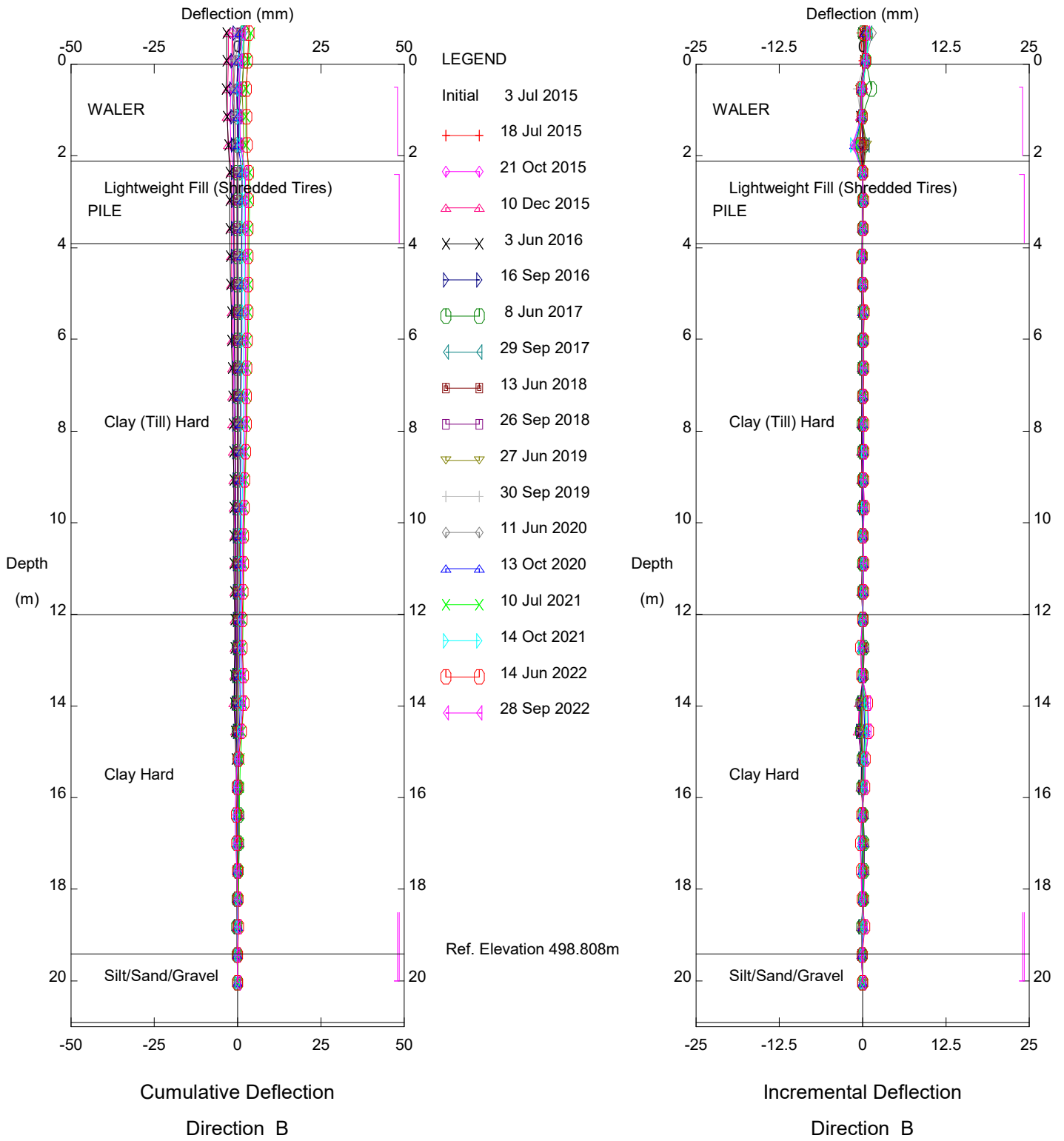
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PH032 KM 58 (Post Construction), Inclinometer PK80

Alberta Transportation

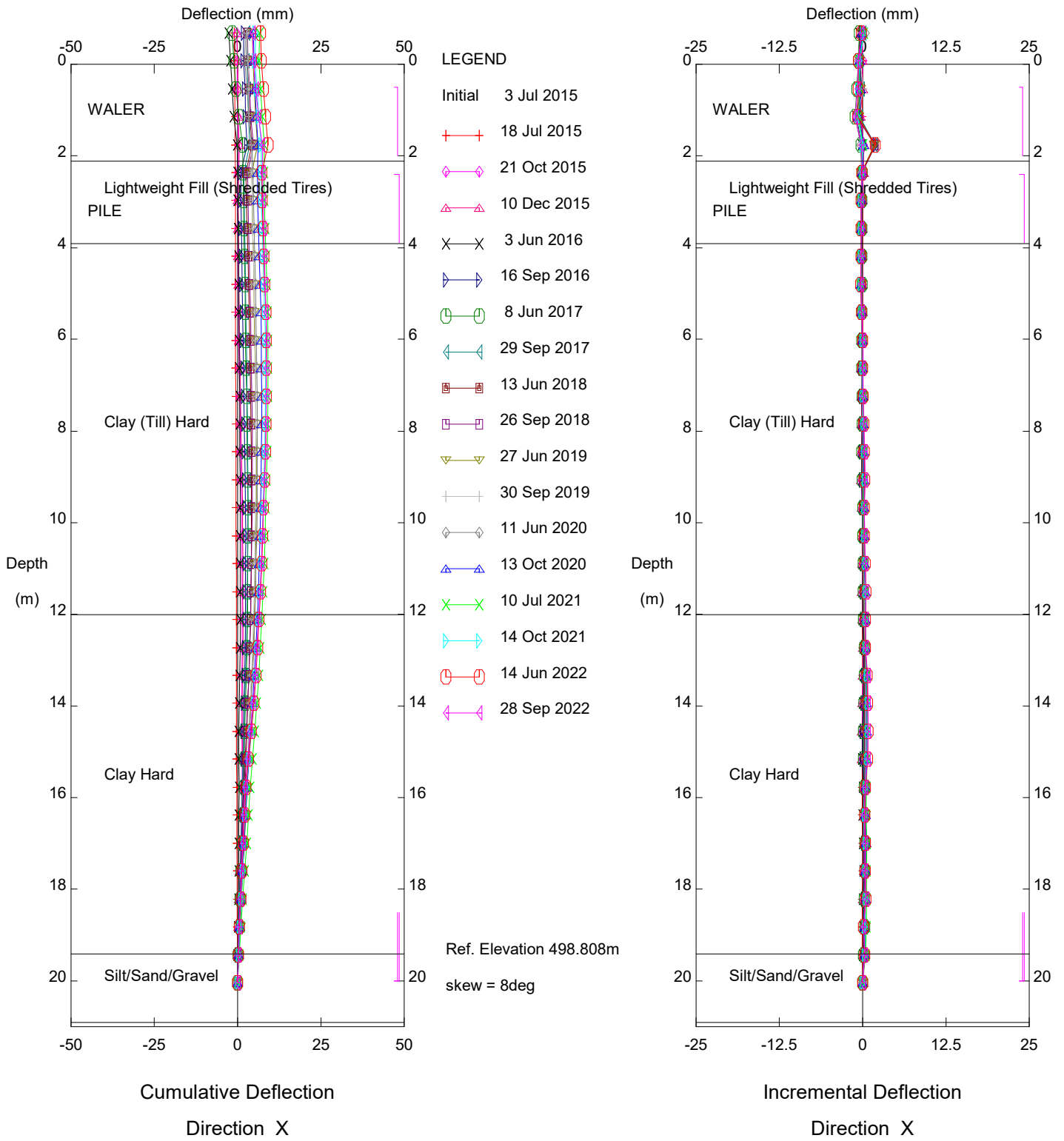
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Alberta Transportation

