ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP PEACE REGION (GRANDE PRAIRIE DISTRICT - NORTH) **INSTRUMENTATION MONITORING – FALL 2025**



Site Number	Location	Name		Hwy	km
PH023	HWY 64:02 km 24.10		River East Hill - Twin Pipes Landslide)	64:02	Km 24.1
Legal Description	n: 12-27-84-11 W6	UTM Co-ordinates			
		11U	E 335453	N 6	244315

Current Monitoring:	29-Sept-2025	Previous Monitoring	15-June-2025
Instruments Read By:	Mr. Niraj Regmi, G.	IT. and Mr. Angelo Castillo, of Thurber	

	Instruments Read During This Site Visit								
Slope Inclinometers (SIs): SI20-1 and SI20-7	Pneumatic Piezometers (PN): PN20-1A, 1B, 2A, 3A, 3B, 7A, 7B, 8A and 8B	Vibrating Wire Piezometers (VW):	Standpipe Piezometers (SP):						
Load Cell (LC):	Strain Gauges:	SAAs:	Others:						

Readout Equipment Used								
Slope Inclinometers: Two RST Digital Inclinometer probes with 2 ft. wheelbase and RST Pocket PC readouts	Pneumatic Piezometers: RST C108 pneumatic piezometer readout	Vibrating Wire Piezometers:	Standpipe Piezometers:					
Load Cell:	Strain Gauges:	SAAs:	Others:					

Notes: Piezometers PN20-5A and 6B will no longer be read to save cost. PN20-2B, 4B, 5B, 6A are inoperable. PN20-4A was not read in this cycle. PN20-7B reading was not stabilizing, and the piezometer is probably damaged.

	Discussion
Zones of New Movement:	None
	Overall, the SIs showed slightly slower rates of movement compared to the previous readings in the spring of 2025.
Interpretation of Monitoring Results:	SI20-1 showed current movement rates of 4.7 mm/yr over 3.7 m to 5.6 m depth and 3.2 mm/yr over 50.1 m to 54.3 m depth. SI20-7 showed rates of movement of 1.2 mm/yr over 17.8 m to 19.6 m and 2.5 mm/yr over 31.8 m to 33.6 m depth. SI 20-1 and 20-7 are about 600 m apart but both show comparable movement rates and elevation of the deeper movement zones (both SI are moving at about elevation 460 m in a weak clay strata) which is a confirmation of a very large and deeply seated movement mass.
	The groundwater levels in piezometers PN20-1A, PN20-1B, PN20-3B, PN20-8A, and showed decreases in groundwater levels of 0.07 m, 0.91 m, 0.07 m, and 0.07 m respectively, since the spring of 2025 readings. PN20-2A, PN20-7B (see comment below) and PN20-8B showed increases in groundwater level of 0.14 m, 1.33 m and 0.07 m, respectively, since the spring of 2025 readings. The groundwater levels in piezometers PN20-3A and PN20-7A remained the same since the spring of 2025 readings.

Client: Alberta Transportation and Economic Corridors

November 18, 2025

	PN20-2B, 4B, 5B, 6A are inoperable. PN20-4A was not read in this cycle. PN20-7B reading was not stabilizing, and the piezometer is probably damaged.
	The instruments should be read again in the spring of 2026. PN20-2B, 20-4B, 20-5B & 20-6A are inoperable and will not be read anymore.
Future Work:	Since TH 20-5 and 20-6 require bear scare escort personnel and the SI's at these locations have sheared, the two remaining operable piezometers (20-5A and 20-6B) where good base readings have been established, will not be read any more in the interest of cost effectiveness.
Instrumentation Repairs:	No instrument repairs are required at this time.
Additional Comments:	

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	■ Table PH023-1 Fall 2025 – HWY 64:02 Clear River East Hill (Site 5- Twin Pipes Landslide), Slope Inclinometer Instrumentation Reading Summary
	 Table PH023-2 Fall 2025 – HWY 64:02 Clear River East Hill (Site 5- Twin Pipes Landslide), Pneumatic Piezometer Instrumentation Reading Summary
	 Statement for Use and Interpretation of Report
Attachments:	■ APPENDIX A – PH023-1 FALL 2025
	□ Field Inspector's report
	 Site Plan Showing Approximate Instrument Locations (Drawing No. 32123-PH023)
	□ SI Reading Plots
	□ Figure PH023-1 (Piezometric Elevations)
	□ Figure PH023-2 (Piezometric Depths)

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. Partner | Senior Geotechnical Engineer

Fernanda Imamura, Ph.D. Geotechnical Engineer-in-Training

Client: Alberta Transportation and Economic Corridors
File: 32123



Table PH023-1 Fall 2025 – Hwy 64:02, Clear River East Hill (Site 5 – Twin Pipes Landslide) Slope Inclinometer Instrumentation Reading Summary

