THURBER ENGINEERING LTD.

ALBERTA TRANSPORTATION
PEACE REGION (PEACE RIVER / HIGH LEVEL)
INSTRUMENTATION MONITORING RESULTS

SPRING 2016

SECTION C

SITE PH047-1: HWY 690:02, DEADWOOD SLIDE

1. OBSERVATIONS

1.1 Field Program and Instrumentation Status

Two new slope inclinometers (SI15-01 and SI15-02) were installed (by others) at the Hwy 690:02 Deadwood Slide site during construction in the fall of 2015. The majority of construction work was completed by the end of November 2015. The two SIs were read on May 25, 2016 by Mr. Ken Froese, P.Eng., of Thurber Engineering Ltd. (Thurber). One standpipe piezometer (SP10-5) was destroyed during construction and could not be read.

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.

2. INTERPRETATION

2.1 General

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

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2.2 Zones of Movement

Zones of movement were observed in slope inclinometers SI15-01 and SI15-02 over 5.7 m to 7.5 m depth and over 4.7 m to 6.0 m depth, respectively.

Zones of movement are summarized in Table PH047-1-1 at the end of this report. 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 inclinometer.

2.3 Interpretation of Monitoring Results

Slope indicator SI15-01 showed a rate of movement of 9.4 mm/yr over 5.7 m to 7.5 m depth. SI15-02 showed a rate of movement of 2.8 mm/yr over 4.7 m to 6.0 m depth.

Historical groundwater levels recorded in the piezometers are summarized in Tables PH047-1-2 and PN047-1-3 at the end of this report and are plotted in Figures PH047-1-1 and PH047-1-2 in Section D. Figures PH047-1-1 and PH047-1-2 show groundwater depth and groundwater elevation, respectively.

3. RECOMMENDATIONS

3.1 Future Work

The instruments should be read again during the fall of 2016.

3.2 Instrumentation Repairs

No instrumentation repairs are required at this time.

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TABLE PH047-1-1
SPRING 2016 – DEADWOOD SLIDE
SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 26, 2016

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)
SI15-01	October 14, 2015	42.8 mm over 5.7 m to 7.5 m depth in 166° direction	650 in October 2015	Operational	November 21, 2015	4.8	9.4	-119.8
SI15-02	October 14, 2015	56.1 mm over 4.7 m to 6.0 m depth in 157° direction	971 in October 2015	Operational	November 21, 2015	1.4	2.8	-162.6

Drawing 13351-PH047-1-1 in section D provides a sketch of the approximate locations of the monitoring instrumentation for this site.

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TABLE PH047-1-2
SPRING 2016 – DEADWOOD SLIDE
STANDPIPE PIEZOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 26, 2016

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM WATER LEVEL BGS (m)	MEASURED WATER LEVEL BGS (m)	PREVIOUS READING (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
SP10-1	*November 4, 2010*	*9.66*	*559.54*	*Blocked at 1.7 mBGS*	*4.60 on November 4, 2010*	*N/A*	*N/A*	*N/A*
SP10-3	*November 4, 2010*	*8.90*	*565.44*	*Destroyed*	*1.14 on May 27, 2011*	*N/A*	*N/A*	*N/A*
SP10-5	*April 27, 2010*	*2.92*	*561.27*	*Damaged*	*0.63 on July 27, 2011*	*N/A*	*1.66*	*N/A*

Drawing 13351-PH047-1-1 in section D provides a sketch of the approximate locations of the monitoring instrumentation for this site.

TABLE PH047-1-3
SPRING 2016 – DEADWOOD SLIDE
VIBRATING WIRE PIEZOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: May 26, 2016

INSTRUMENT	DATE INITIALIZED	TIP ELEV. (m)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM GROUNDWATER ELEVATION (m)	CURRENT GROUNDWATER ELEV. (m)	PREVIOUS GROUNDWATER ELEV. (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
VW10-1 (100D10918)	*April 27, 2011*	*553.50*	*562.00*	*Non-operational*	*560.59 m on June 2, 2014 (1.41 mBGS)*	*N/A*	*560.33 (1.67 mBGS)*	*N/A*
VW10-2 (100D10917)	*April 27, 2011*	*555.17*	*560.96*	*Non-operational*	*558.96 m on June 2, 2014 (2.00 mBGS)*	*N/A*	*N/A*	*N/A*

Drawing 13351-PH047-1-1 in section D provides a sketch of the approximate locations of the monitoring instrumentation for this site.

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ALBERTA TRANSPORTATION
PEACE REGION (PEACE RIVER / HIGH LEVEL)
INSTRUMENTATION MONITORING RESULTS

SPRING 2016

SECTION D
DATA PRESENTATION

SITE PH047-1: HWY 690:02, DEADWOOD SLIDE

ALBERTA TRANSPORTATION
PEACE REGION (PEACE RIVER / HIGH LEVEL)
INSTRUMENTATION MONITORING FIELD SUMMARY (PH047-1)
SPRING 2016

Location:	Deadwood Slide (HWY 690:02 C1 2.431)	**Readout:**	RST #9
File Number:	13351	**Extension:**	-
Probe:	RST #9	**Temp:**	10C
Cable:	RST #9	**Read by:**	KEF

SLOPE INCLINOMETER (SI) READINGS

SI#	GPS Location (NAD83)		Date	Stickup (m)	Depth from top of casing (ft)	Magn. North A+ Groove	Current Bottom Depth Readings				Remarks
	Latitude (N)	Longitude (W)					A+	A-	B+	B-	
SI15-01			26-May-16	0.75	52 to 2	168	-18	27	-757	758	
SI15-02			26-May-16	1.05	52 to 2	176	202	-198	-526	518	