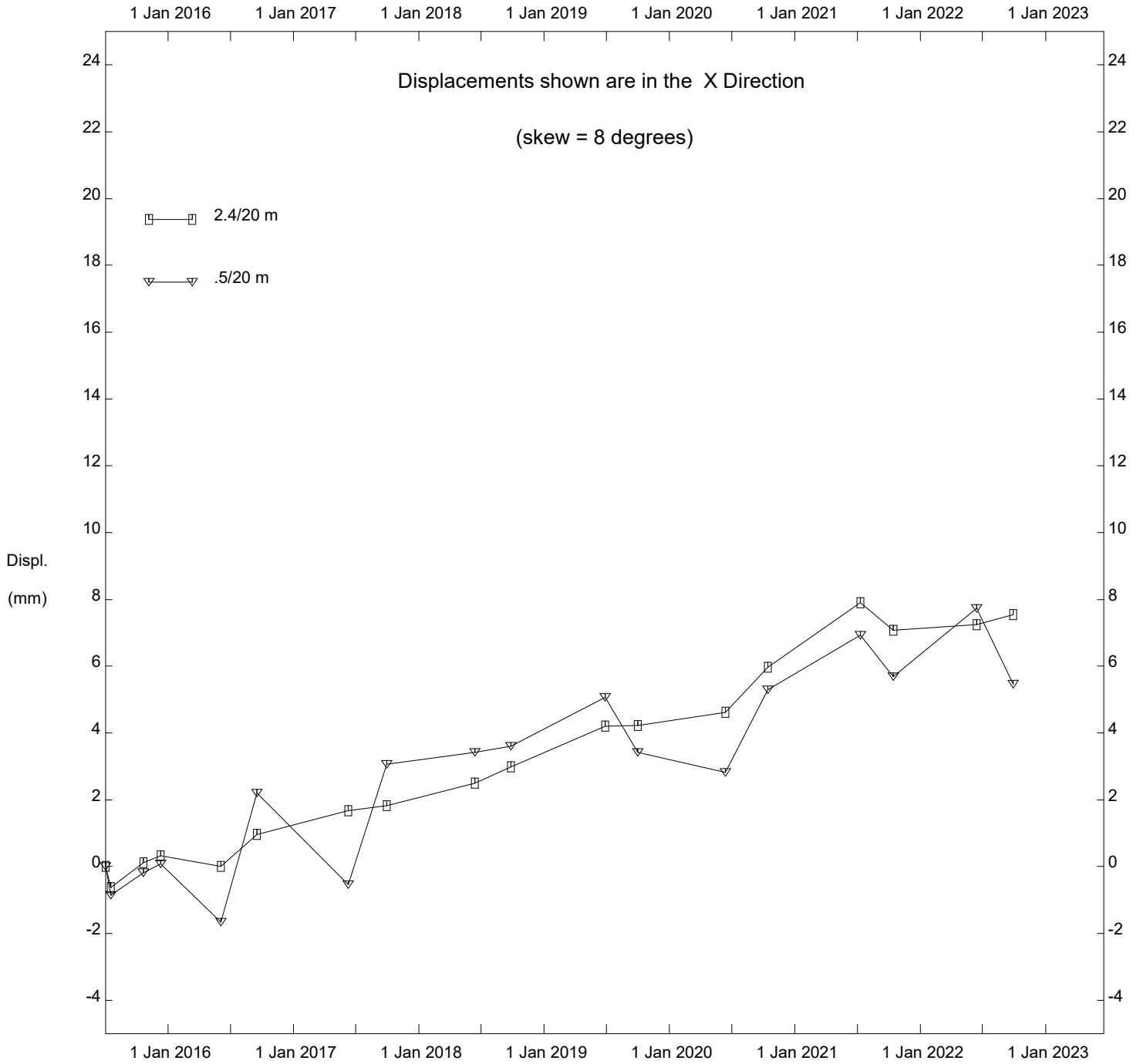
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Alberta Transportation

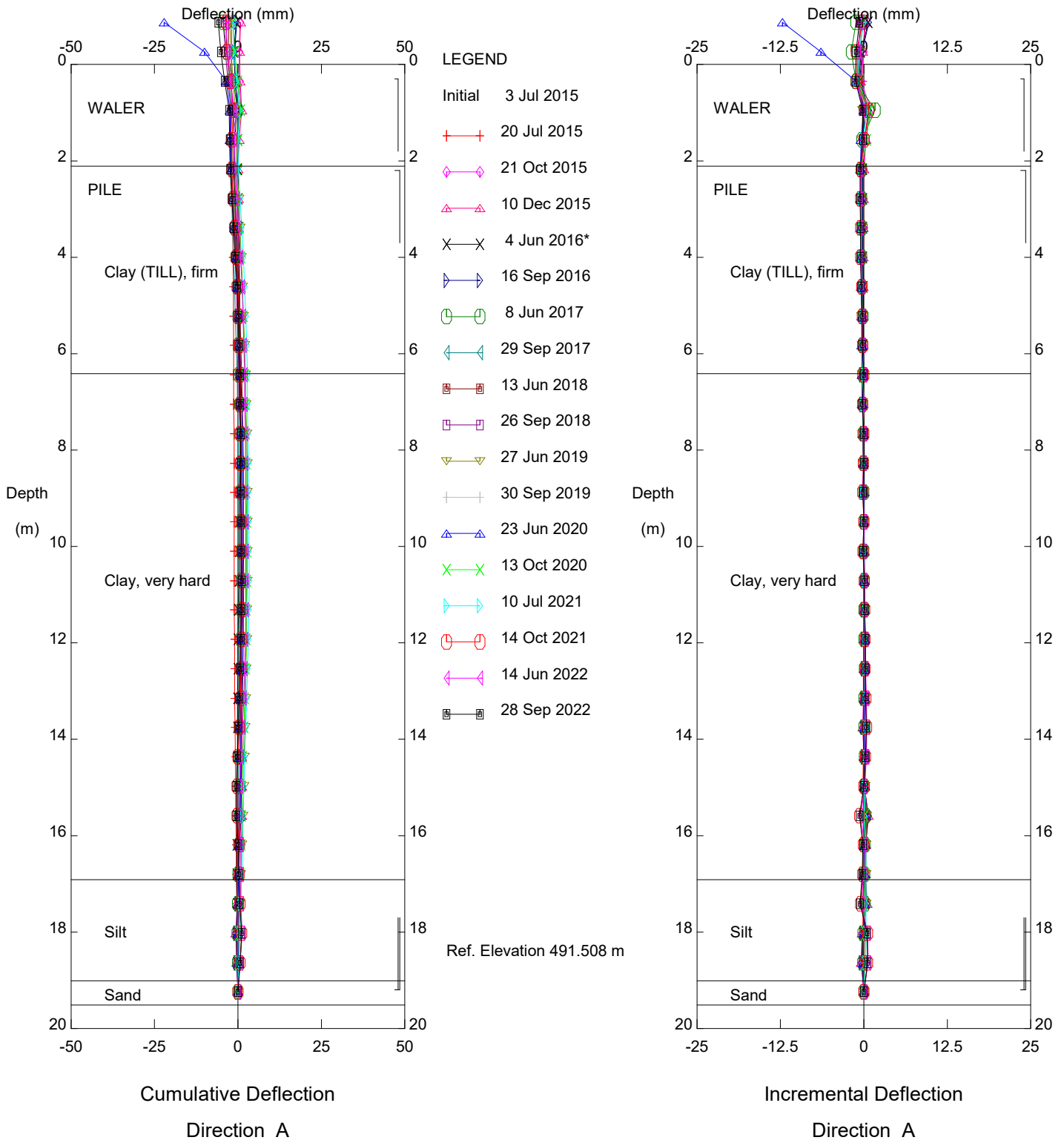
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Alberta Transportation