Date Monitored: September 30, 2025

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)
		126.0 mm over 3.6 m to 7.9 m depth in 284° direction	159.3 mm/yr in October 2020	Sheared at		N/A	N/A	N/A
SI-9	May 8, 1996	36.2 mm over 9.7 m to 11.6 m depth in 116° direction	43.0 mm/yr. in October 2020	5.5 m below top	October 18, 2021	N/A	N/A	N/A
		16.9 mm over 11.6 m to 13.4 m depth in 116° direction	14.7 mm/yr. in October 2020	of casing		N/A	N/A	N/A
SI20-1	October 11,	98.4 mm over 3.7 m to 5.6 m depth in 10° direction	49.6 mm/yr in October 2022	Onevetional	June 15,	1.4	4.6	-1.2
5120-1	2020	18.3 mm over 50.1 m to 54.3 m depth in 10° direction	5.0 mm/yr in June 2022	Operational	2025	0.9	3.2	-0.8
S/20.2	October 11,	39.5 mm over 31.8 m to 34.2 m depth in 193° direction	59.6 mm/yr in July 2021	Sheared at 33.2 m	October	N/A	N/A	N/A
SI20-2	2020	4.2 mm over 42.1 m to 43.4 m depth in 213° direction	7.1 mm/yr in October 2020	below top of casing	18, 2021	N/A	N/A	N/A
SI20-3	October 11, 2020	48.0 mm over 19.6 m to 21.4 m depth in 213° direction	75.1 mm/yr in July 2021	Sheared at 21.0 m below top of casing	October 18, 2021	N/A	N/A	N/A

Drawing 32123-PH023 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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Table PH023-1 – Continued... Fall 2025 – Hwy 64:02, Clear River East Hill (Site 5 – Twin Pipes Landslide) Slope Inclinometer Instrumentation Reading Summary

Date Monitored: September 30, 2025

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)
S120-4	October 11,	49.8 mm over 6.2 m to 8.0 m depth in 197° direction	42.1 mm/yr in June 2022	Sheared at 7.6 m	June 20,	N/A	N/A	N/A
3120-4	2020	6.1 mm over 60.4 m to 62.3 m depth in 187° direction	8.5 mm/yr in October 2020	below top of casing	2022	N/A	N/A	N/A
S/20-5	October 11,	70.9 mm over 9.4 m to 11.8 m depth in 200° direction	82.3 mm/yr in July 2021	Sheared at 11.6 m	June 20, 2022	N/A	N/A	N/A
3/20-3	2020	74.7 mm over 31.3 m to 35.6 m depth in 200° direction	64.3 mm/yr in June 2022	below top of casing		N/A	N/A	N/A
SI20-6	October 11,	33.9 mm over 18.3 m to 20.1 m depth in 230° direction	73.1 mm/yr in July 2021	Sheared at 20.1 m		N/A	N/A	N/A
3/20-0	2020	36.8 mm over 28.1 m to 31.1 m depth in 230° direction	62.6 mm/yr in July 2021	below top of casing	2021	N/A	N/A	N/A
SI20-7	October 11,	34.1 mm over 17.8 m to 19.6 m depth in 195° direction	52.3 mm/yr in October 2022	Operational	June 15,	0.4	1.2	-0.6
3120-7	2020	16.2 mm over 31.8 m to 33.6 m depth in 204° direction	6.5 mm/yr in June 2022	Operational	2025	0.7	2.6	-0.1

Drawing 32123-PH023 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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Table PH023-1 – Continued... Fall 2025 – Hwy 64:02, Clear River East Hill (Site 5 – Twin Pipes Landslide) Slope Inclinometer Instrumentation Reading Summary

Date Monitored: September 30, 2025

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)
SI20-8	October 11, 2020	48.4 mm over 34.1 m to 36.6 m depth in 194° direction	53.0 mm/yr in June 2022	Sheared at 36.2 m below top of casing	October 18, 2021	N/A	N/A	N/A

Drawing 32123-PH023 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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Table PH023-2 Fall 2025 – Hwy 64:02, Clear River East Hill (Site 5 – Twin Pipes Landslide) Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: September 30, 2025

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED GROUNDWATER ELEVATION (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER ELEVATION (m)	PREVIOUS GROUNDWATER ELEVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN20-1A (38006)	October 11, 2020	27.43	515.79	Operational	506.85 on September 24, 2024	174.4	506.15	506.22	-0.07
PN20-1B (38581)	October 11, 2020	57.91	515.79	Operational	492.82 on October 11, 2020	264.1	484.81	484.72	-0.91
PN20-2A (38240)	October 11, 2020	5.79	506.27	Operational	506.46 on June 20, 2022	50.3	505.62	505.47	0.14
PN20-2B (37405)	October 11, 2020	36.58	506.27	Malfunctioning	497.81 on October 11, 2020	N/A	N/A	495.35 (May 27, 2024)	N/A
PN20-3A (38242)	October 11, 2020	15.24	497.13	Operational	491.73 on October 12, 2023	95.8	491.66	491.66	0
PN20-3B (37402)	October 11, 2020	30.48	497.13	Operational	491.89 on February 18, 2021	238.6	490.97	491.04	-0.07
PN20-4A (38241)	October 11, 2020	6.40	517.15	Operational	511.10 on November 26, 2020	N/A	N/A	510.82 (June 15, 2025)	N/A
PN20-4B (38580)	October 11, 2020	51.82	517.15	Non- operational	469.06 on November 26, 2020	N/A	N/A	469.06 (Nov. 26, 2020)	N/A

Drawing 32123-PH023 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site

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Table PH023-2 – Continued... Fall 2025 – Hwy 64:02, Clear River East Hill (Site 5 – Twin Pipes Landslide) Pneumatic Piezometer Instrumentation Reading Summary