STANDPIPE PIEZOMETER READINGS

SP#	GPS Location (NAD83)		Date	Stick-up (m)	Reading below top of casing (m)	Bottom Pipe Depth (below top of casing (m)
SP10-5	*56.74110*	*117.60529*	*26-May-16*	*0.7*	*Damaged*	*3.66*

INSPECTOR REPORT

H:\13000\13351 Geohazard Assessment - Peace RiverHigh Level (CON0017602)\Drafting\13351-PH047-1-1.dwg - 1 - Aug. 29, 2016

PROPOSED 2m DEEP SUBDRAIN UNDER EXISTING HIGHWAY DITCH (SEE DETAIL SHEET 6)

SUBDRAIN TRANSITION TO EXISTING HIGHWAY DITCH

SP10-3 (TH10-3)

GAS

CRACK

DIP

ACP PATCH

I2

I3

HIGHWAY 690

EXISTING CULVERT

SP10-1

FRENCH DRAINS (TYP). (SEE DETAIL SHEET 6)

SI10-1 (TH10-4)

SI15-01

VW10-1

VW10-2

SP10-5

SI10-2 (TH10-5)

SI15-02

USE NON-PERFORATED PIPE THROUGH CULVERT CLAY SEAL ZONE

LIMITS OF TREE CLEARING

CLASS 2 RIP RAP

CREEK

TRM LINED SWALE

PROPOSED 1800mm Ø C.SP. CULVERT

DOWNSLOPE SUBDRAIN (SEE DETAIL SHEET 6)

4H:1V

2H:1V

%6

%3

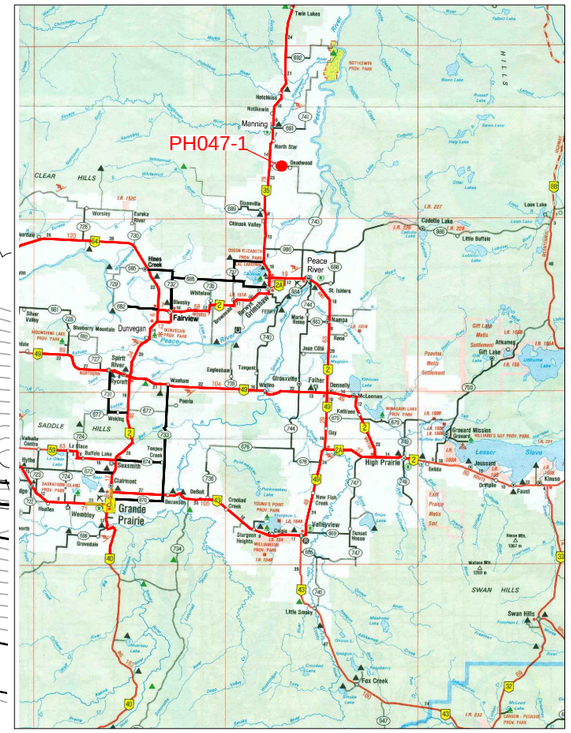
%2

N

W

E

S



0 5 10 15 20 30m

SCALE 1:600

LEGEND :

- INSTRUMENT LOCATION
- INSTRUMENT NOT IN USE
- SI SLOPE INCLINOMETER

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PEACE REGION (PEACE RIVER/ HIGH LEVEL) 2016

PH047-1: HWY 690:02 - DEADWOOD SLIDE INSTRUMENT LOCATIONS

DWG No. 13351-PH047-1-1

DRAWN BY	ML
DESIGNED BY	NFR
APPROVED BY	DWP
SCALE	1:600
DATE	AUGUST 2016
FILE No.	13351

THURBER ENGINEERING LTD.

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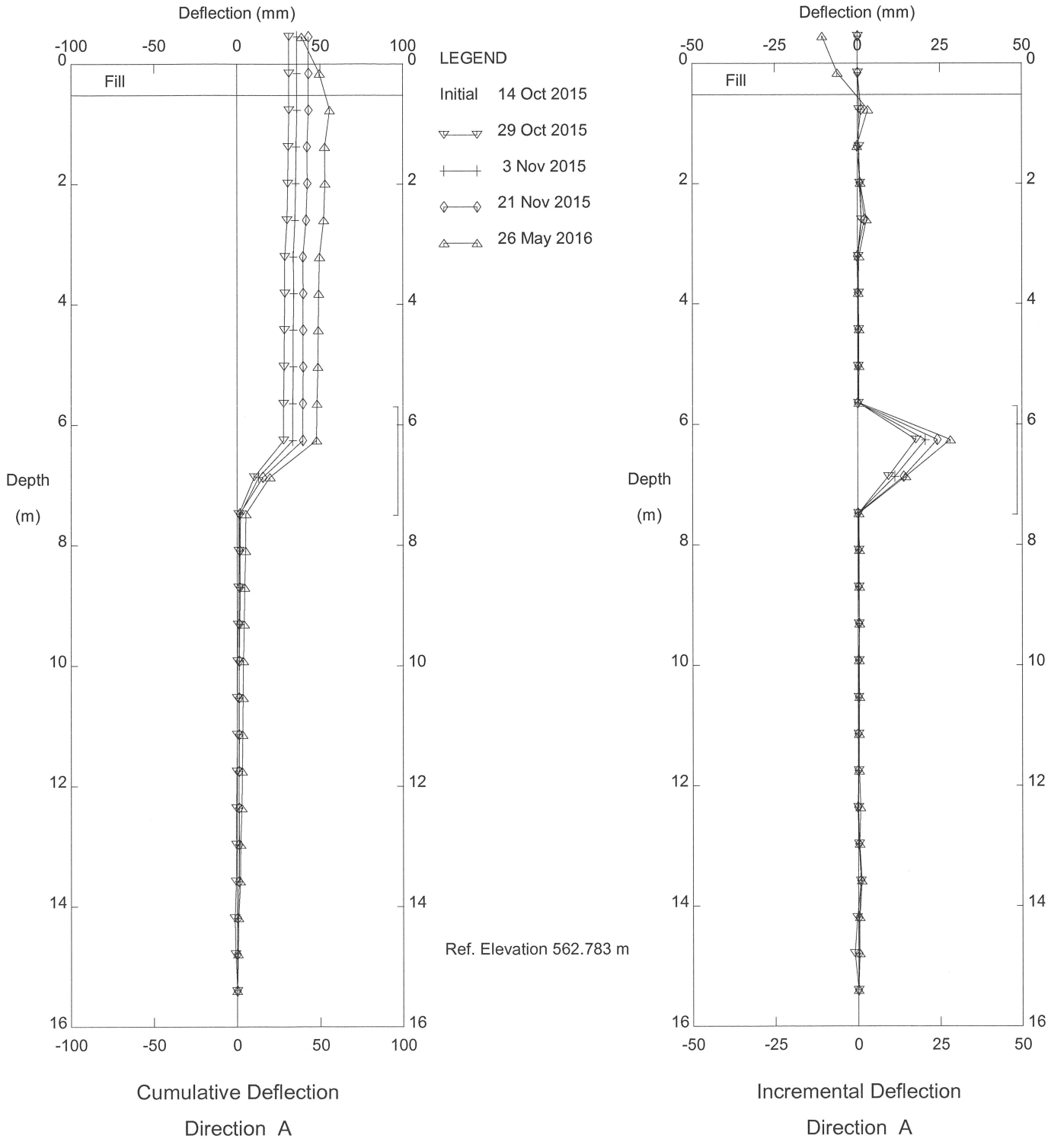