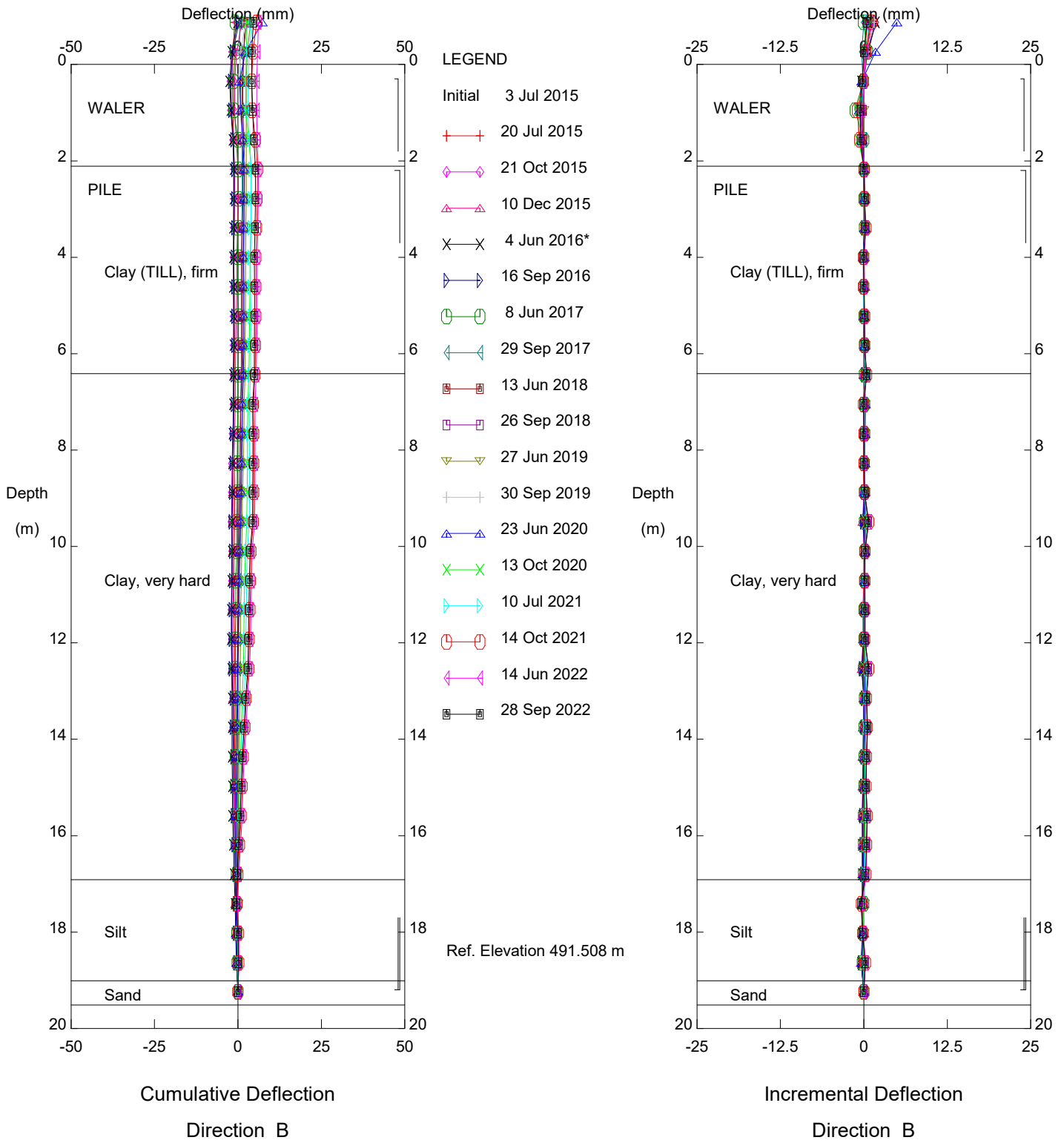
Thurber Engineering Ltd.



