ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS GRMP
PEACE REGION – (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING - FALL 2024

THURBER ENGINEERING LTD.

Site Number	Location	Name	Hwy	km
PH093	Shaftesbury Trail	The Big Eddie	684:02	8.86 to 8.98
Legal Description:		**UTM Co-ordinates**		
8-21-82-23 W5		11V E 467580.75	N 6333080.85	

Current Monitoring:	19-Sep-2024	**Previous Monitoring:**	18-May-2024
Instruments Read By:	Mr. Niraj Regmi, G.I.T., and Mr. Nixson Mationg, Thurber		

Instruments Read During This Site Visit			
Slope Inclinometers (SIs):	**Pneumatic Piezometers (PN):**	**Vibration Wire Piezometers (VW):**	**Standpipe Piezometers (SP):**
SI23-1 SI23-4	N/A	VW23-1A VW23-4A VW23-4B VW23-5	SP23-2 SP23-3
Load Cell (LC):	**Strain Gauges:**	**SAAs:**	**Others:**
N/A	N/A	N/A	N/A

Readout Equipment Used			
Slope Inclinometers:	**Pneumatic Piezometers:**	**Vibration Wire Piezometers:**	**Standpipe Piezometers:**
Two RST Digital Inclinometer probes with 2 ft. wheelbases and RST Pocket PC readouts	N/A	Geokon GK404	Heron dipmeter
Load Cell:	**Strain Gauges:**	**SAAs:**	**Others:**
N/A	N/A	N/A	N/A
Note: SI23-1 sheared at 11.5 m since the previous readings on May 18, 2024.			

Zones of New Movement:	None
Interpretation of Monitoring Results:	Slope inclinometer S23-1 was installed south (downslope) of Highway 684. SI23-1 sheared at a well-defined movement plane at approximately 11.5 m depth with a cumulative displacement of 56 m. The average rate of movement over this zone was 97.1 mm/yr. The SI plots for the May 18, 2024, readings are attached for reference. Slope inclinometer SI23-4 was installed to the north (upslope) of Highway 684. SI23-4 has not showed a well-defined movement zone. Vibrating wire VW23-1, installed at SI23-1 is being datalogged and has been dry since initialization. Two vibrating wire piezometers VW23-4A and VW23-4B, were installed in the same test hole as SI23-4,. VW23-4A has been dry since installation. VW23-4B showed a decrease in groundwater level of 9.72 m since the spring of 2024 readings. This groundwater level is a

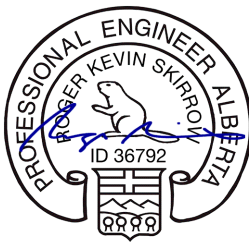
	return to historical norm levels though it is now at the lowest recorded level. VW23-5, installed on the backslope above the highway, has been dry since March 2024. Standpipe piezometers, SP23-2 and SP23-3, installed along the north side of the highway showed increases in groundwater level of 0.50 m and 0.28 m, respectively. Both instruments are showing the highest measured groundwater levels since they were initialized.
Future Work:	The instruments should be read again in the spring of 2025.
Instrumentation Repairs:	No instrument repairs are required at this time although it is recommended that the datalogger be shifted from the dry VW23-1 to VW23-4B to monitor for a similar spring increase in water level next year.
Additional Comments:	

Attachments:	▪ Table PH093-1: Fall 2024 – Highway 684:02 The Big Eddie Slide Slope Inclinometer Instrumentation Reading Summary ▪ Table PH093-2: Fall 2024 – Highway 684:02 The Big Eddie Slide Vibrating Wire Piezometer Instrumentation Reading Summary ▪ Table PH093-3: Fall 2024 – Highway 684:02 The Big Eddie Slide Standpipe Piezometer Instrumentation Reading Summary ▪ Statement of Limitations and Conditions ▪ APPENDIX A - PH093 FALL 2024 □ Field Inspector's report □ Site Plan Showing Instrument Locations (Drawing No. 32121-PH093-1) □ SI Reading Plots □ Figure PH093-1 (Vibrating Wire Piezometer Depths) □ Figure PH093-2 (Vibrating Wire Piezometer Elevations)

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.
Roger Skirrow, M.Sc., P. Eng.
Senior Geotechnical Engineer

2024-11-21



2024-11-21

PERMIT TO PRACTICE
THURBER ENGINEERING LTD.
RM SIGNATURE: _____
RM APEGA ID #: 91085
DATE: November 21, 2024
PERMIT NUMBER: P005186
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Lucas Green, P.Eng.
Geotechnical Engineer

Table PH093-1: Fall 2024 – Highway 684:02 The Big Eddie Slide Slope Inclinometer Instrumentation Reading Summary

Date Monitored: September 19, 2024

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)
SI23-1	*October 19, 2023*	*211.5 mm over 10.0 m to 13.0 m depth in 159° direction*	*147.3 mm/y In November 2023*	*Sheared at 11.5 m*	*May 18, 2024*	*N/A*	*N/A*	*N/A*
SI23-4	October 19, 2023	No discernible movement	No discernible movement	N/A	May 18, 2024	N/A	N/A	N/A

Drawing 32121-PH093-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

Table PH093-2: Fall 2024 – Highway 684:02 The Big Eddie Slide Vibrating Wire Piezometer Instrumentation Reading Summary