Cumulative Deflection

Direction A

Incremental Deflection

Direction A

PH47-Deadwood, Inclinometer SI15-01

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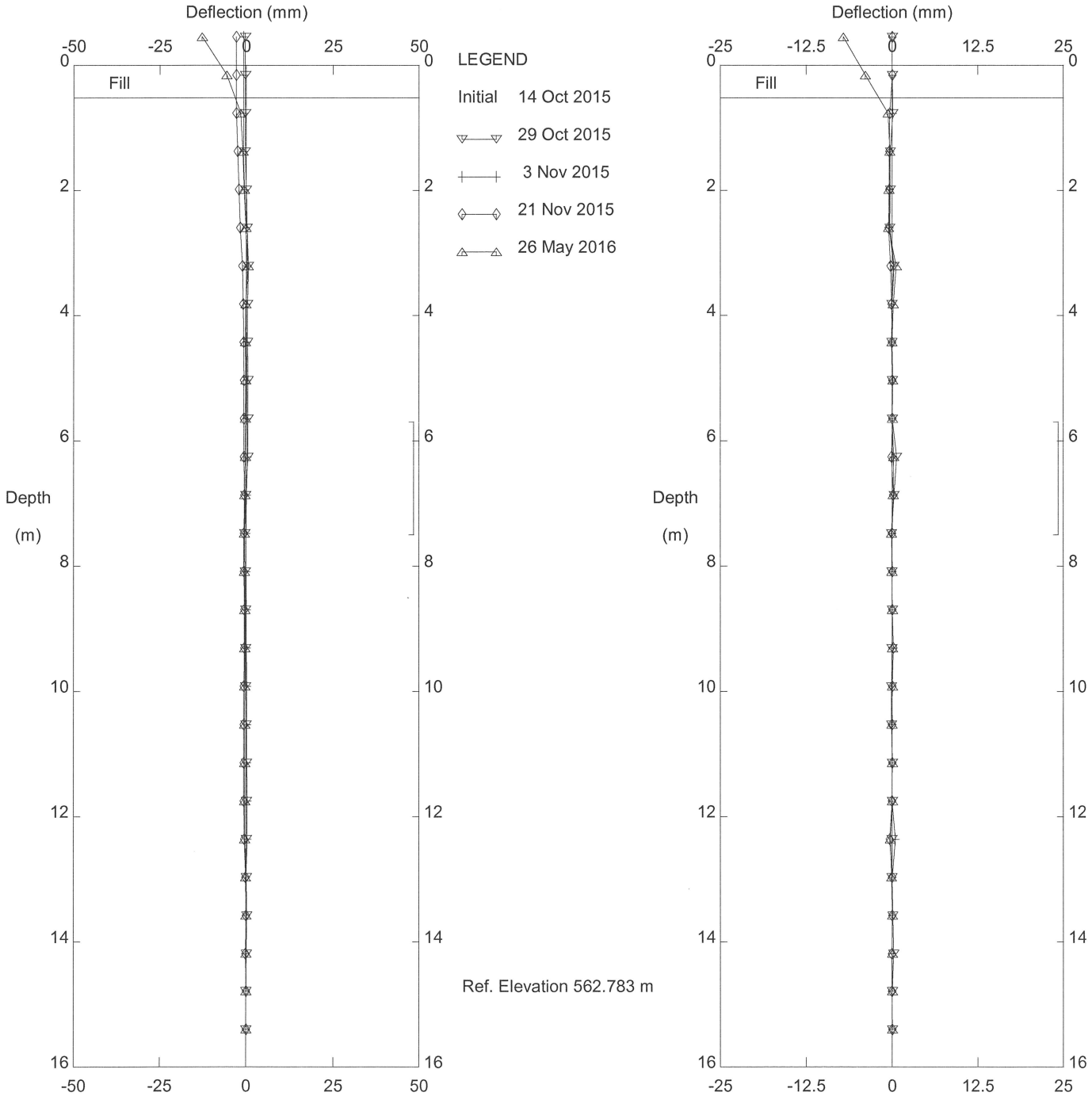