Date Monitored: September 30, 2025

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED GROUNDWATER ELEVATION (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER ELEVATION (m)	PREVIOUS GROUNDWATER ELEVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
PN20-5A (37853)	October 19, 2020	7.62	490.91	Operational	486.45 on June 20, 2022	N/A	N/A	485.61 (May 7, 2025)	N/A
PN20-5B (37403)	October 19, 2020	49.99	490.91	Damaged	450.62 on October 19, 2020	N/A	N/A	440.99 (June 20, 2022)	N/A
PN20-6A (38005)	October 11, 2020	15.24	489.15	Malfunctioning	484.11 on July 15, 2021	N/A	N/A	473.98 (May 8, 2024)	N/A
PN20-6B (37404)	October 11, 2020	38.40	489.15	Not Read	468.82 on October 11, 2020	N/A	N/A	460.59 (May 7, 2025)	N/A
PN20-7A (38007)	October 11, 2020	13.41	492.55	Operational	484.56 on June 20, 2022	51	484.35	484.35	0
PN20-7B (38528)	October 11, 2020	53.34	492.55	Operational	450.81 on October 11, 2020	19.3	441.18	439.85	1.33
PN20-8A (38239)	October 11, 2020	27.43	488.99	Operational	475.41 on October 1, 2022	129.6	474.78	474.85	-0.07
PN20-8B (38583)	October 11, 2020	44.20	488.99	Operational	469.75 on October 24, 2020	183.4	463.49	463.42	0.07

Drawing 32123-PH023 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

Client: Alberta Transportation and Economic Corridors



STATEMENT FOR USE AND INTERPRETATION OF REPORT

1. STANDARD OF CARE

This Report has been prepared in a manner consistent with that degree of care and skill ordinarily exercised by members of the same profession currently practicing under similar circumstances at the same time and in the same or similar locality and in compliance with all applicable laws.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment, including this Statement For Use and Interpretation of Report, 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, AS DESCRIBED ABOVE. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE OF THE 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 for the development, design objectives, and/or purposes described to Thurber by the Client. **NO OTHER PARTY MAY USE OR RELY ON THE REPORT OR ANY PORTION THEREOF FOR OTHER THAN THE CLIENT'S BENEFIT IN CONNECTION WITH THE PURPOSES DESCRIBED IN THE REPORT.** Any use which a third party makes of the Report is the sole responsibility of such third party and is always subject to this Statement for Use and Interpretation of Report. Thurber accepts no liability or responsibility for damages suffered by any third party resulting from use of the Report for purposes outside the reasonable contemplation of Thurber at the time it was prepared or in any manner unintended by Thurber.

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 is inherently judgement-based. 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 parties making use of such documents or records with or without our express written consent need to 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 parties. Some conditions are subject to change over time and those making use of the Report need to be aware of this possibility and understand that the Report only presents the interpreted conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client must 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 based on conditions in evidence at the time of site inspections and based on 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 resulting from misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other parties 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 is recommended to 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 need to 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 to confirm and document that the site conditions do not materially differ from those 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. 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, interpretations and/or decisions of the Client, or other parties 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, unless such decisions expressly form part of the stated purpose of the Report as described in Paragraph 3.



ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP (CON0022165) PEACE REGION (GRANDE PRAIRIE DISTRICT – NORTH) INSTRUMENTATION MONITORING RESULTS

FALL 2025

APPENDIX A
DATA PRESENTATION

SITE PH023: HWY 64:02, CLEAR RIVER EAST HILL (SITE 5 – TWIN PIPES LANDSLIDE)

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS PEACE REGION (GRANDE PRAIRIE - NORTH DISTRICT) INSTRUMENTATION MONITORING FIELD SUMMARY (PH023) FALL 2025

Location: Clear River East Hill - Site 5 (HWY 64:02 C1 24.101)