Date Monitored: September 23, 2024

INSTRUMENT	DATE INITIALIZED	GROUND ELEVATION (m)	TIP DEPTH (m)	CURRENT STATUS	MAXIMUM GROUNDWATER ELEVATION (m)	CURRENT GROUNDWATER ELEVATION (m)	PREVIOUS GROUNDWATER ELEVATION (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
VW23-1	October 19, 2023	452.12	18.04	Operational	Dry	Dry	Dry	Dry
VW23-4A	October 19, 2023	456.71	15.01	Operational	441.74 on December 21, 2023	Dry	Dry	Dry
VW23-4B	October 19, 2023	456.71	24.77	Operational	446.51 on May 18, 2024	436.80	446.51	-9.72
VW23-5	October 19, 2023	463.06	7.83	Operational	455.25 on December 21, 2023	Dry	Dry	Dry

Drawing 32121-PH093-1 in Appendix A provides a sketch of the approximate location of the monitoring instrumentation for this site.

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Table PH093-3: Fall 2024 – Highway 684:02 The Big Eddie Slide Standpipe Piezometer Instrumentation Reading Summary

Date Monitored: September 26, 2024

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED WATER LEVEL ELEVATION (m)	MEASURED WATER LEVEL BGS (m)	PREVIOUS READING (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SP23-2	October 19, 2023	19.51	459.29	Active	455.83 on September 19, 2024	455.83	455.33	0.50
SP23-3	October 19, 2023	19.13	451.22	Active	446.89 on September 19, 2024	446.89	446.61	0.28

Drawings 32123-PH093-1 in Appendix A provide sketches of the approximate locations of the monitoring instrumentation for this site.

THURBER

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 AND ECONOMIC CORRIDORS GRMP (CON0022164)
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING RESULTS

FALL 2024

APPENDIX A
DATA PRESENTATION

SITE PH093: HWY 684:02, THE BIG EDDIE LANDSLIDE

ALBERTA TRANSPORTATION AND ECONOMIC CORRIDORS
PEACE REGION (PEACE RIVER DISTRICT)
INSTRUMENTATION MONITORING FIELD SUMMARY (PH093)
FALL 2024

Location:	Hwy 684:02 Big Eddie Slide	**Readout:**	RST Set 10
File Number:	32121	**Casing Diameter:**	2.75"
Probe:	RST Set 10	**Temp:**	10
Cable:	RST Set 10	**Read by:**	NRM/NKR

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (UTM 11)		Date	Stickup (m)	Readings Depth from top of **casing** (ft)	Azimuth of A+ Groove degree	Current Bottom Depth Readings				Remarks
	Northing	Easting					A+	A-	B+	B-	
SI23-1	6219621	467077	19-Sep-24	0.69	100 to 2	135	61	-58	53	-63	Sheared off @ 37' 10" depth
SI23-4	6219684	467056	19-Sep-24	0.87	84 to 2	156	-150	196	-278	287	Readings start 18.5" off bottom

VIBRATING WIRE PIEZOMETER (VW) READINGS

PN #	Serial	GPS Location (UTM 11)		Location	Date	Reading		Comments
		Northing	Easting			B Unit	°C	
VW23-1	168532	6219621	467077	Attached to TH23-1	19-Sep-24	Downloaded		*Attached to Datalogger
VW23-4A	175703	6219684	467056	Attached to TH23-4	19-Sep-24	8321.2	6.4	
VW23-4B	168520	6219684	467056	Attached to TH23-4	19-Sep-24	8865.4	6.9	
VW23-5	175712	6219736	467059	Attached to TH23-5	19-Sep-24	8535.9	6.3	

SP#	GPS Location (UTM 11)		Date	Stick-up (m)	Water level below top of pipe (m)	Comments
	Northing	Easting				
SP23-2	6219669	467009	19-Sep-24	0.93	4.39	
SP23-3	6215664	467132	19-Sep-24	0.77	5.1	

INSPECTOR REPORT

Datalogger attached to VW168532 in TH23-1 has to be downloaded.