Cumulative Deflection

Direction B

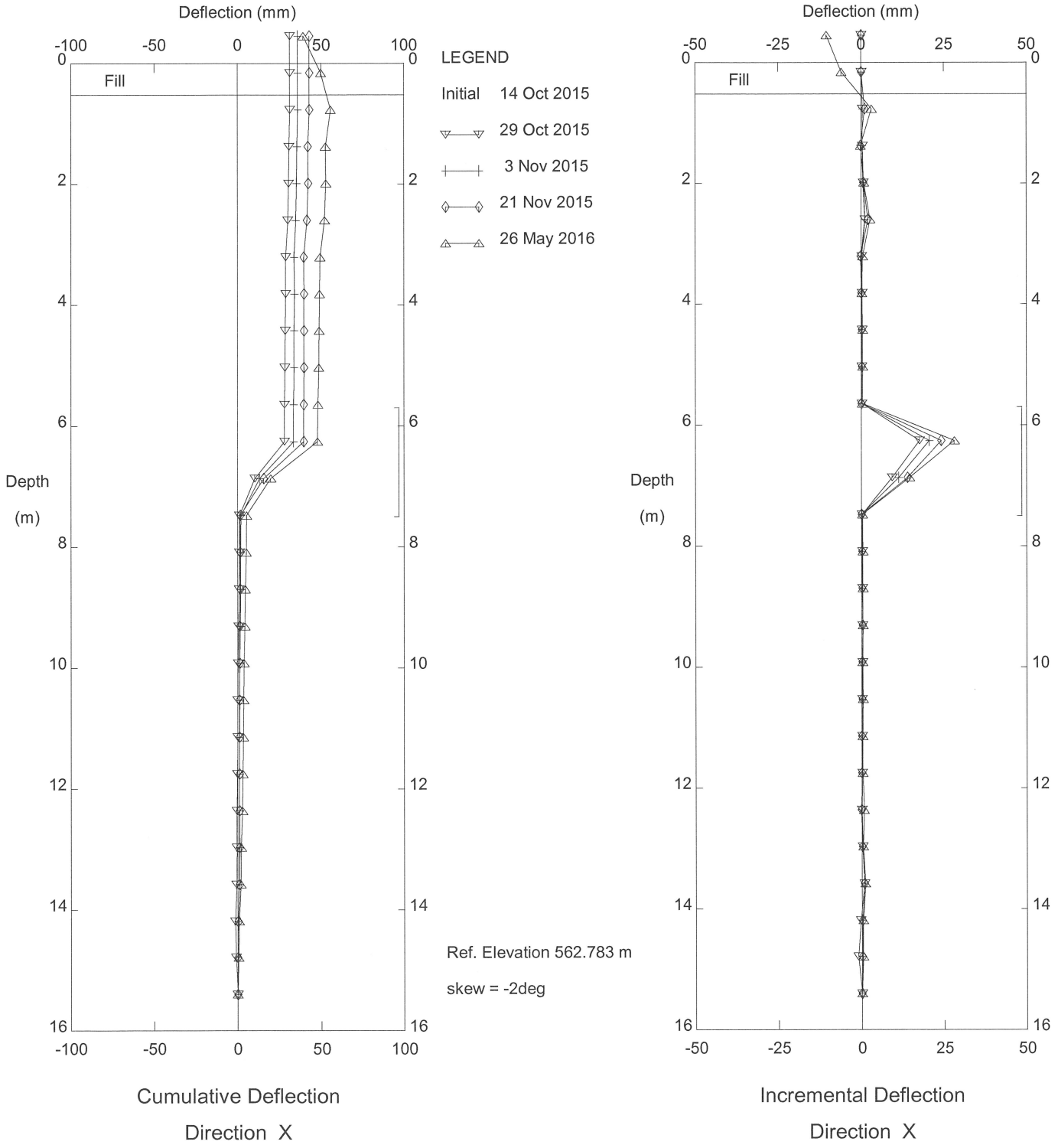
Incremental Deflection

Direction B

PH47-Deadwood, Inclinometer SI15-01

Alberta Transportation

Thurber Engineering Ltd.