PH032 Makeout (Post Construction), Inclinometer PM12

Alberta Transportation

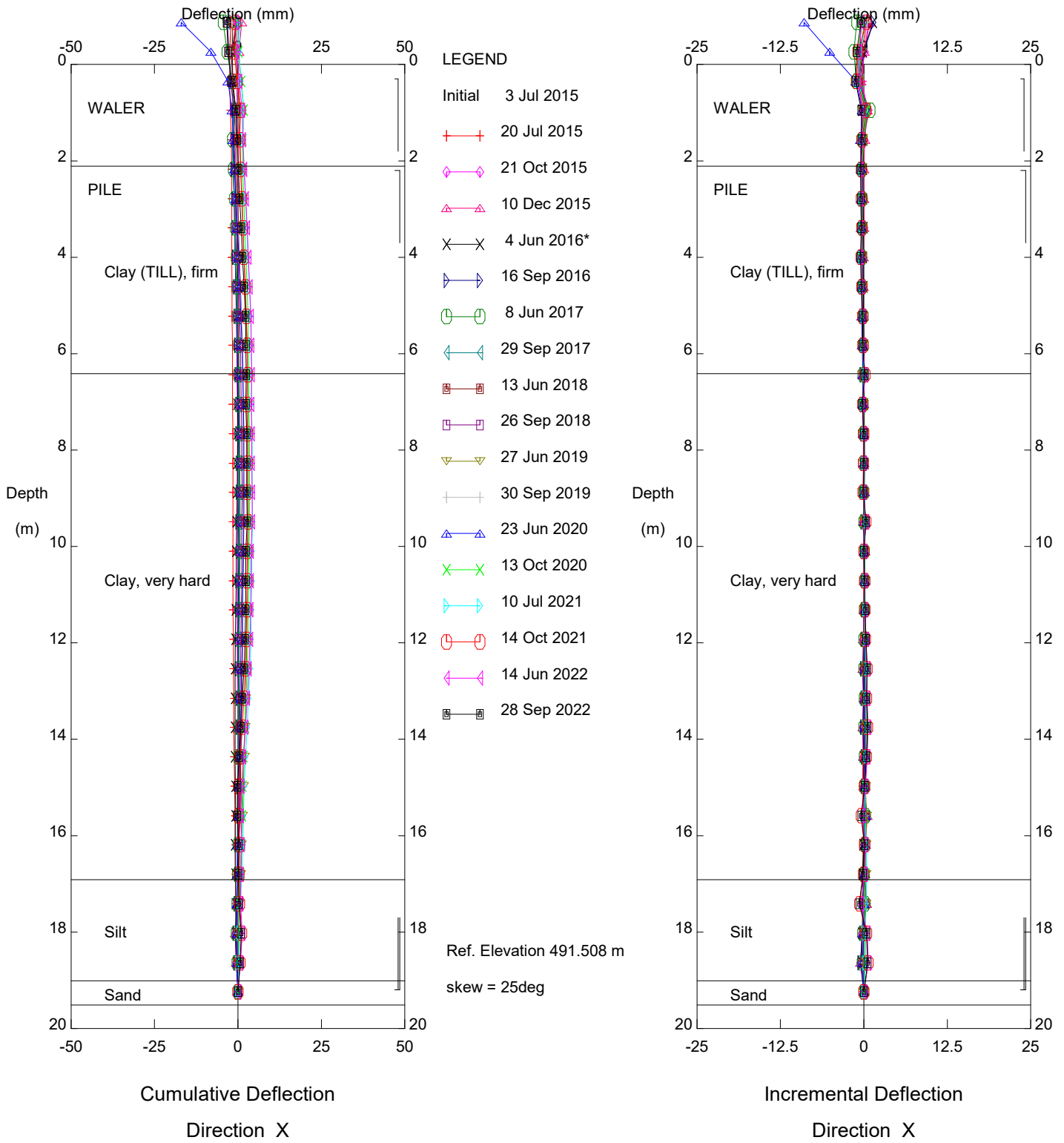
Sets marked * include zero shift and/or rotation corrections.