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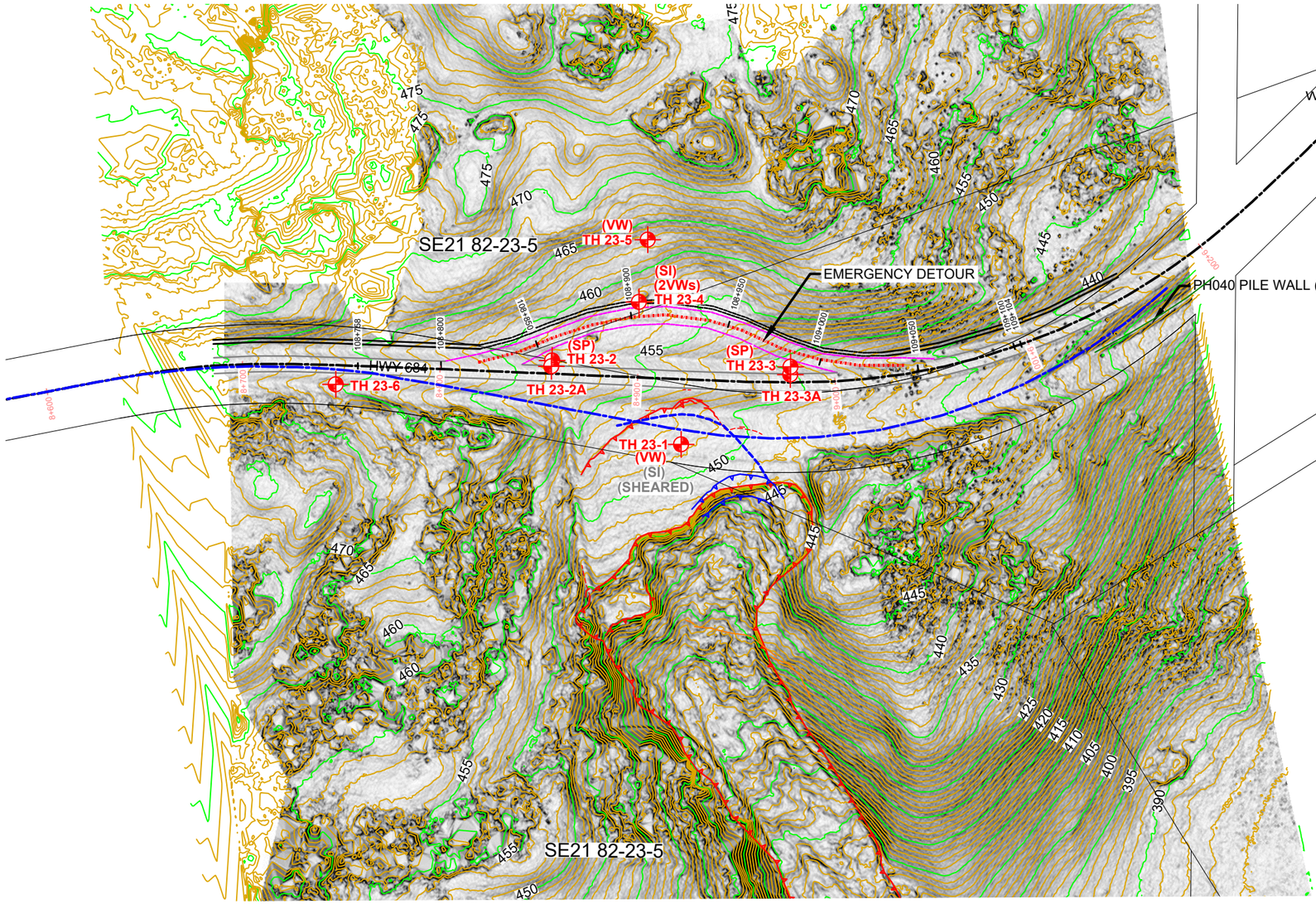

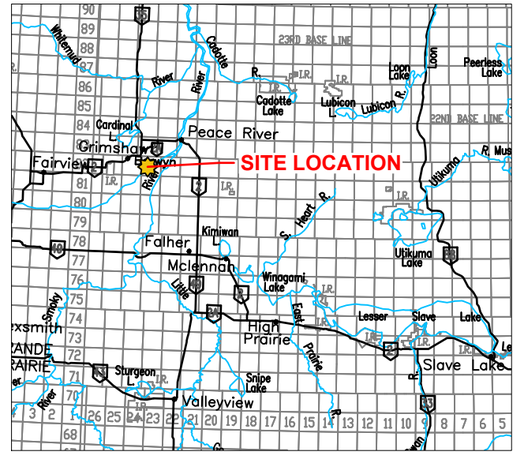

KEY MAP
SCALE 1:3 000 000

0 25 50 75 100 125 150m
SCALE 1:2500

LIDAR FROM JUNE 2023 SURVEY AND DETOUR BASE PLAN PROVIDED BY MCINTOSH PERRY

LEGEND

- SURVEYED TEST HOLE LOCATION
- (SP) STANDPIPE PIEZOMETER
- (SI) SLOPE INCLINOMETER
- (VW) VIBRATING WIRE PIEZOMETER
- SCARP
- CRACK
- CRACK SEEN ON GOOGLE EARTH MAY 10, 2023, SATELLITE IMAGE
- GROUND SURFACE CONTOUR (CONTOUR INTERVAL = 1m)
- ESTIMATED 1986 CENTERLINE
- 1986 SLIDE EXTENT
- 1986 SCARP

Alberta

PEACE REGION (PEACE RIVER DISTRICT)
BIG EDDIE: HWY 684:02 km 8.86 TO KM 8.98

SITE PLAN SHOWING INSTRUMENT LOCATIONS

DWG No. 32121-PH093-1

DRAWN BY	ML
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	1:2500
DATE	NOVEMBER 2024
FILE No.	32121

