



THURBER ENGINEERING LTD.

ALBERTA TRANSPORTATION NORTH CENTRAL REGION – ATHABASCA AREA INSTRUMENTATION MONITORING RESULTS

SPRING 2018

SECTION C

SITE NC014-1: HWY 661:02 FORT ASSINIBOINE

1. OBSERVATIONS

1.1 Field Program and Instrumentation Status

Two slope inclinometers (SI06-6 and SI06-11) and eleven standpipe piezometers (SP06-1 to SP06-5, SP06-9, SP06-10, SP06-13, SP6-14, SP06-18 and SP06-19) were read at the HWY 661:02 Fort Assiniboine site on June 4, 2018 by Mr. Niraj Regmi, G.I.T. and Mr. Eddy Mar, E.I.T., both of Thurber Engineering Ltd.

The SIs were read using a RST Digital Inclinometer probe with a 2 ft. wheelbase and a RST Pocket PC readout. Inclinometer reading depths were defined as per cable markings with respect to the top of the inclinometer casing. The standpipe piezometers were read using a Heron Water Tape.

2. INTERPRETATION

2.1 General

SI plots for A and B directions are presented in Section D and are summarized below. Standpipe piezometer results are also provided in Section D.

2.2 Zones of Movement

No new zones of movement were observed since the last set of readings recorded in the fall of 2017.

Historical zones of movement are summarized on Table NC014-1-1 at the end of this report. Table NC014-1-1 also provides a historical account of the total movement that has occurred at



this site since the initialization of the slope inclinometers, the depth of movement and the maximum rate of movement.

2.3 Interpretation of Monitoring Results

Slope inclinometers SI06-6 and SI06-11 have recorded no discernible movements since initialization.

Standpipe piezometers SP06-1, SP06-3, SP06-4, SP06-5, SP06-10, SP06-13, SP06-14 and SP06-18 showed decreases in groundwater level of 0.58 m, 0.29 m, 0.14 m, 0.01 m, 0.61 m, 0.10 m, 0.31 m and 0.10 m, respectively, since the fall of 2017 readings. Standpipe piezometers SP06-2, SP06-9 and SP06-19 showed increases in groundwater level of 0.20 m, 0.22 m and 0.01 m, respectively, since the fall of 2017 readings. The standpipe piezometer readings are summarized in Table NC014-1-2 below and are plotted on Figure NC014-1-1 in Section D.

3. RECOMMENDATIONS

3.1 Future Work

The instruments should be read again in the fall of 2018.

3.2 Instrumentation Repairs

No instrument repairs are needed at this time.



**TABLE NC014-1-1
 SPRING 2018 – HWY 661:02 FORT ASSINIBOINE
 SLOPE INCLINOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: June 4, 2018

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)
SI06-6	Mar. 31, 2006	No discernible movement	N/A	Operational	September 23, 2017	No discernible movement	N/A	N/A
SI06-11	Apr. 1, 2006	No discernible movement	N/A	Operational	September 23, 2017	No discernible movement	N/A	N/A
SI06-12	Mar. 30, 2006	4.3 over 6.4 m depth to 6.8 m depth in 193° direction	1.5 mm/yr between September 2010 and May 2011	Blocked/ Destroyed	May 13, 2011	N/A	N/A	N/A
SI06-15	Mar. 28, 2006	No discernable movement	N/A	Blocked	May 22, 2007	N/A	N/A	N/A
SI06-16	Mar. 29, 2006	4.0 over 4.6 m depth to 8.2 m depth in 183° direction	2.6 mm/yr between May 2007 and May 2008	Sheared off at 7.8 m	Sept. 28, 2009	N/A	N/A	N/A

Drawing 13357-NC014-1 in section D provides a sketch of the approximate location of the monitoring instrumentation for this site.