Readout: Casing Size: 3.34

Probe: RST SET 8R Cable: RST SET 8R

File Number: 32123

Temp: 10/ rain
Read by: AFC/NKR

SLOPE INCLINOMETER (SI) READINGS

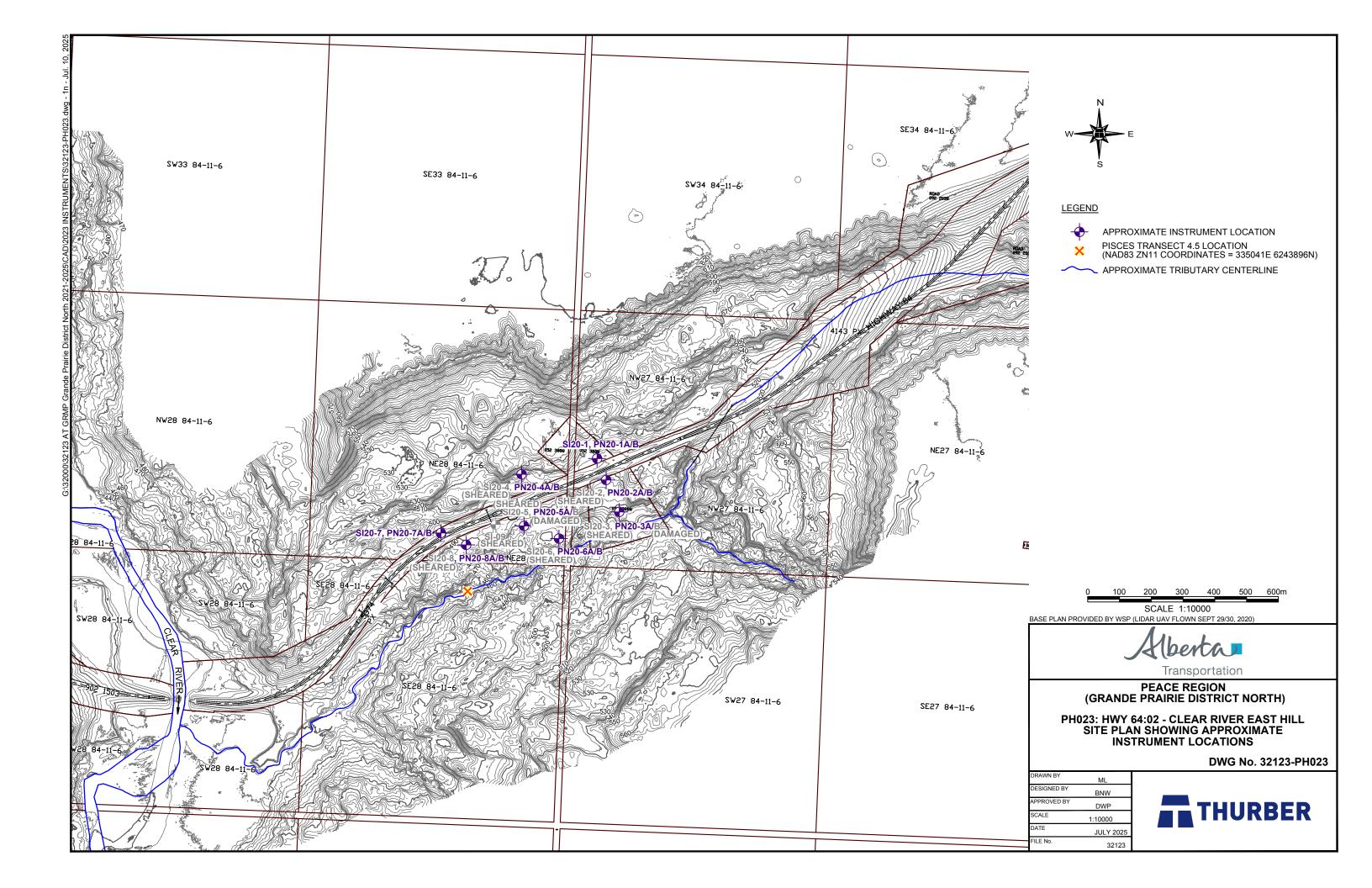
SI#	GPS Location		Date	Stickup	Depth from top	Azimuth of	Current Bottom			Probe/			
	(UTM 11)			(m)	of casing (ft)	A+ Groove	Depth Readings		Reel	Size			
	Easting (m)	Northing (m)					A+	A-	B+	B-	#	(")	Remarks
SI20-1	335453	6244315	29-Sep-25	0.83	196 to 2	340	-132	147	-32	39	8R/8R	3.34	
SI20-7	334956	6244086	29-Sep-25	0.82	178 to 2	180	-68	85	81	-74	8R/8R	3.34	

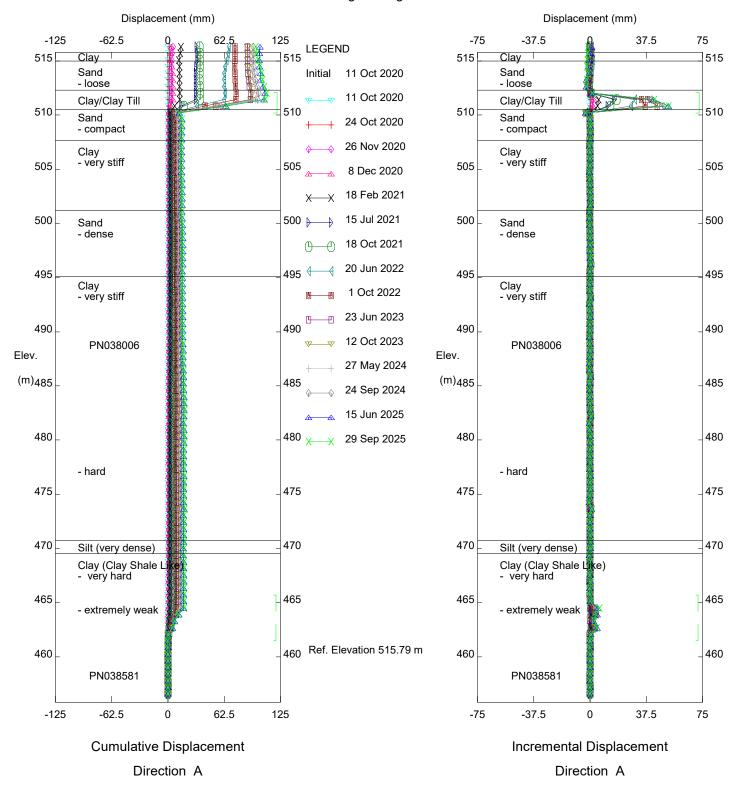
PNEUMATIC PIEZOMETER (PN) READINGS

PN#	PN# GPS Location (UTM 11)		Date	Reading	Identification	
	Easting (m)	Northing (m)		Psi	Number	
PN20-1A	335453	6244315	29-Sep-25	25.3	38006	
PN20-1B	335453	6244315	29-Sep-25	38.3	38581	
PN20-2A	335476	6244253	29-Sep-25	7.3	38240	
PN20-3A	335579	6244143	29-Sep-25	13.9	38242	
PN20-3B	335579	6244143	29-Sep-25	34.6	37407	
PN20-7A	334956	6244086	29-Sep-25	7.4	38007	
PN20-7B	334956	6244086	29-Sep-25	2.8	38582	
PN20-8A	332430	5933825	29-Sep-25	18.8	38239	
PN20-8B	332430	5933825	29-Sep-25	26.6	38583	