PH47-Deadwood, Inclinometer SI15-01

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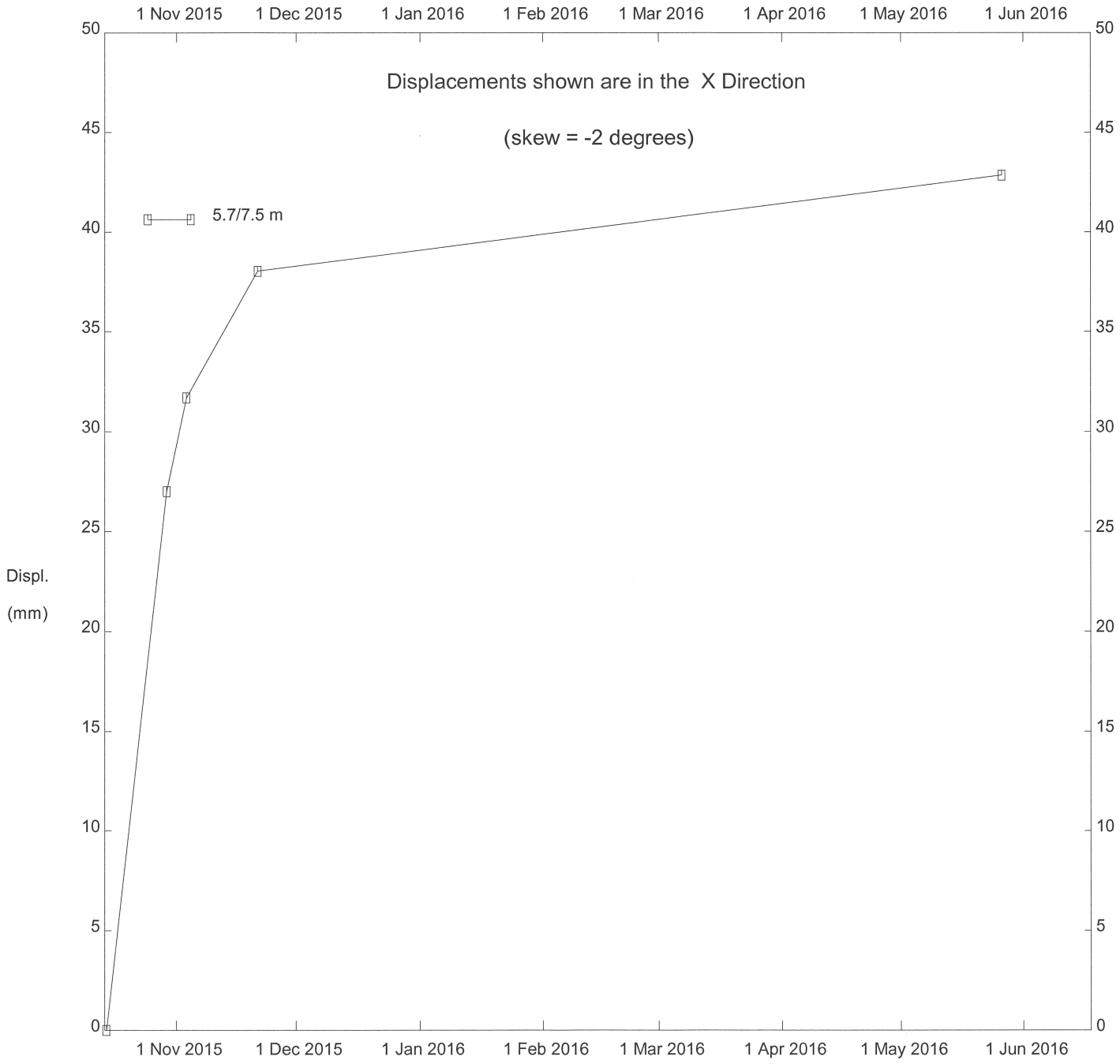

PH47-Deadwood, Inclinometer SI15-01

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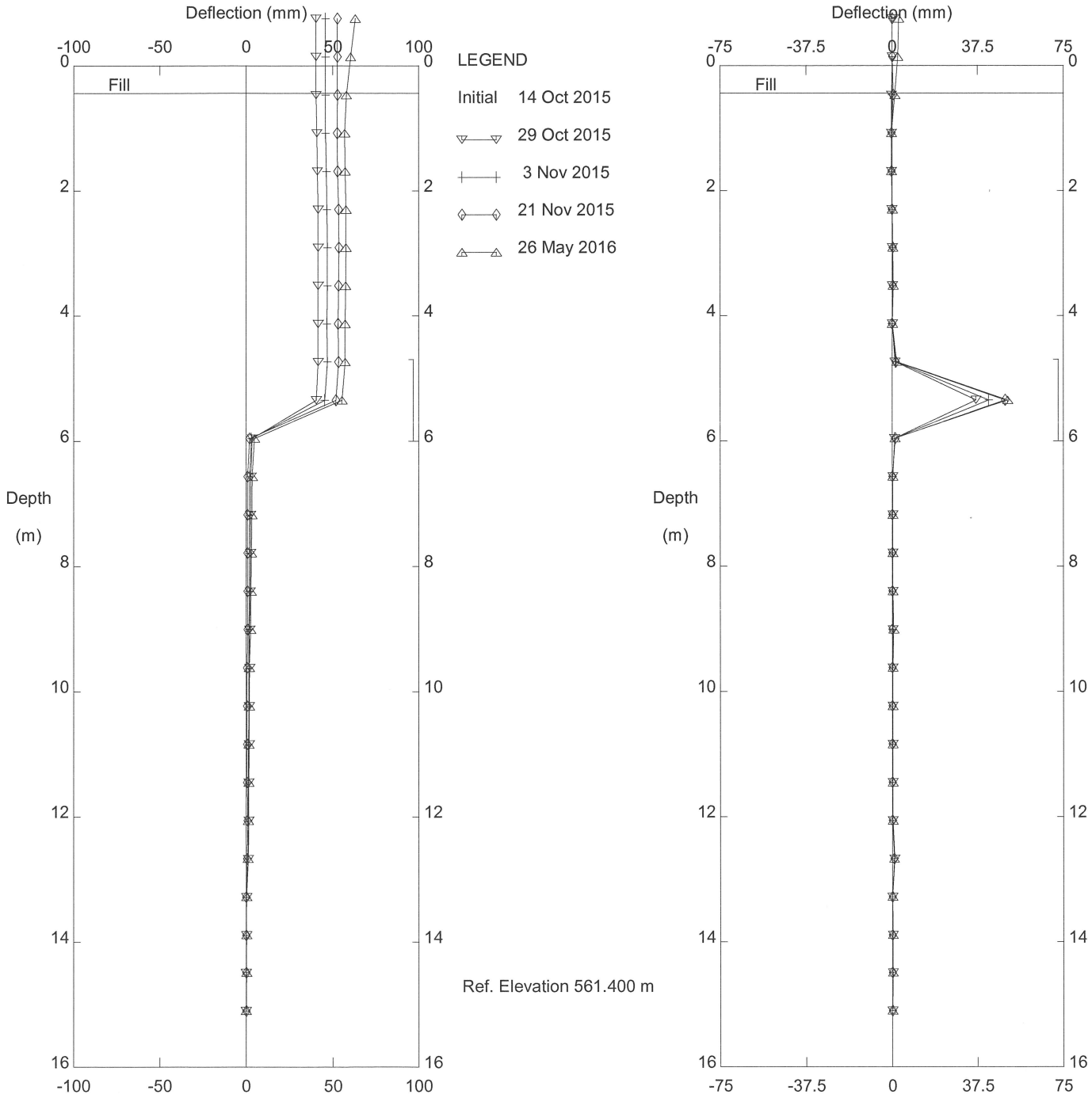