**TABLE NC014-1-2
 SPRING 2018 – HWY 661:02 FORT ASSINIBOINE
 STANDPIPE PIEZOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: June 4, 2018

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (mBGS)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM GROUNDWATER LEVEL (mBGS)	MEASURED GROUNDWATER LEVEL (mBGS)	PREVIOUS READING (mBGS)	CHANGE IN GROUNDWATER LEVEL SINCE PREVIOUS READING (m)
SP06-1	Apr. 2, 2006	9.13	N/A	Active	Sept. 12, 2016 (1.25)	1.85	1.27	-0.58
SP06-2	Apr. 2, 2006	9.12	N/A	Active	June 4, 2018 (5.27)	5.27	5.47	0.20
SP06-3	Apr. 2, 2006	25.00	N/A	Active	May 27, 2015 (3.72)	5.26	4.97	-0.29
SP06-4	Mar. 31, 2006	15.21	N/A	Active	Sept. 23, 2017 (8.57)	8.71	8.57	-0.14
SP06-5	Mar. 31, 2006	25.00	N/A	Active	Apr. 2, 2006 (9.46)	14.27	14.26	-0.01
SP06-9	Apr. 1, 2006	15.24	N/A	Active	Apr. 2, 2006 (4.46)	6.14	6.36	0.22
SP06-10	Apr. 2, 2006	25.00	N/A	Active	Sept. 23, 2017 (5.97)	6.58	5.97	-0.61
SP06-13	Apr. 2, 2006	9.95	N/A	Active	Sept. 12, 2016 (6.95)	7.08	6.98	-0.10
SP06-14	Mar. 28, 2006	9.16	N/A	Active	May 30, 2017 (6.61)	7.06	6.75	-0.31

Drawing 13357-NC014-1 in section D provides a sketch of the approximate location of the monitoring instrumentation for this site.



**TABLE NC014-1-2 – CONTINUED...
 SPRING 2018 – HWY 661:02 FORT ASSINIBOINE
 STANDPIPE PIEZOMETER INSTRUMENTATION READING SUMMARY**

Date Monitored: June 4, 2018

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (mBGS)	GROUND ELEV. (m)	CURRENT STATUS	MAXIMUM GROUNDWATER LEVEL (m)	MEASURED GROUNDWATER LEVEL (mBGS)	PREVIOUS READING (mBGS)	CHANGE IN GROUNDWATER LEVEL SINCE PREVIOUS READING (m)
SP06-17	Apr. 2 2006	8.83	N/A	Destroyed	September 27, 2011 (6.12)	N/A	N/A	N/A
SP06-18	Apr. 2, 2006	9.43	N/A	Active	September 12, 2016 (1.85)	2.15	2.05	-0.10
SP06-19	Apr. 2, 2006	7.95	N/A	Active	Sept. 23, 2017 (6.73)	6.72	6.73	0.01
A11	N/A	N/A	N/A	Destroyed	May 28, 2006 (6.70)	N/A	N/A	N/A

Drawing 13357-NC014-1 in section D provides a sketch of the approximate location of the monitoring instrumentation for this site.

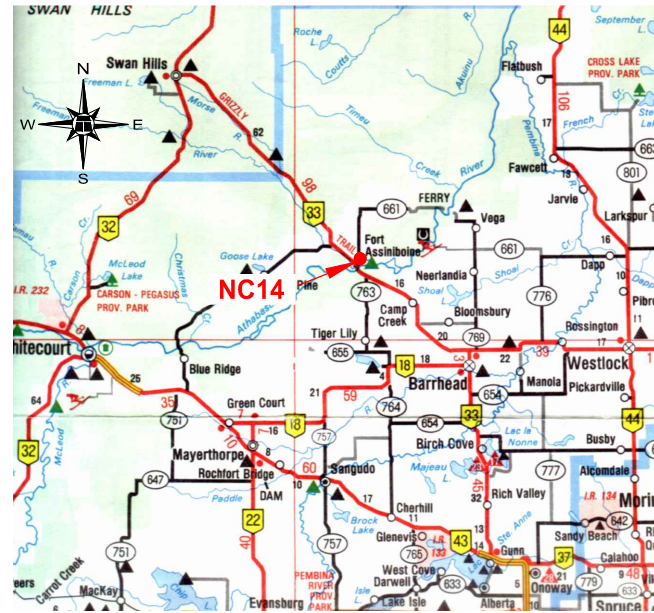


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INSTRUMENTATION MONITORING RESULTS**