INSPECTOR REPORT

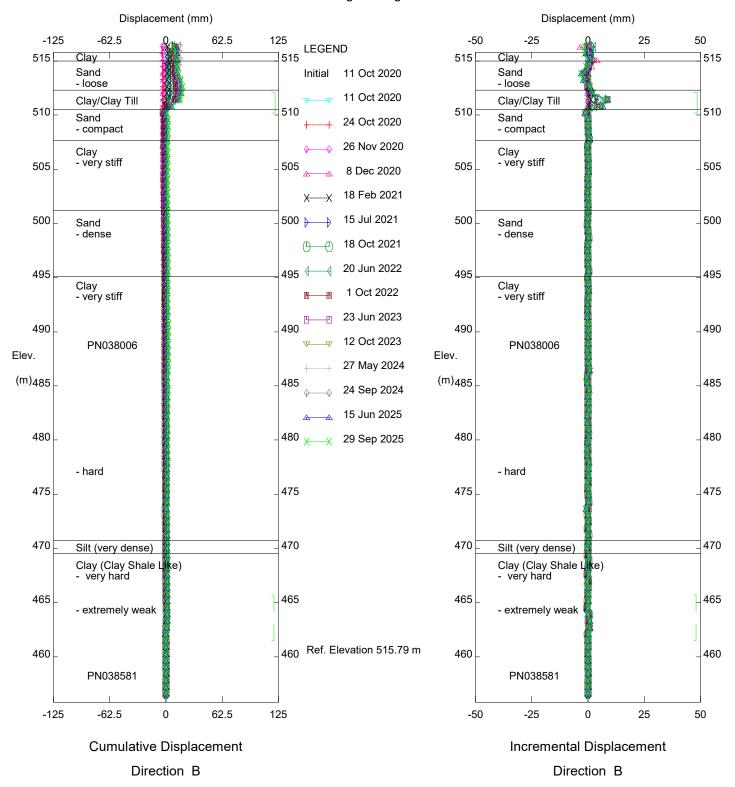
PN20-5A and PN20-6B no longer read to save cost			
PN20-7B reading does not want to stabilize, probably damaged.			





Hwy 64:02 Twin Pipes Landslide (PH023), Inclinometer SI20-1

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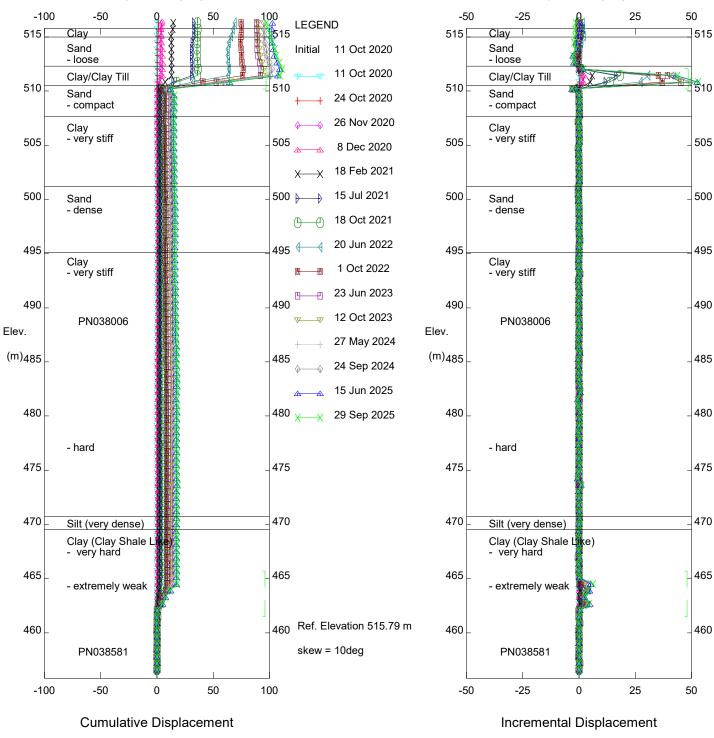
Hwy 64:02 Twin Pipes Landslide (PH023), Inclinometer SI20-1

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Thurber Engineering - Edmonton Displacement (mm) -50 **LEGEND** 515