Cumulative Deflection
Direction A

Incremental Deflection
Direction A

PH47-Deadwood, Inclinometer SI15-02

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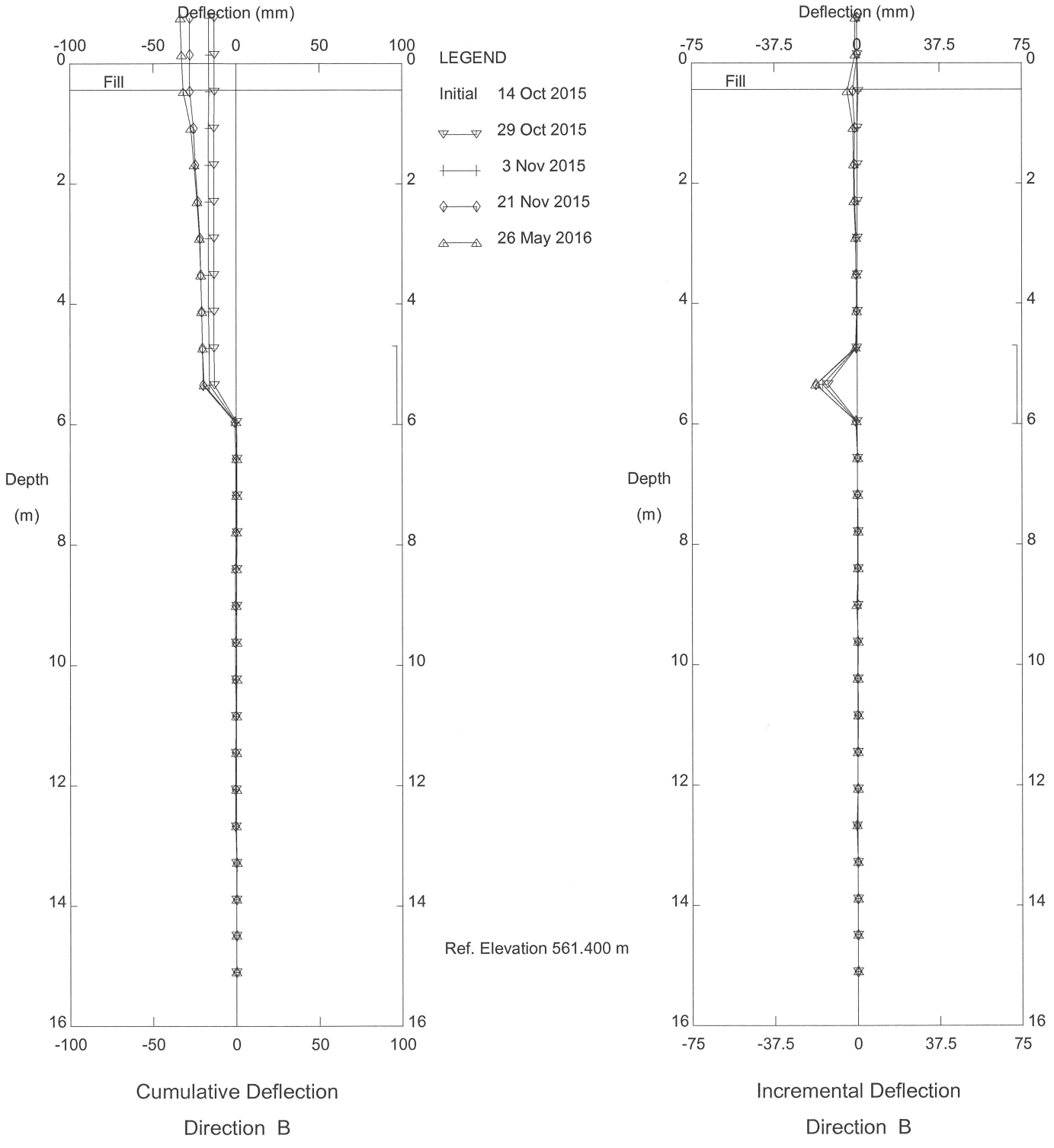