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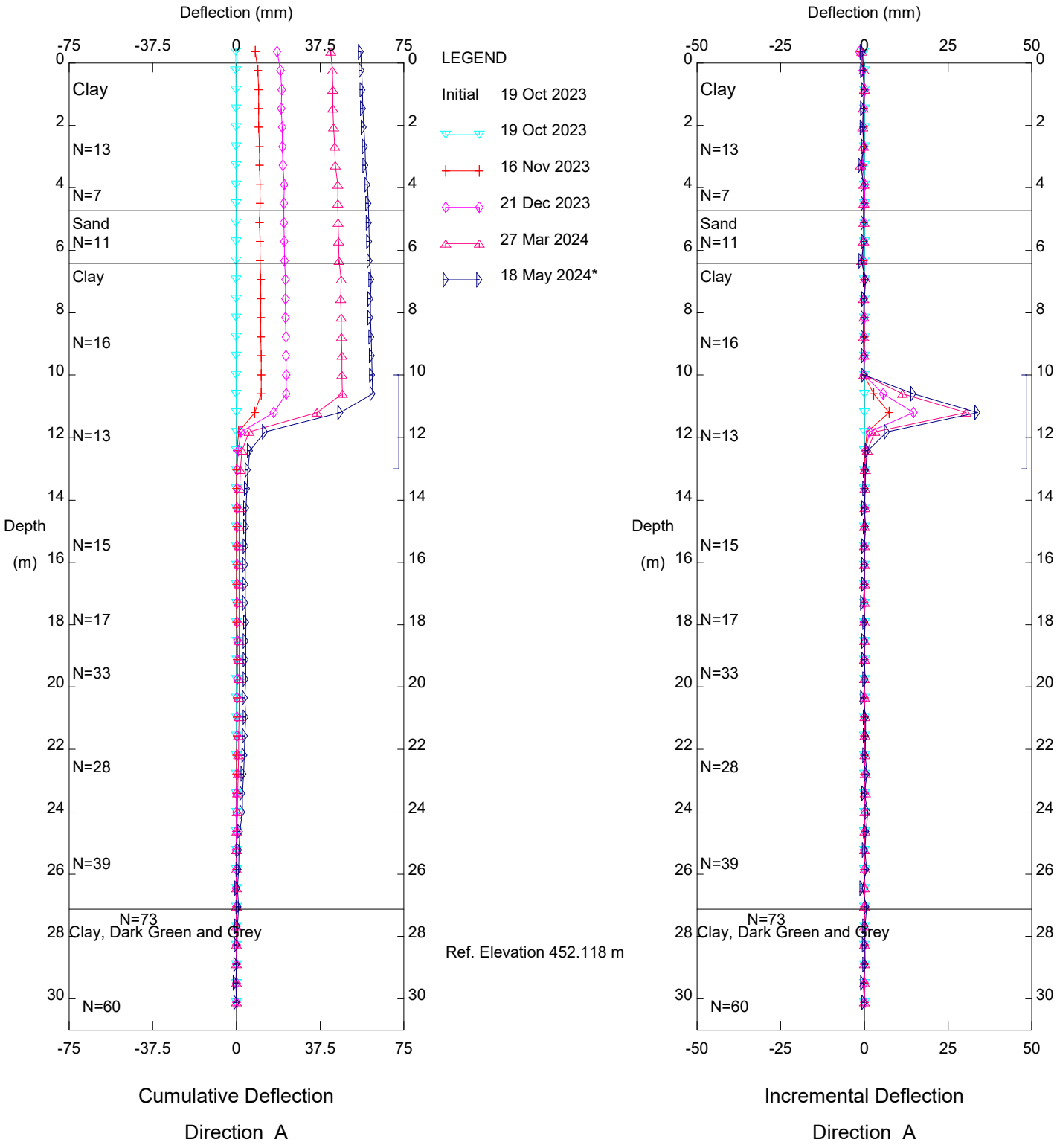

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

PH093 Big Eddie Slide, Inclinometer SI23-1

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

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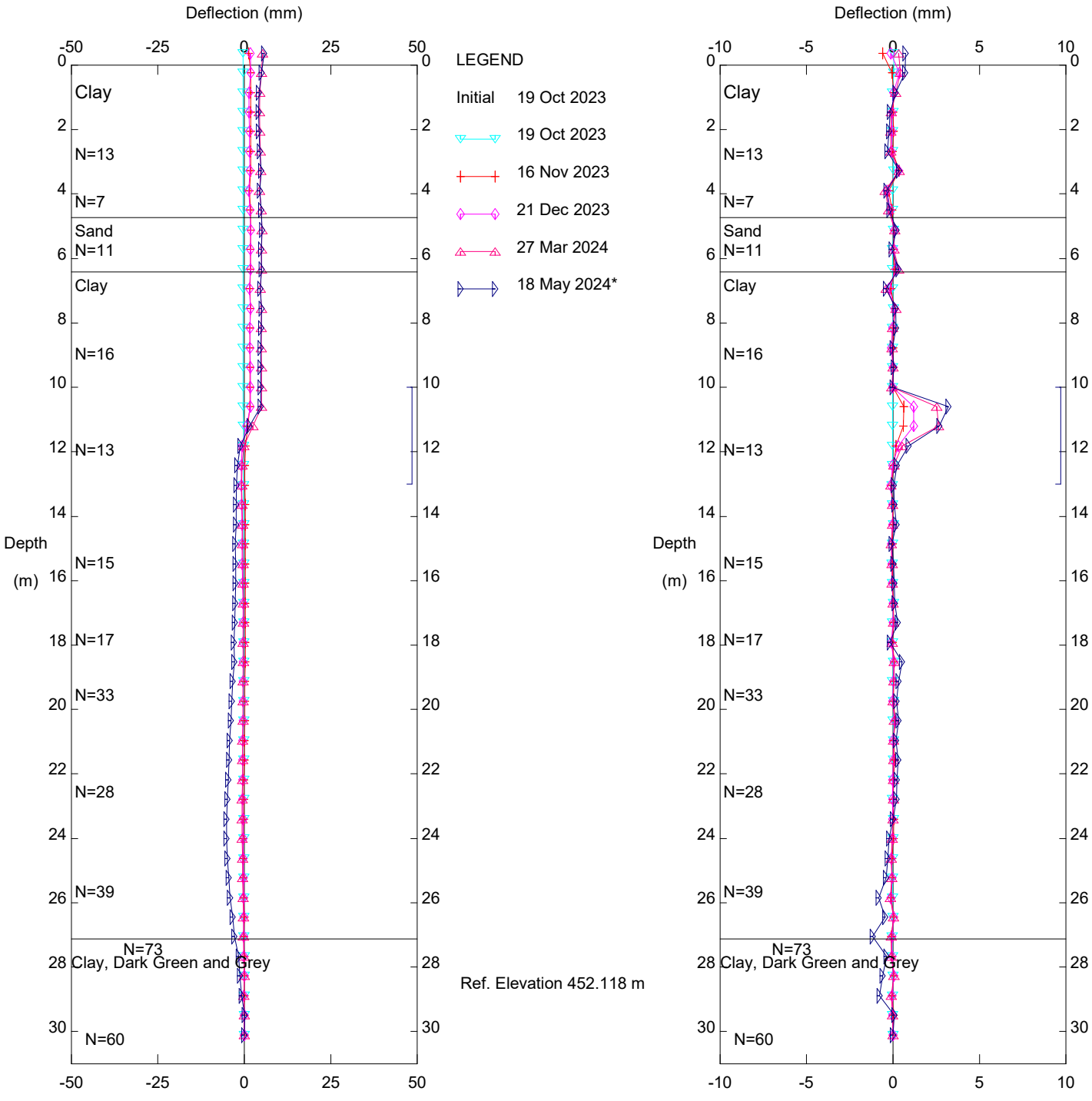