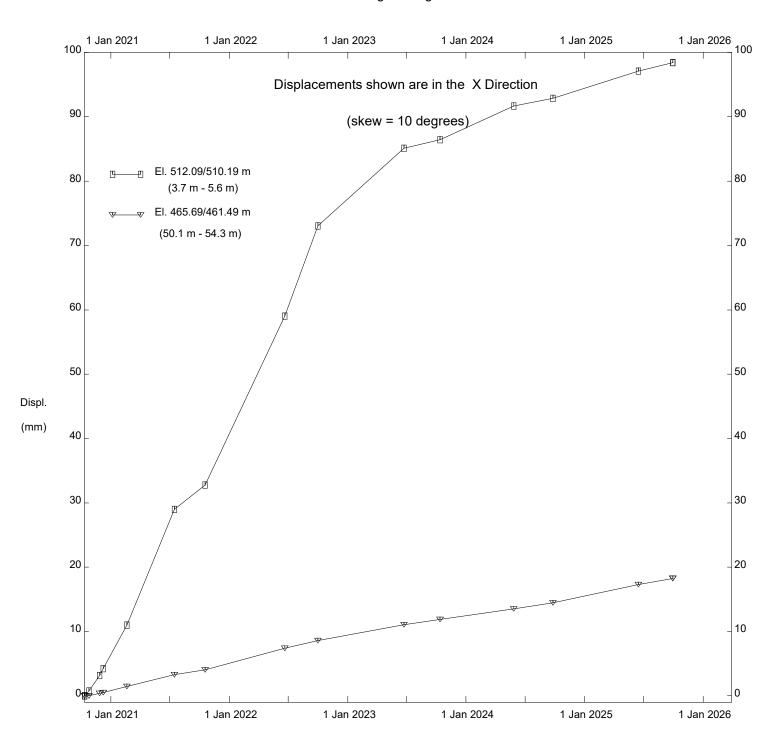
Displacement (mm)

Direction X



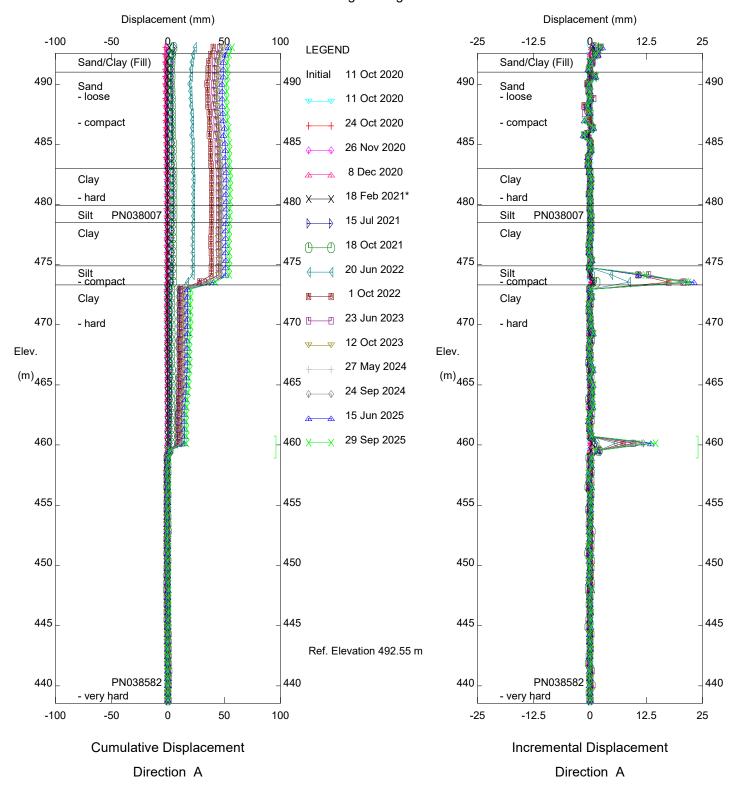
Hwy 64:02 Twin Pipes Landslide (PH023), Inclinometer SI20-1 Alberta Transportation

Direction X



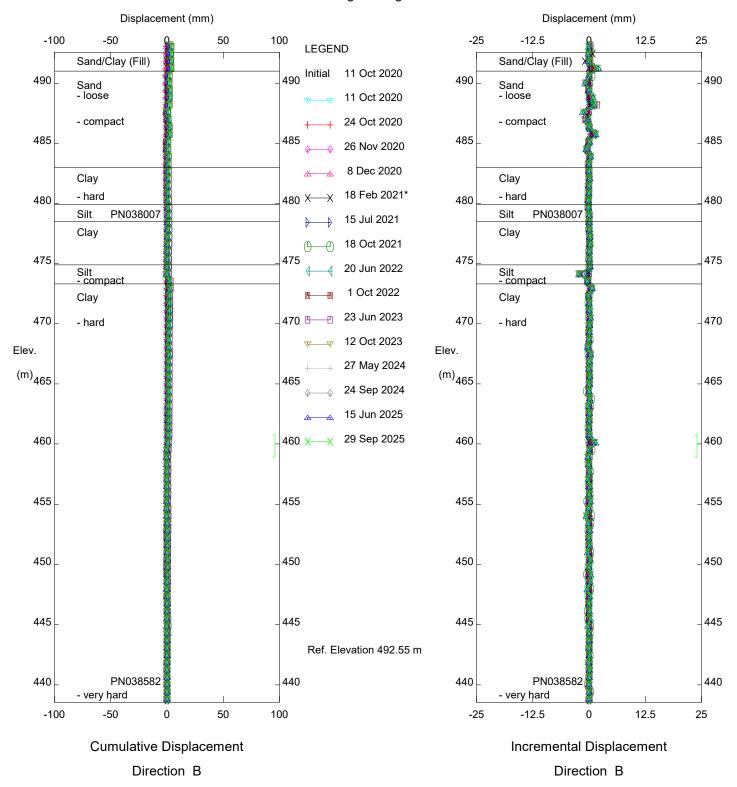
Hwy 64:02 Twin Pipes Landslide (PH023), Inclinometer SI20-1