PH032 Makeout (Post Construction), Inclinometer PM12

Alberta Transportation

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

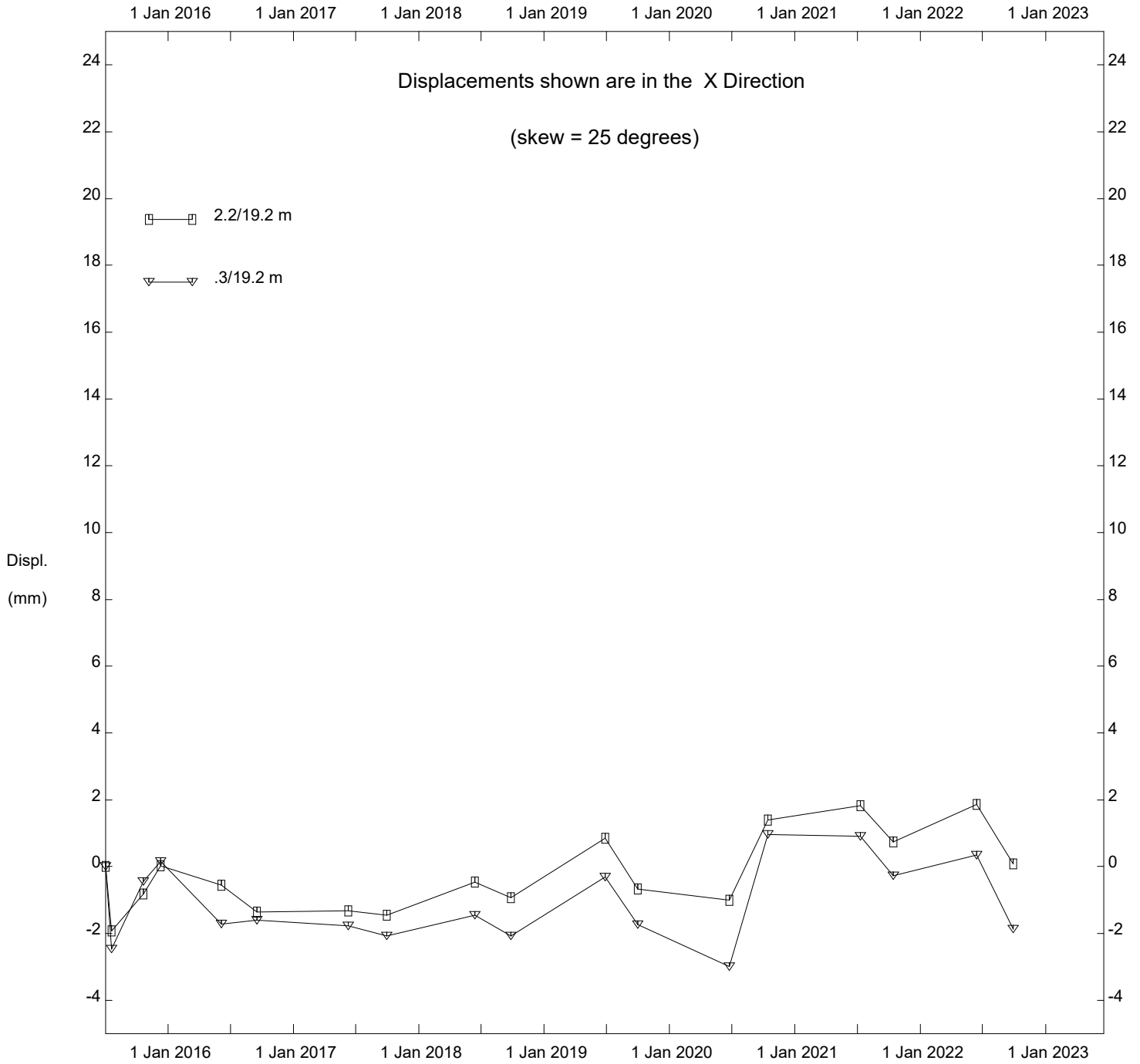


PH032 Makeout (Post Construction), Inclinometer PM12

Alberta Transportation

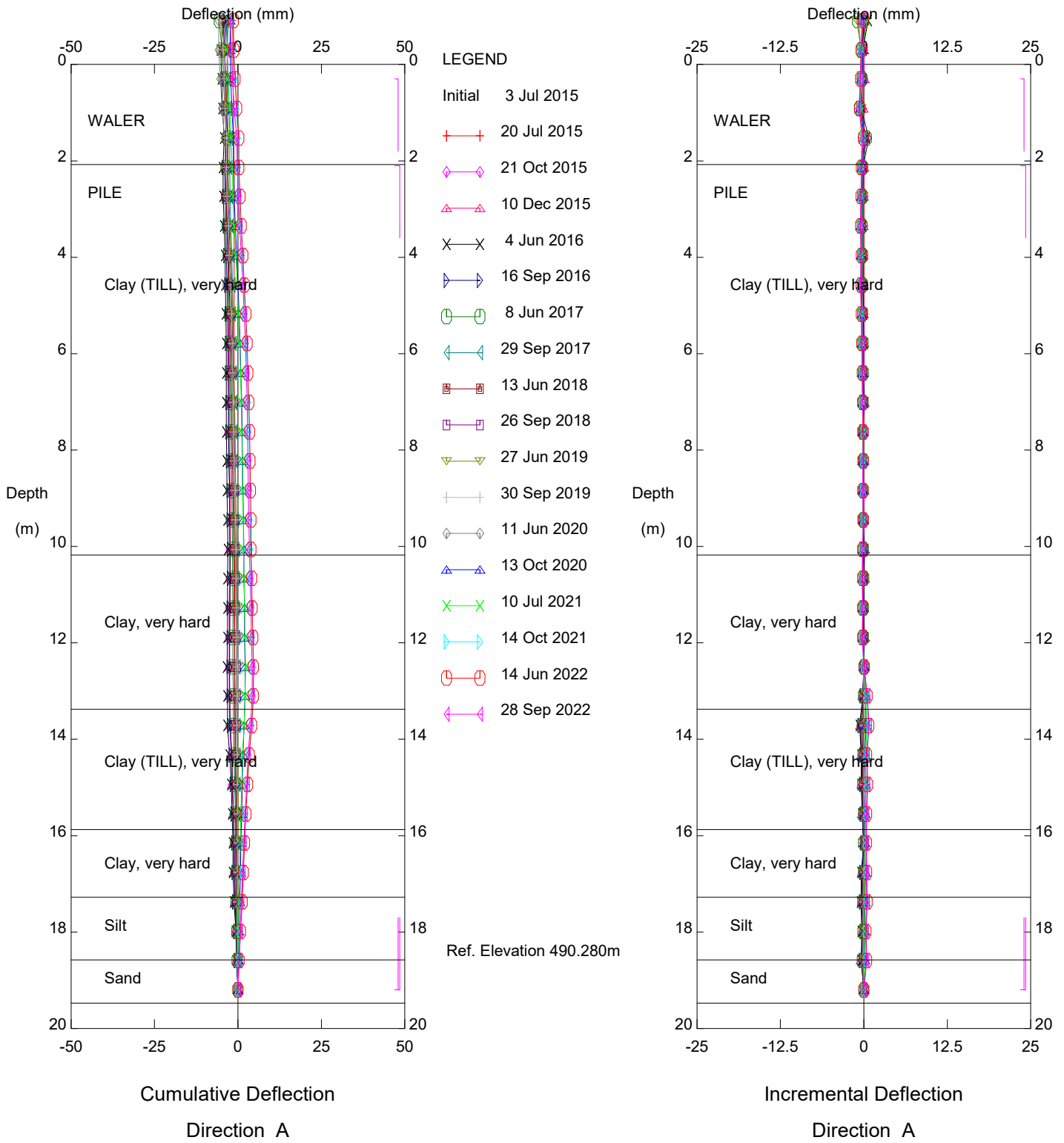
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Thurber Engineering Ltd.



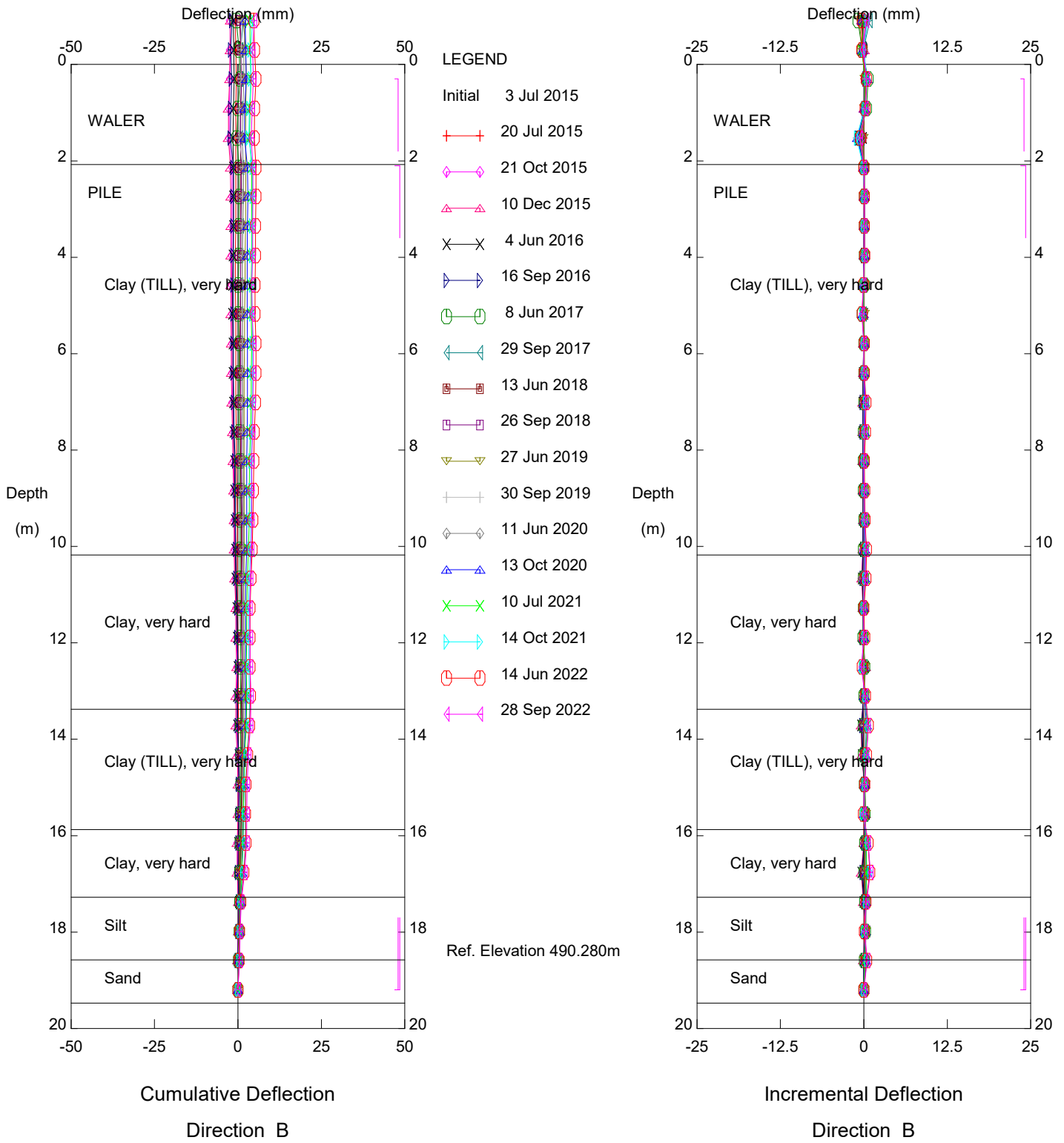
PH032 Makeout (Post Construction), Inclinator PM12