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

PH093 Big Eddie Slide, Inclinometer SI23-1

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

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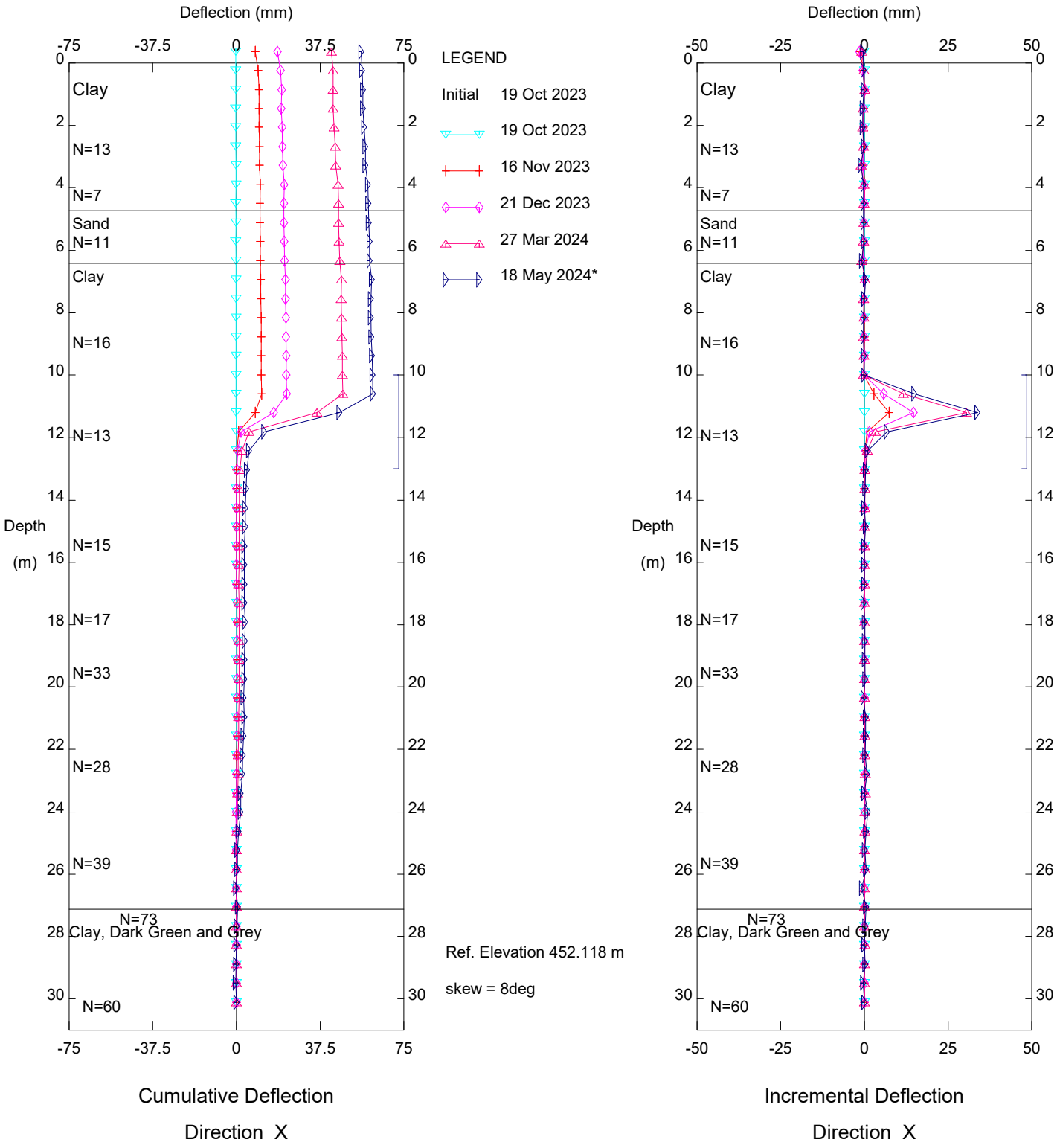