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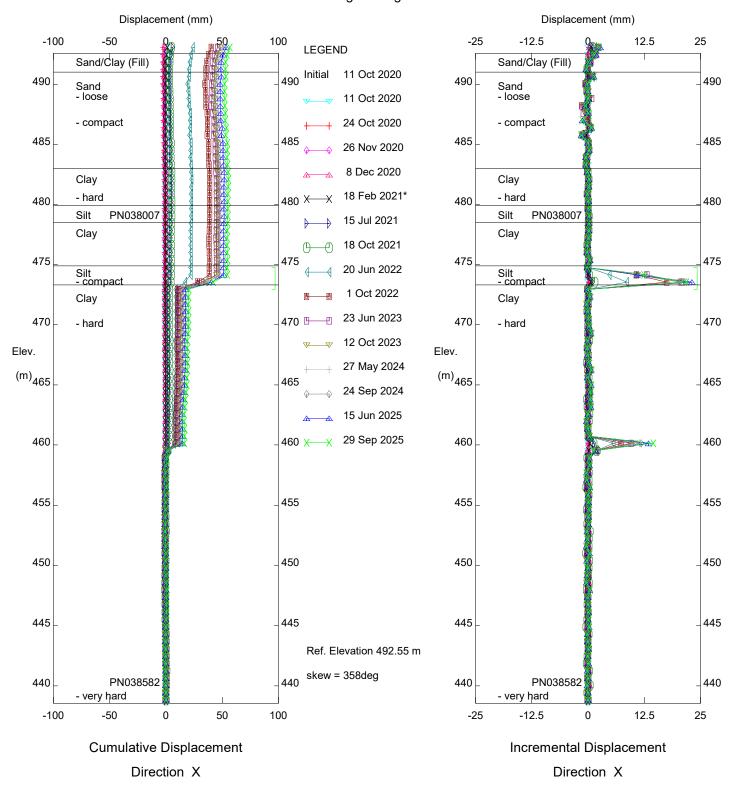
Hwy 64:02 Twin Pipes Landslide (PH023), Inclinometer SI20-7

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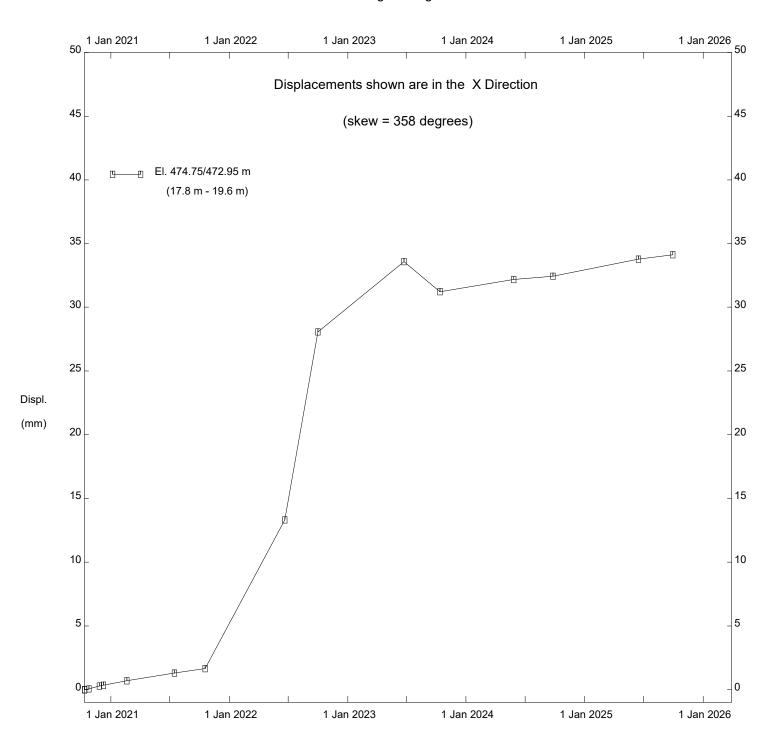
Hwy 64:02 Twin Pipes Landslide (PH023), Inclinometer SI20-7

Alberta Transportation



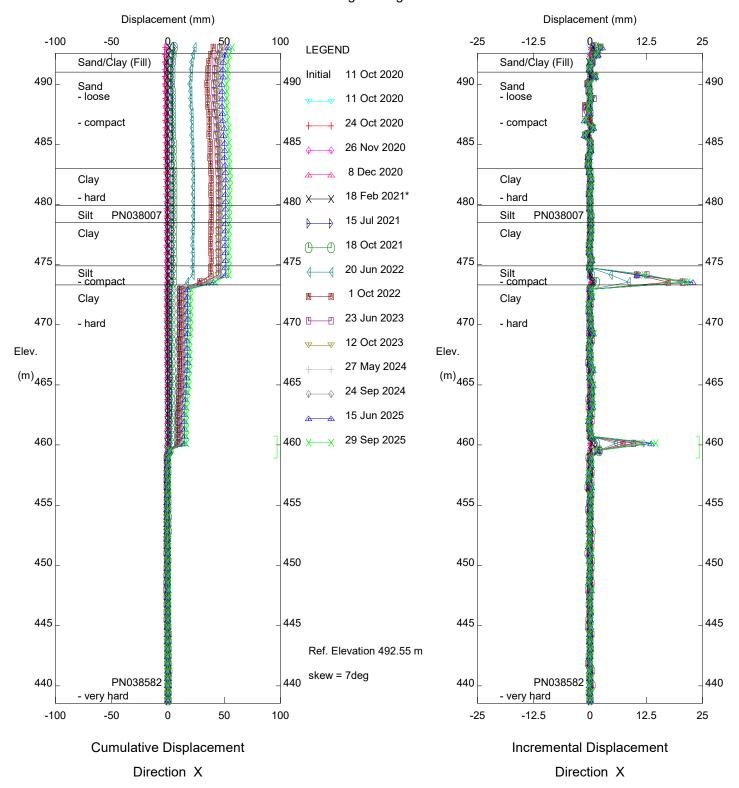
Hwy 64:02 Twin Pipes Landslide (PH023), Inclinometer SI20-7