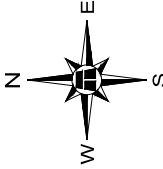
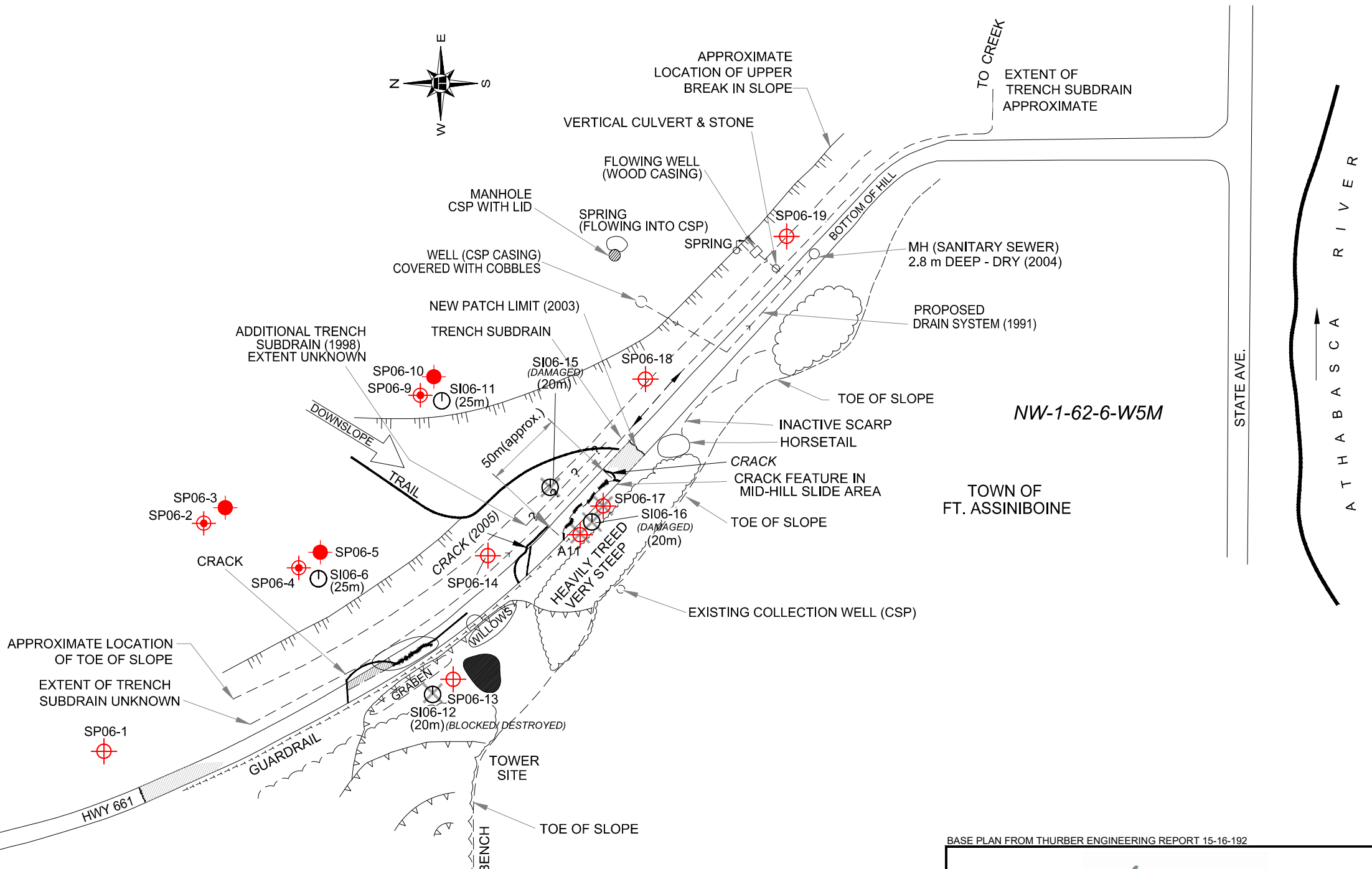
SPRING 2018

**SECTION D
DATA PRESENTATION**

SITE NC014-1: HWY 661:02 FORT ASSINIBOINE



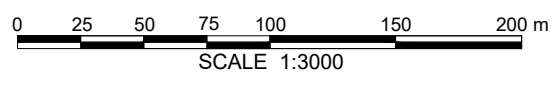
KEY MAP
N.T.S.