PH093 Big Eddie Slide, Inclinometer SI23-1

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

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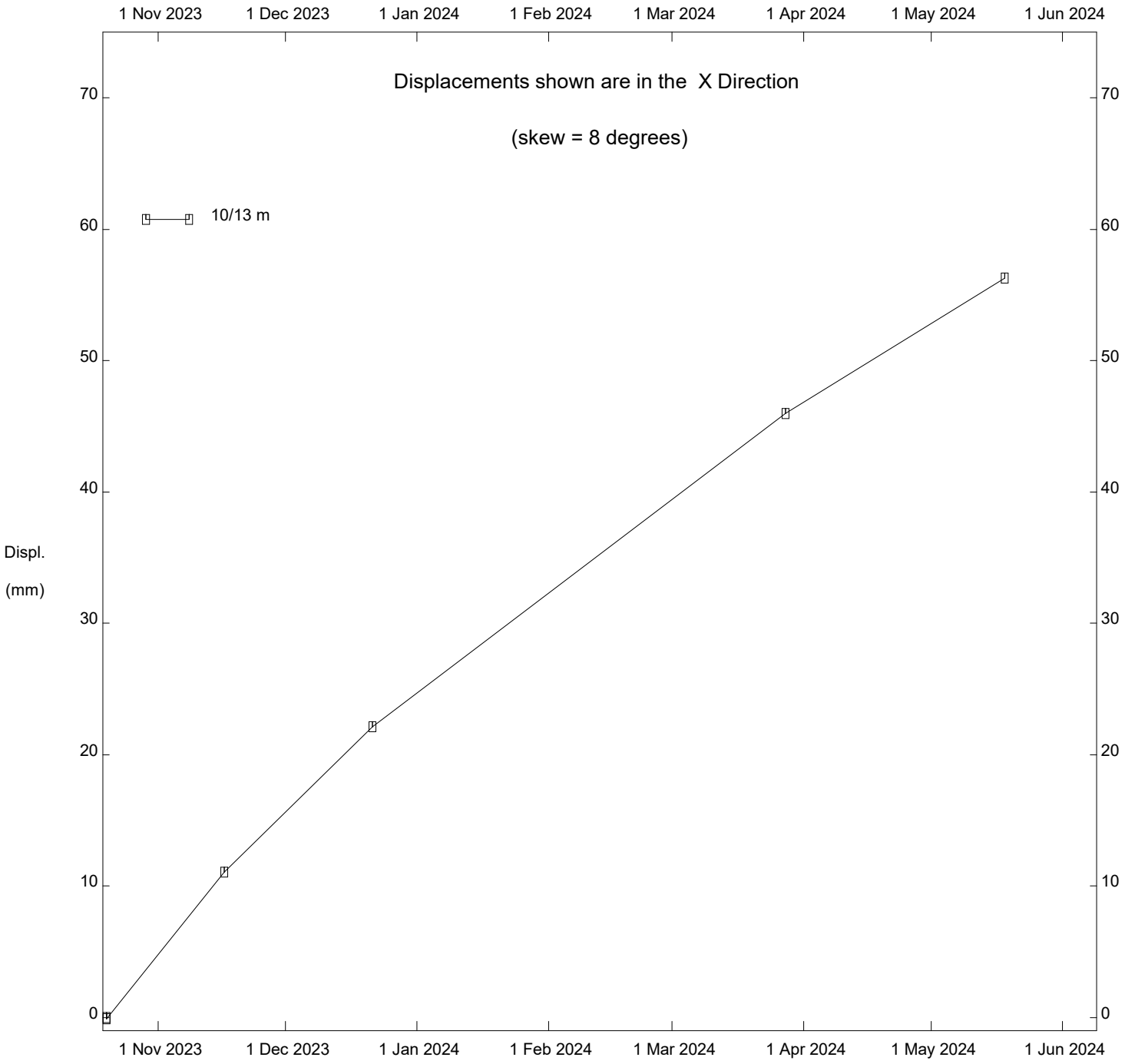
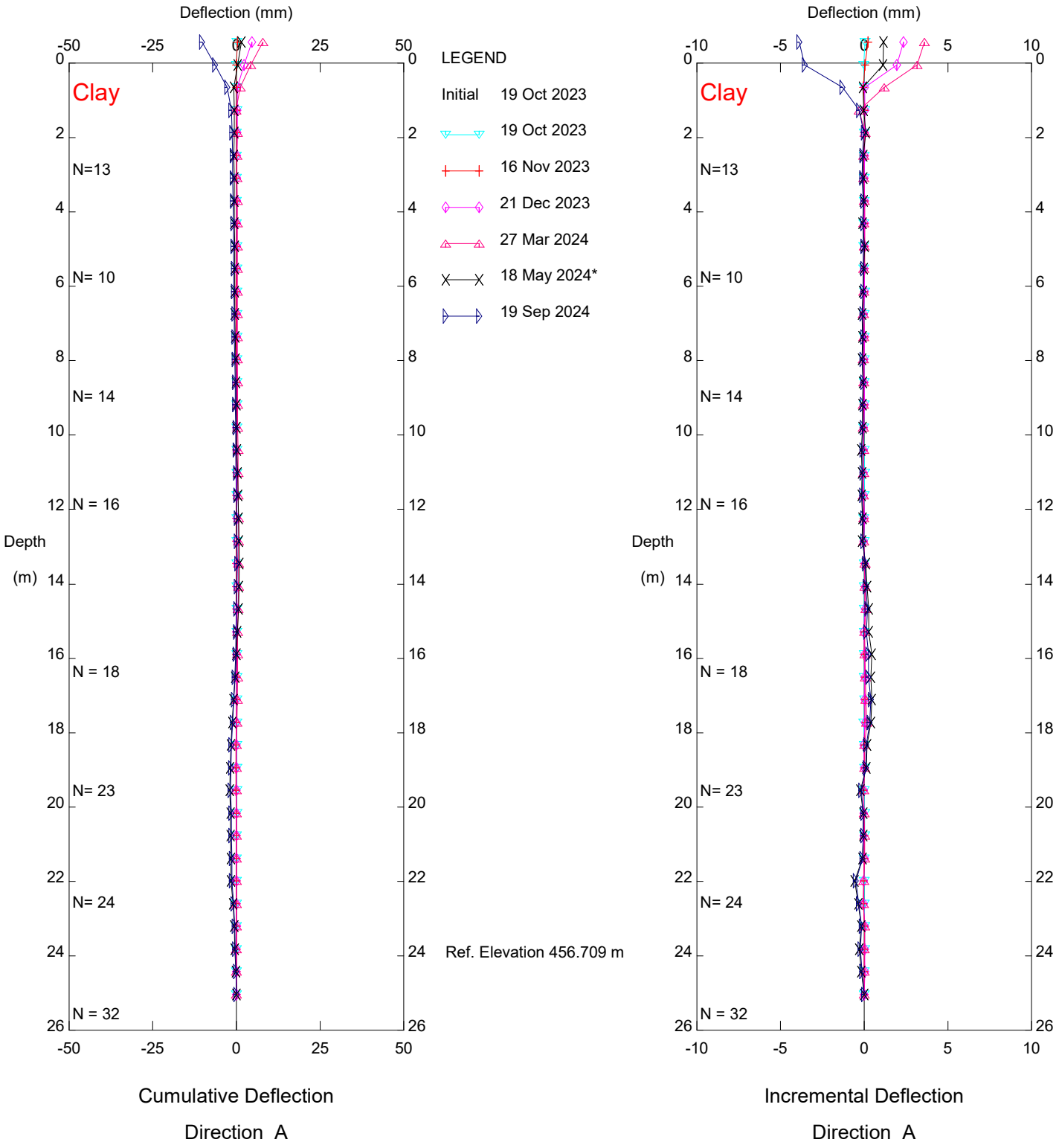