Alberta Transportation



PH032 Makeout (Post Construction), Inclinometer PM24

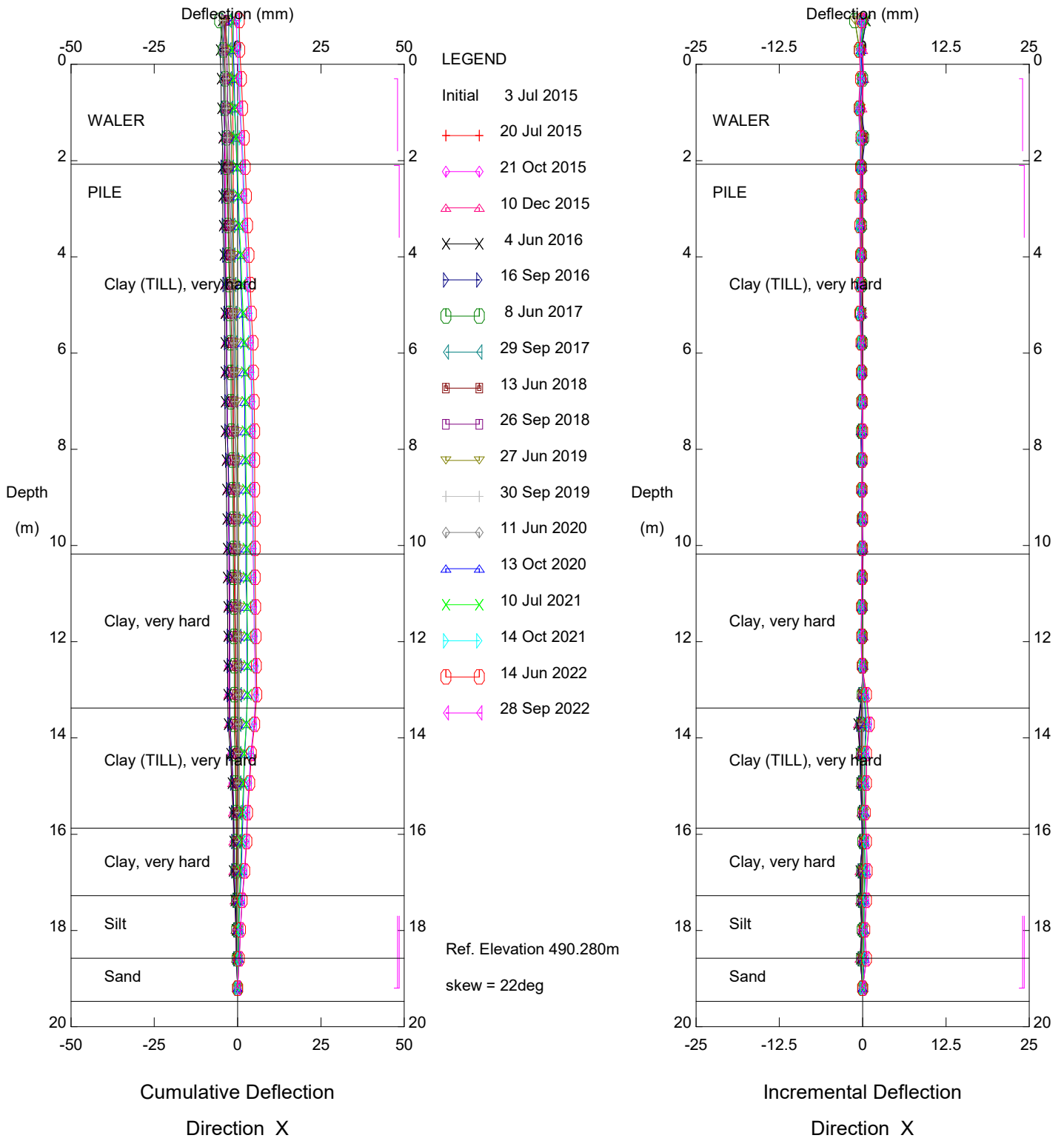
Alberta Transportation



PH032 Makeout (Post Construction), Inclinometer PM24

Alberta Transportation

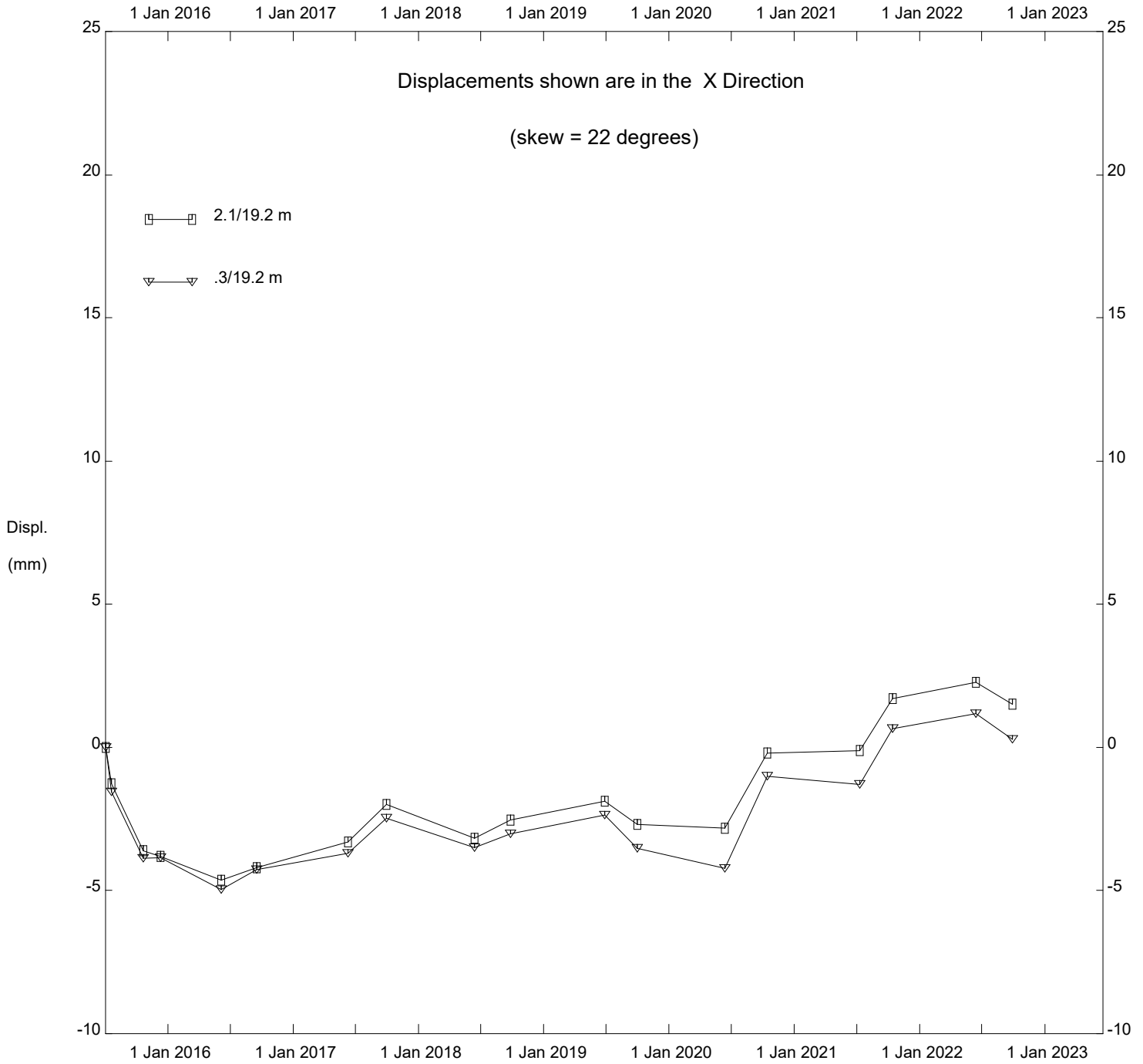
Thurber Engineering Ltd.