LEGEND

- SI (m) SLOPE INCLINER AND DEPTH
- SP STANDPIPE PIEZOMETER (25m DEPTH)
- SP STANDPIPE PIEZOMETER (15m DEPTH)
- SP STANDPIPE PIEZOMETER (10m DEPTH)
- SI SLOPE INCLINER NON OPERATIONAL
- SP STANDPIPE PIEZOMETER NON OPERATIONAL

MR. CARTWRIGHT PROPERTY



BASE PLAN FROM THURBER ENGINEERING REPORT 15-16-192



NORTH CENTRAL REGION - ATHABASCA AREA

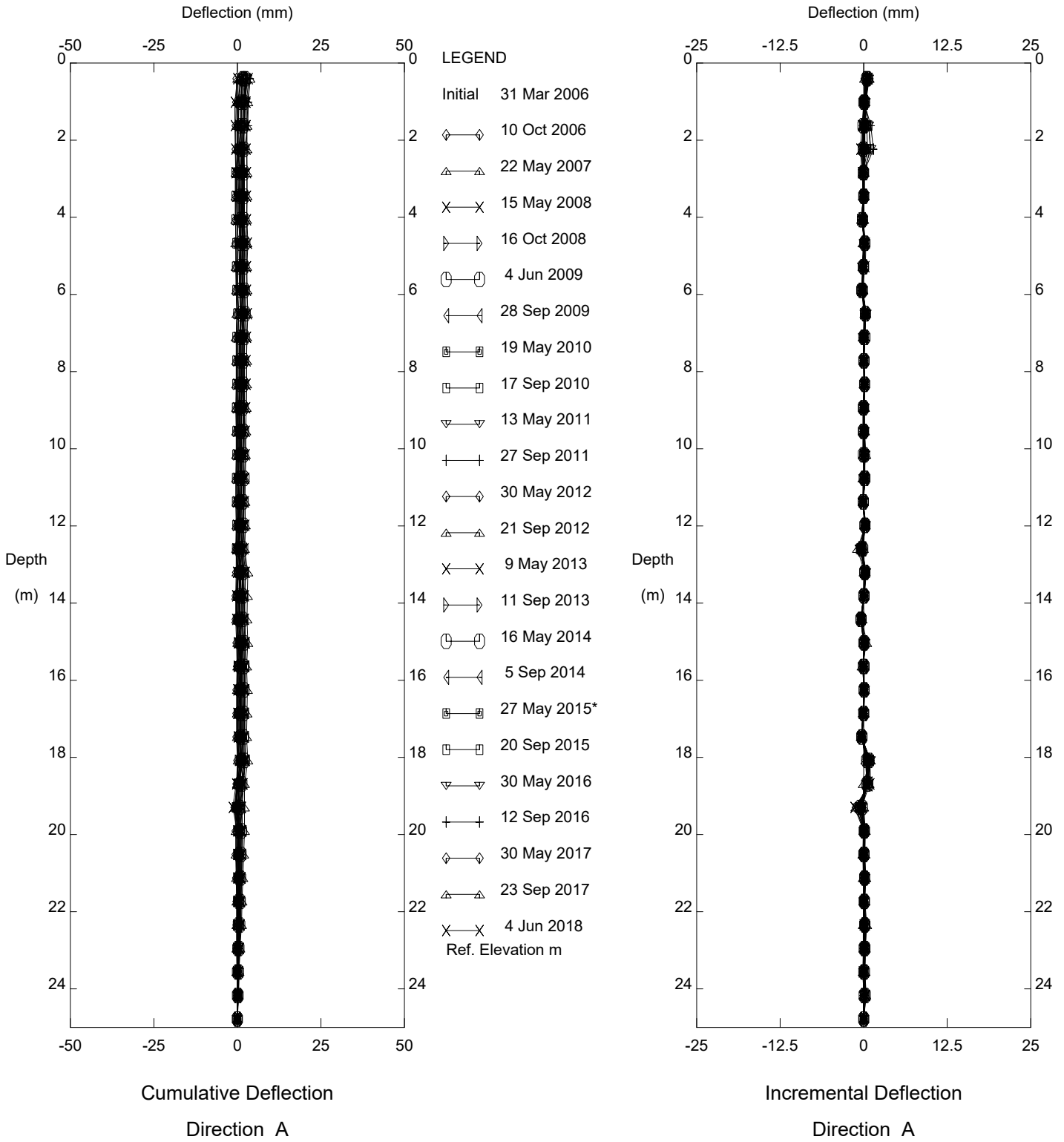
**NC014-1: FORT ASSINIBOINE
SITE PLAN SHOWING INSTRUMENT LOCATIONS**

DWG No. 13357-NC014-1

DRAWN BY	ML
DESIGNED BY	NFR
APPROVED BY	TSA
SCALE	1:3000
DATE	JUNE 2018
FILE No.	13357



Thurber Engineering Ltd

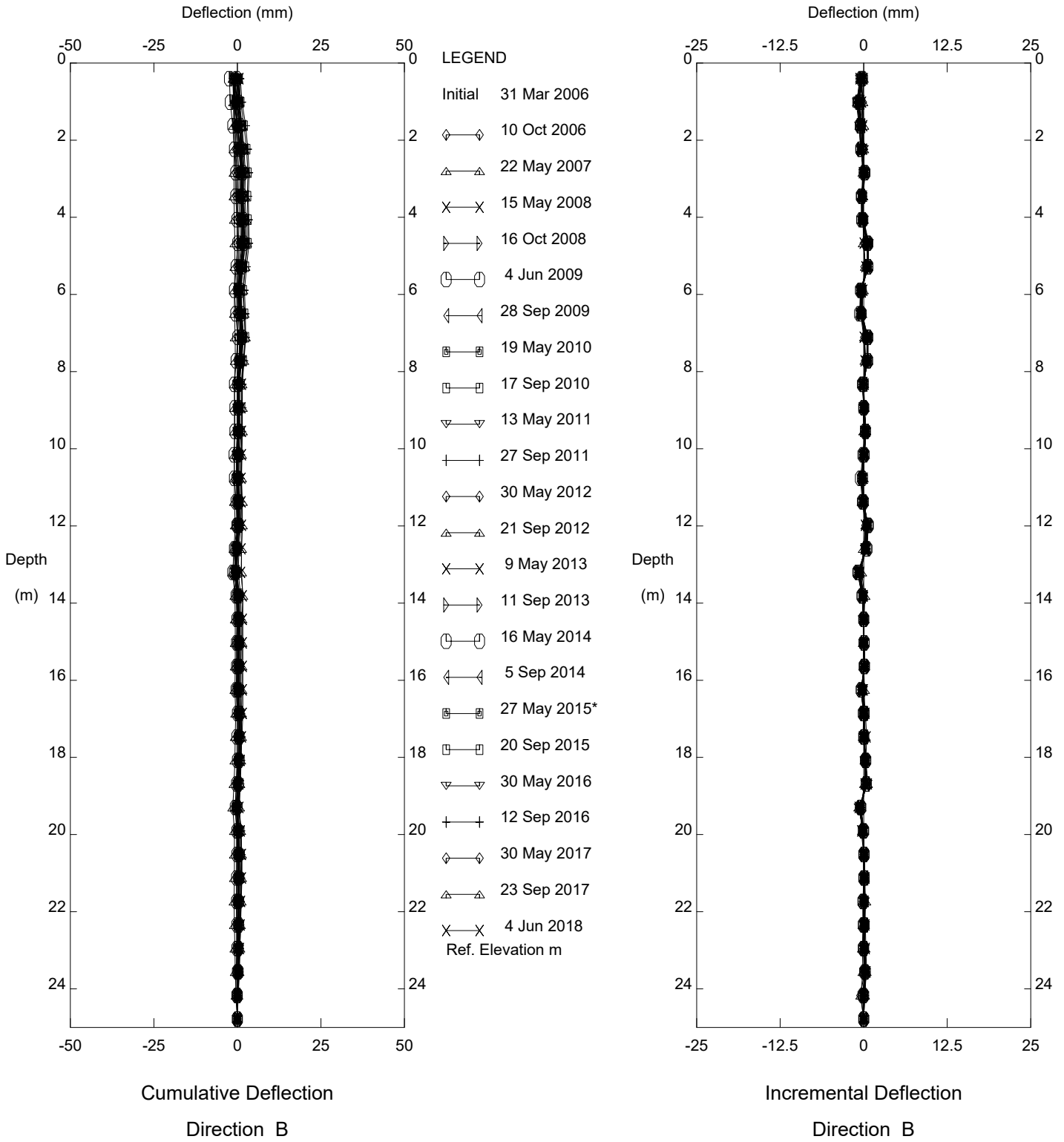


Hwy 661:02 Ft Assiniboine, Inclinometer SI06-6