PH093 Big Eddie Slide, Inclinometer SI23-1

Thurber Engineering Ltd.



Cumulative Deflection

Direction A

Incremental Deflection

Direction A

PH093 Big Eddie Slide, Inclinometer SI23-4

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

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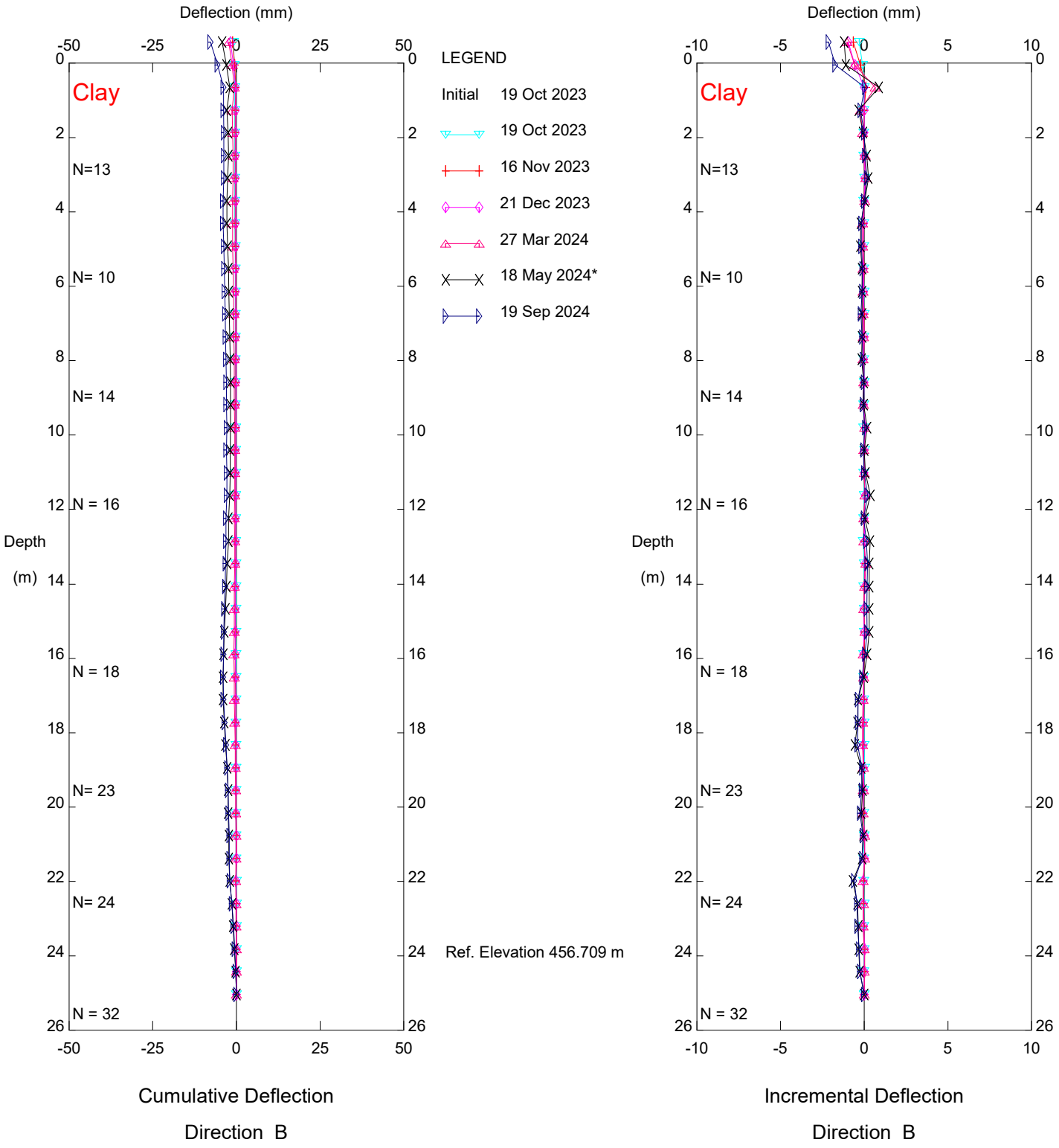
Thurber Engineering Ltd.