Alberta Transportation



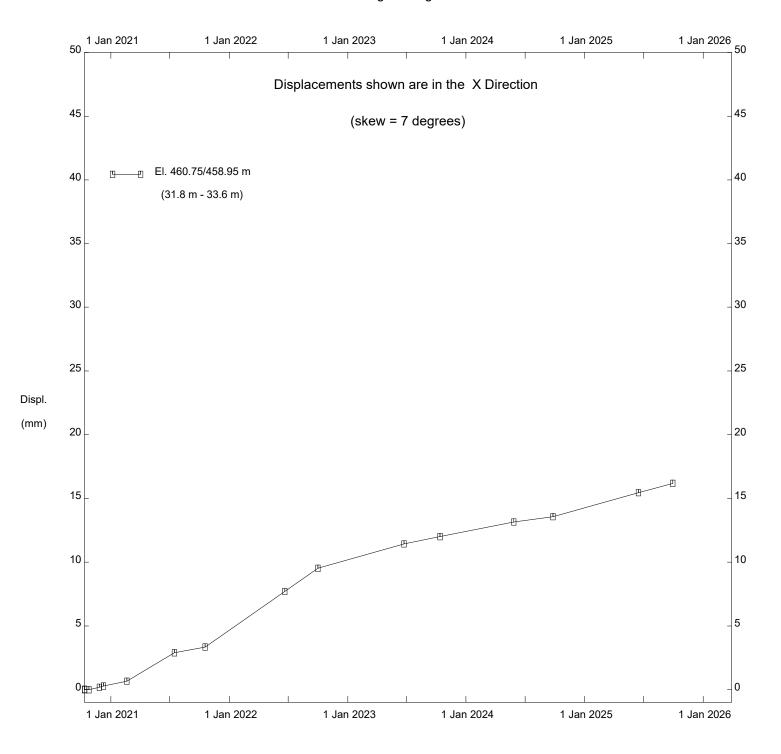
Hwy 64:02 Twin Pipes Landslide (PH023), Inclinometer SI20-7

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Hwy 64:02 Twin Pipes Landslide (PH023), Inclinometer SI20-7

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Hwy 64:02 Twin Pipes Landslide (PH023), Inclinometer SI20-7

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FIGURE PH023-1
HWY 64:02 - CLEAR RIVER EAST HILL - (SITE #5)
PIEZOMETRIC ELEVATIONS

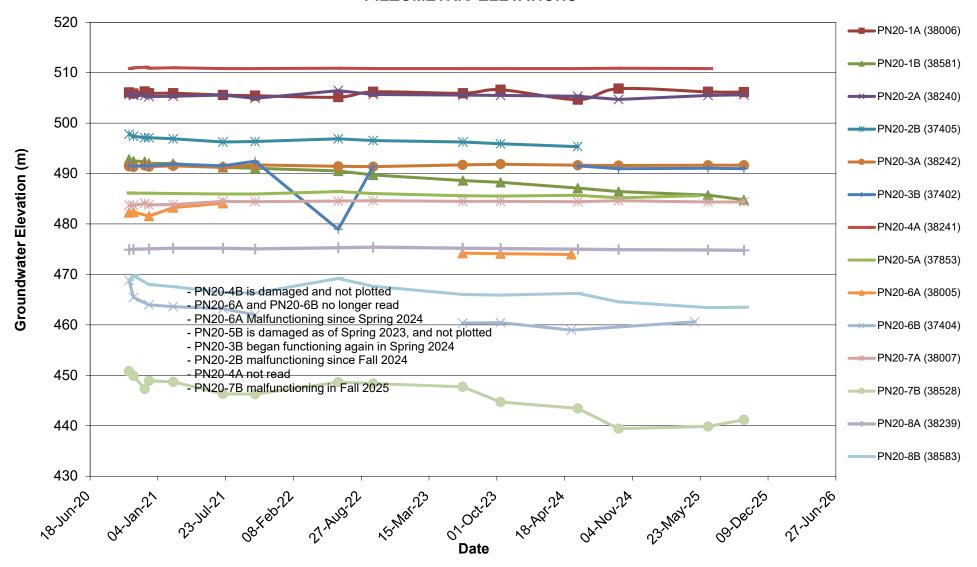


FIGURE PH023-2 HWY 64:02 - CLEAR RIVER EAST HILL - (SITE #5) PIEZOMETRIC DEPTHS