Cumulative Deflection

Direction B

Incremental Deflection

Direction B

PH47-Deadwood, Inclinometer SI15-02

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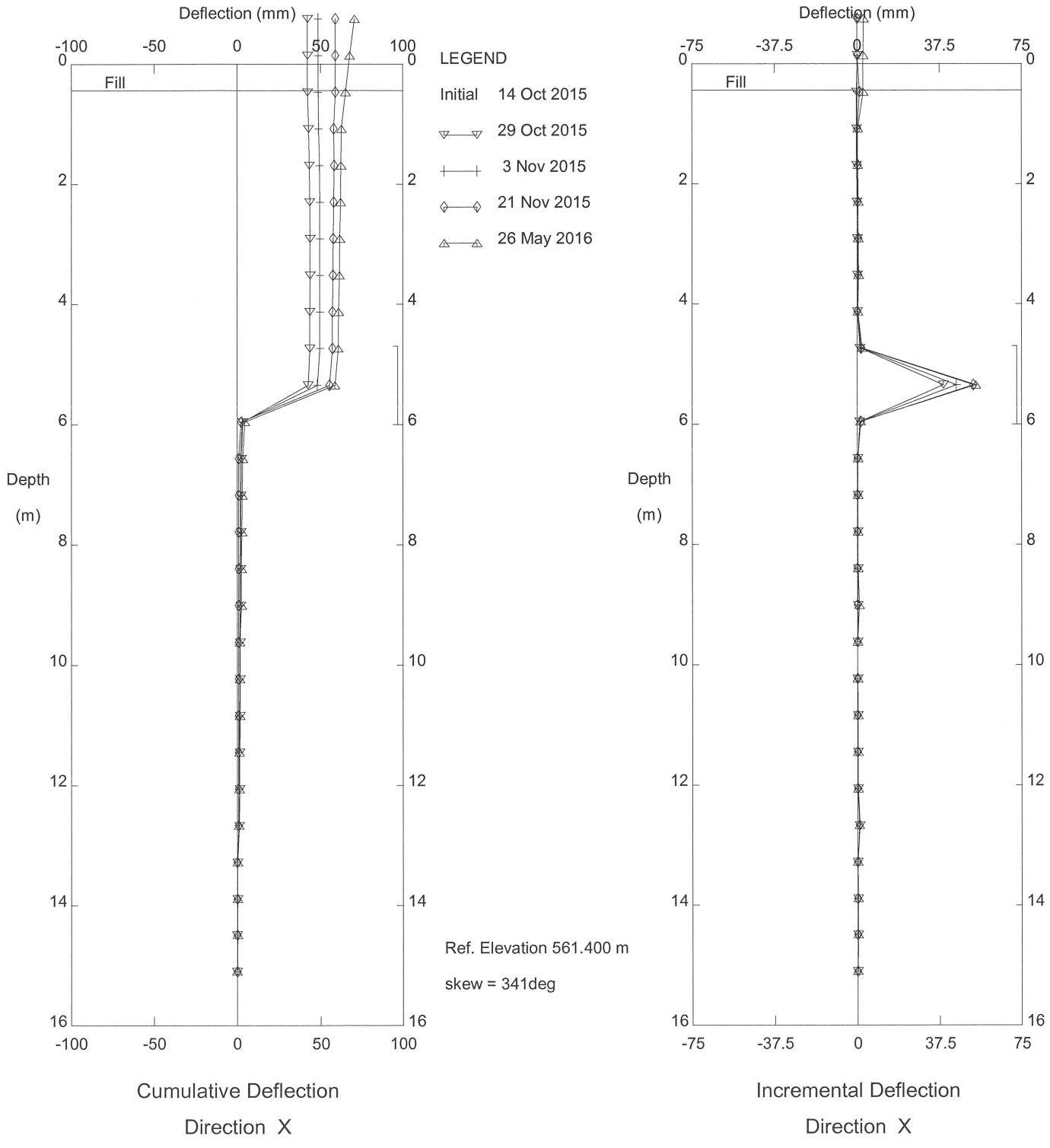

Cumulative Deflection

Direction X

Incremental Deflection

Direction X

PH47-Deadwood, Inclinometer SI15-02

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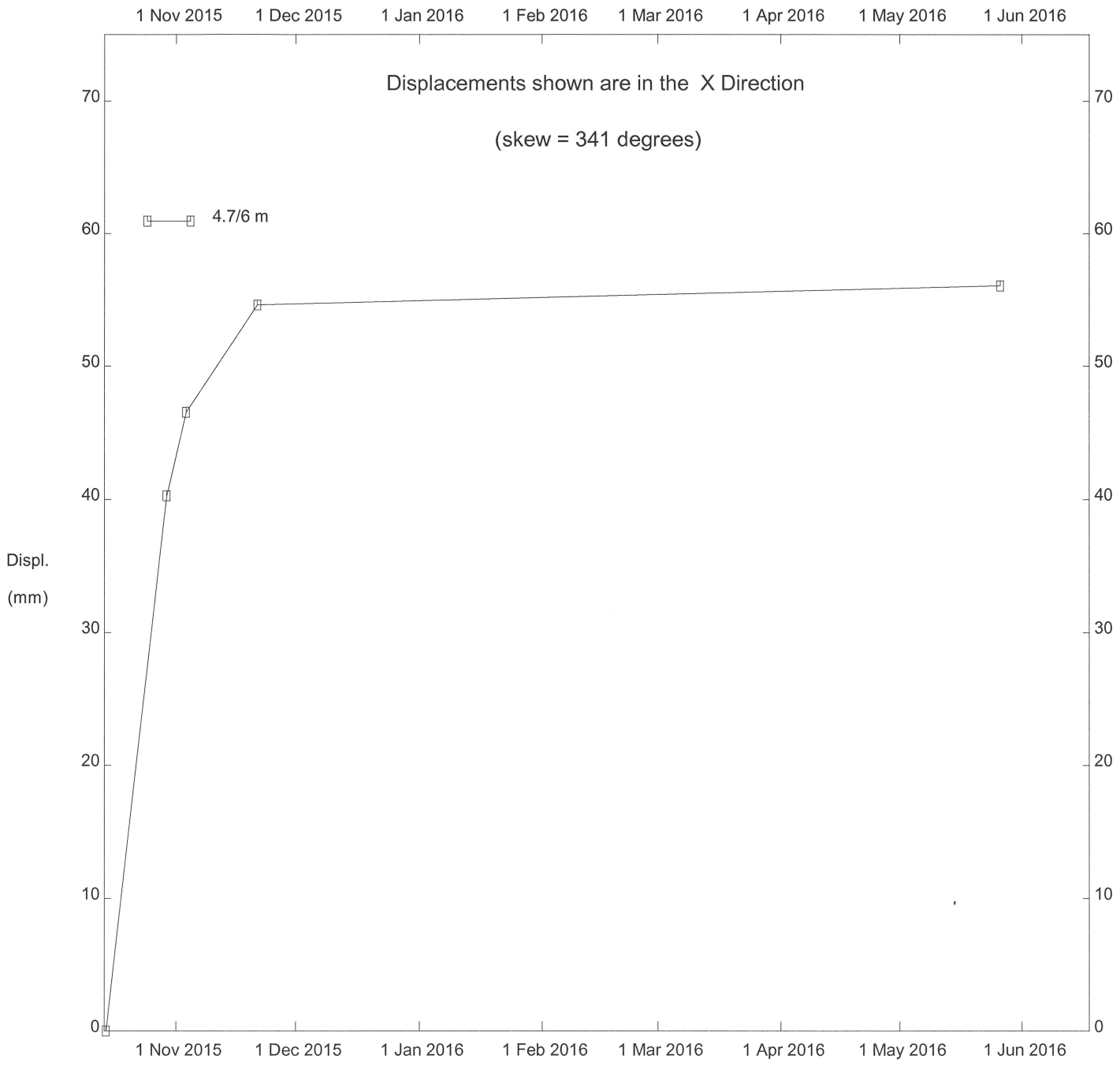