PH032 Makeout (Post Construction), Inclinometer PM24

Alberta Transportation

Thurber Engineering Ltd.



PH032 Makeout (Post Construction), Inclinator PM24

Alberta Transportation

**FIGURE PH032-1
PIEZOMETRIC ELEVATIONS FOR HWY 744:04, JUDAH HILL MAKEOUT SLIDE**

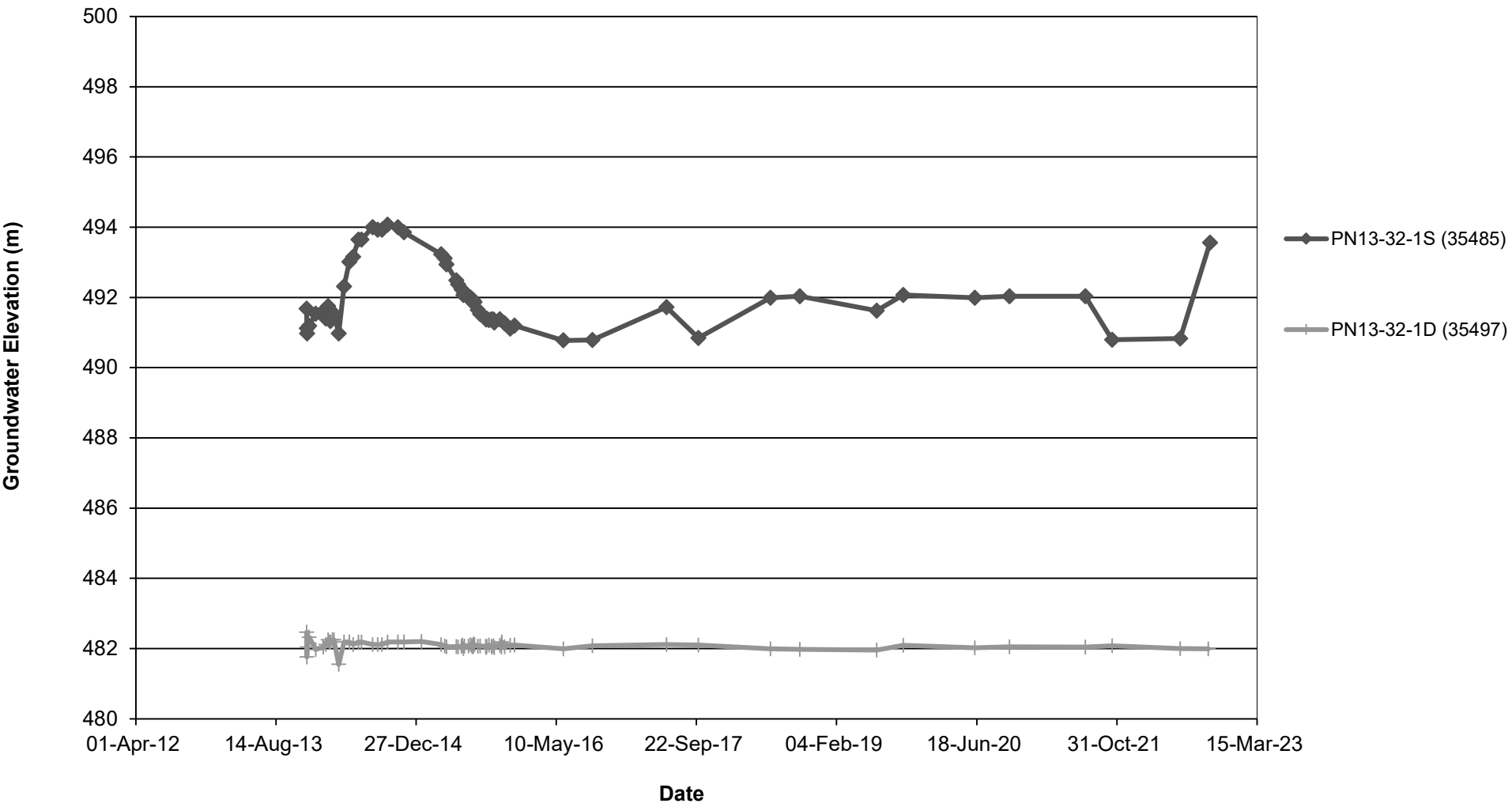