Cumulative Deflection

Direction B

Incremental Deflection

Direction B

PH093 Big Eddie Slide, Inclinometer SI23-4

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

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FIGURE PH093-1
BIG EDDIE LANDSLIDE PIEZOMETER DEPTHS

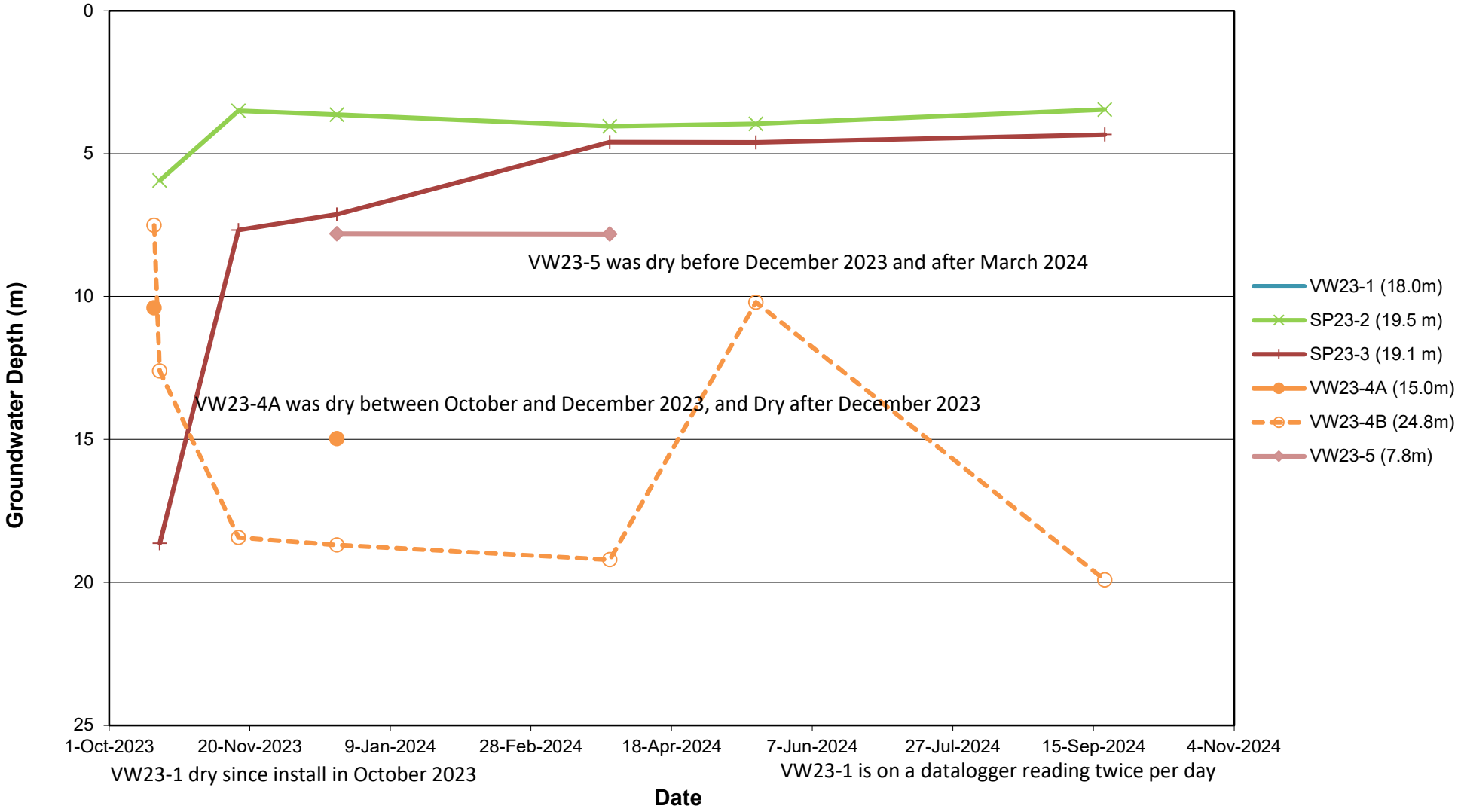

FIGURE PH093-2
BIG EDDIE LANDSLIDE PIEZOMETER ELEVATIONS