Alberta Transportation

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

Thurber Engineering Ltd

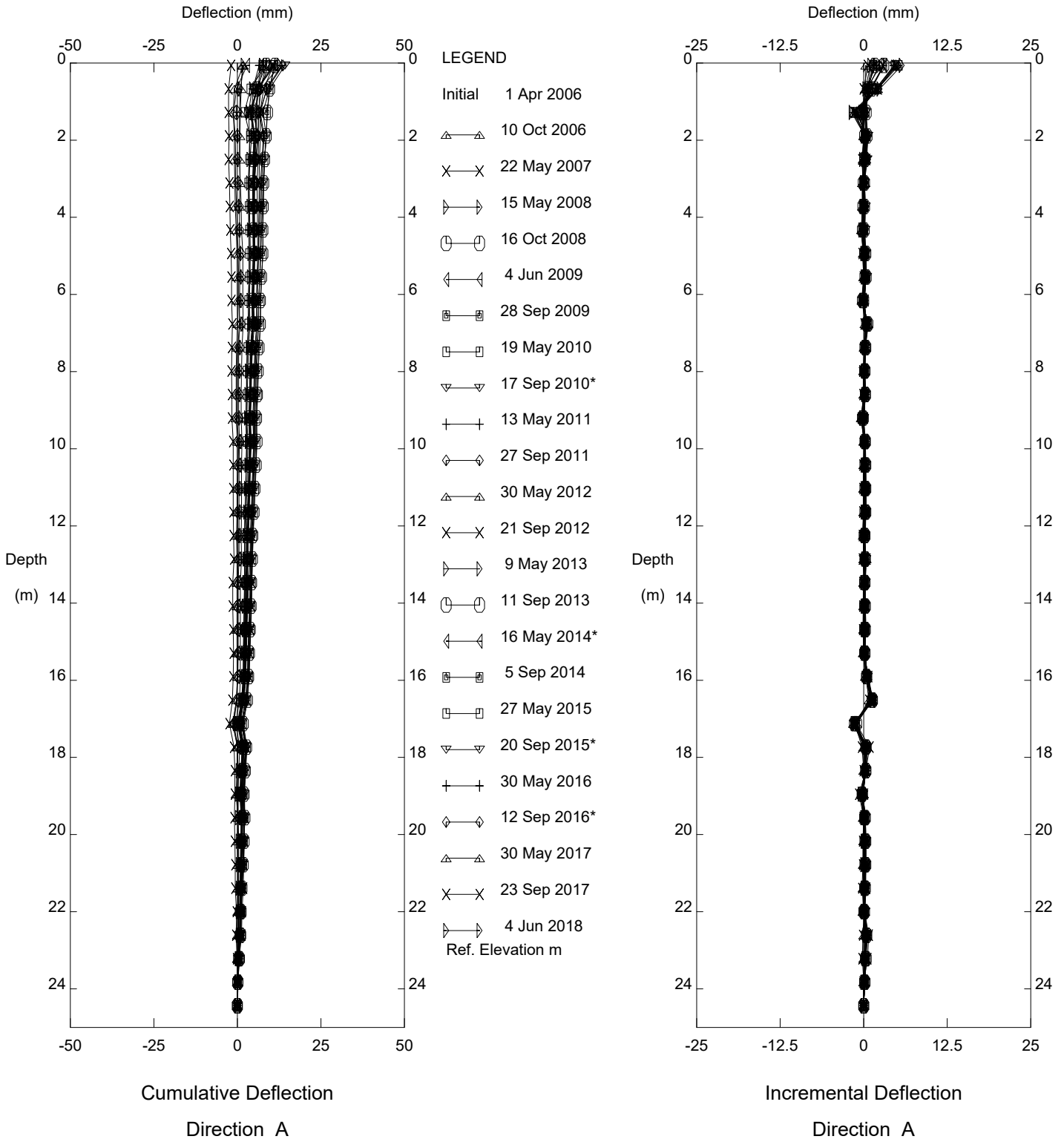


Hwy 661:02 Ft Assiniboine, Inclinometer SI06-6

Alberta Transportation

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

Thurber Engineering Ltd

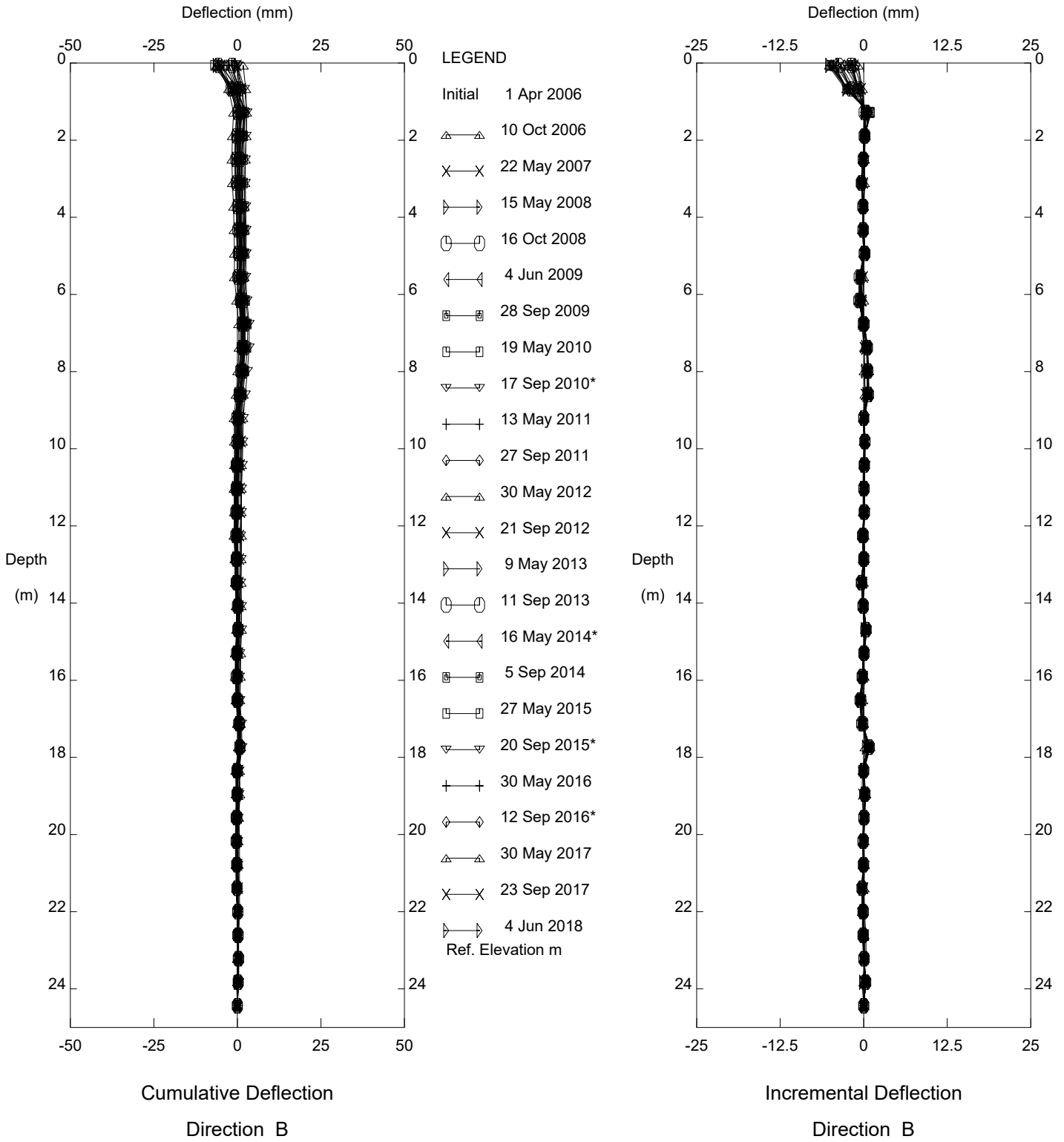


Hwy 661:02 Ft Assiniboine, Inclinometer SI-11

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

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Hwy 661:02 Ft Assiniboine, Inclinometer SI-11

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

**FIGURE NC014-1-1
STANDPIPE PIEZOMETER DATA FOR HWY661:02 FORT ASSINIBOINE**