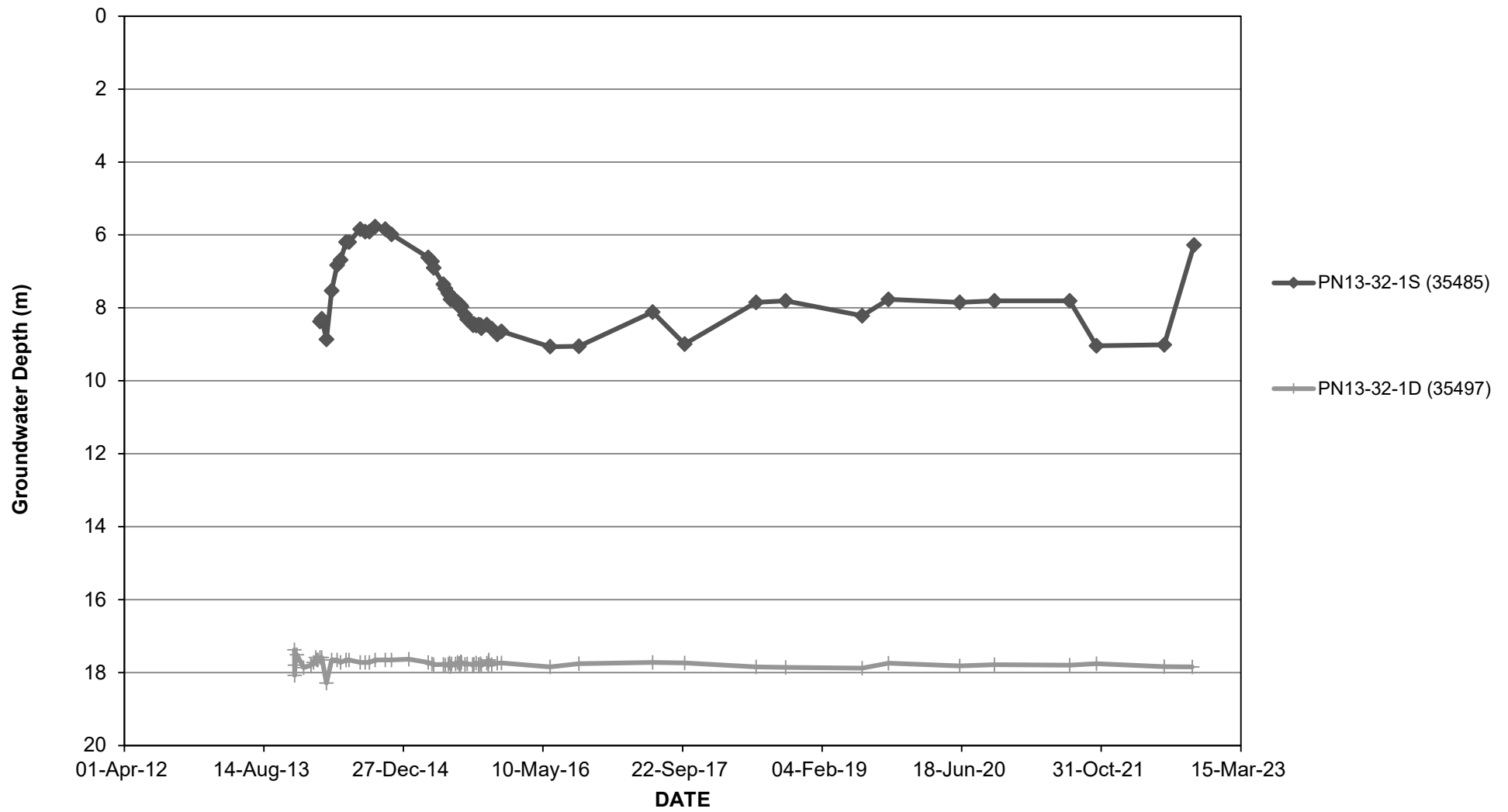
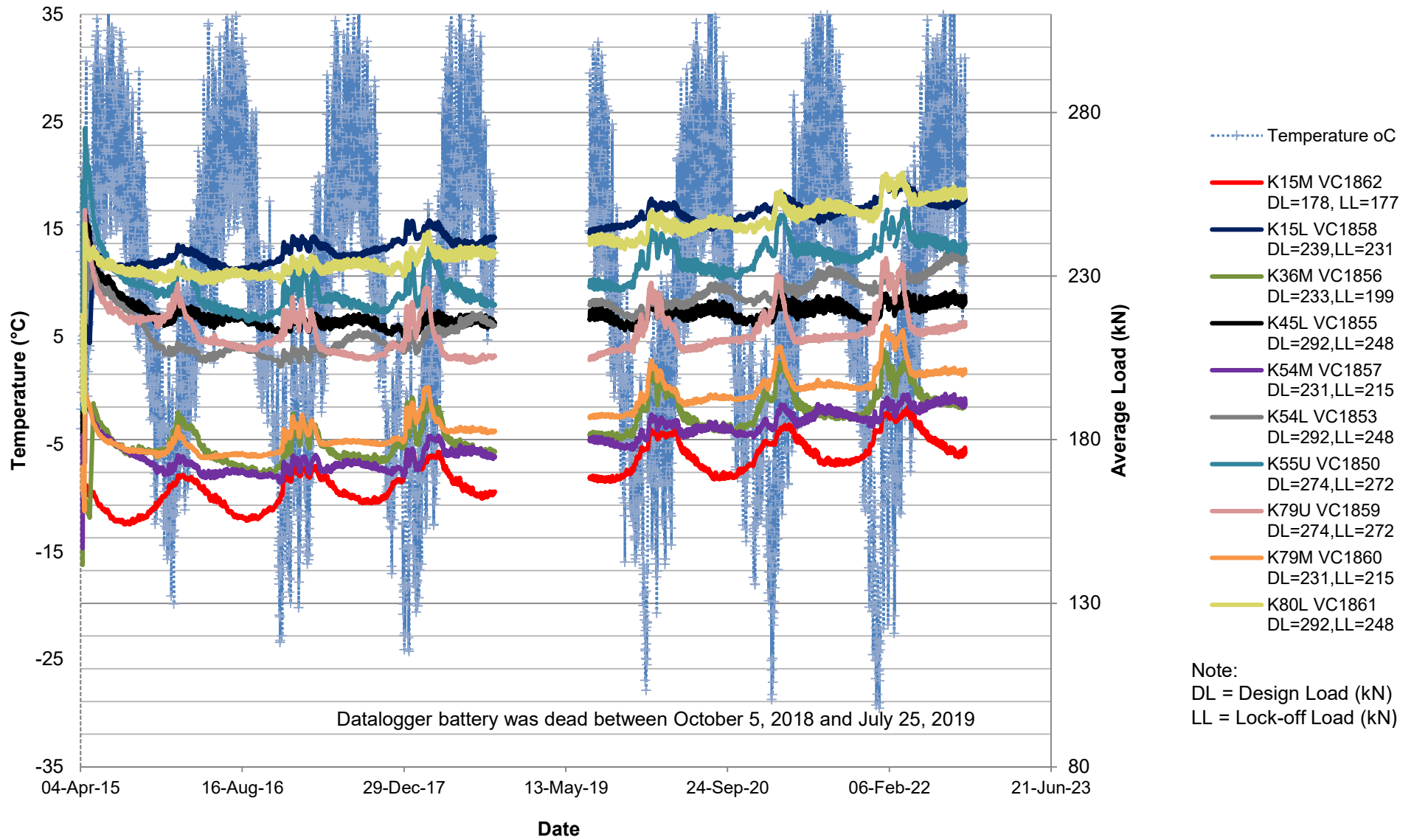


FIGURE PH032-2
PIEZOMETRIC DEPTHS FOR PH032-1: JUDAH HILL MAKEOUT SLIDE



**FIGURE PH032-3
LOAD CELL DATA FOR KM 58 PILE WALL**



**FIGURE PH032-4
LOAD CELL DATA FOR MAKEOUT PILE WALL**