PH47-Deadwood, Inclinometer SI15-02

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FIGURE PH047-1-1
PIEZOMETRIC DEPTHS FOR PH047-1 (DEADWOOD SLIDE)

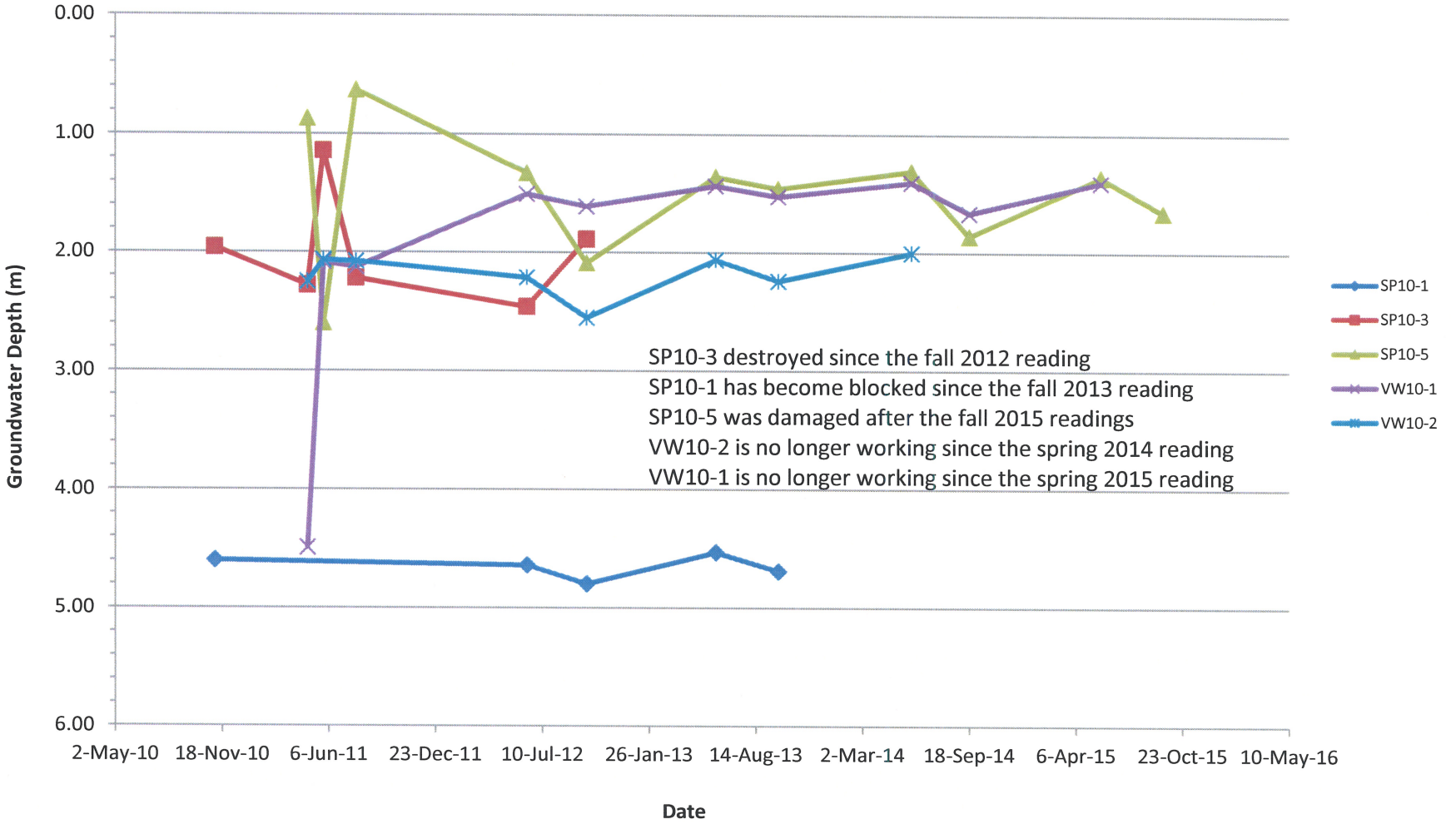

FIGURE PH047-1-2
PIEZOMETRIC ELEVATIONS FOR PH047-1 (DEADWOOD SLIDE)