



# Close-Out Monitoring Report

## FISHER STREET WORKS ~ Fisher Street Shaft

CRL Document No. **C300-BFK-C4-RGN-CRT00\_ST005-51234**

Contract MDL reference: C14.020

### 1. Contractor Document Submittal History

Revision	Date	Prepared by	Checked by	Approved by	Reason for Issue
3.0	11/04/2016	[REDACTED]	[REDACTED]	[REDACTED]	For CRL Acceptance
		[REDACTED]	[REDACTED]	[REDACTED]	

2a. Stakeholder Review Required? YES  NO

Stakeholder submission required: LU  RfL  Purpose of submission:  
 NR  LO  For no objection   
 DLR  Other: \_\_\_\_\_ For information

This document has been reviewed by the following individual for coordination, compliance, integration and acceptance and is acceptable for transmission to the above stakeholder for the above stated purpose.

Sign: \_\_\_\_\_ Name: \_\_\_\_\_ Role: \_\_\_\_\_ Date: \_\_\_\_\_  
 Sign: \_\_\_\_\_ Name: \_\_\_\_\_ Role: \_\_\_\_\_ Date: \_\_\_\_\_

### 2b. Review by Stakeholder (if required):

Stakeholder Organisation	Job Title	Name	Signature	Date	Acceptance
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### 3. Acceptance by Crossrail:

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## 1. Purpose and Scope

The purpose this document is to provide a summary of the observed movements related to the works in the vicinity of Fisher Street Shaft and to provide the information required under Clauses KX10.2113 and KX10.2114 for Final and Close-Out Reports to gain agreement to the de-commissioning of instrumentation.

It is noted that monitoring has been progressively de-scoped by presentation of data at CTC meetings with subsequent confirmation under a number of RFIs. Extensive data for the area to the west of the shaft has also been presented in the Grout Shaft Close Out report (C300-BFK-C4-RGN-CRT00\_ST005-51233) and will not be repeated herein. To the east of the shaft, the western end of the crossover on the westbound running tunnel is below Proctor Street, consequently, data on and to the east of Proctor Street will be reported in the Crossover Tunnels Close Out Report (C300-BFK-C4-RGN-CRT00\_ST005-51234). The areas covered by the respective reports are shown in Figure 1. A further separate report will be prep

The “as-built record and status” required under KX10.4102 will be supplied as co-ordinates and digital data for incorporation into UCIMS.

Information about Thames Water assets are also provided, both within the report and in Appendix 2 (summary table). In general, no deflection amber trigger (average of 3 values) has been breached on Thames Water assets.

It should be noted that some transects include a large number of measuring points. In these cases, for the sake of clarity, only the points within the Zone of Influence (ZoI) have been included in the charts.



Figure 1: Location. General overview of the works on the Map

## 2. Works at Fisher Street Shaft

### 2.1. Grout Shaft

The grout shaft at Fisher Street, located within the Kingsway Tram Tunnel, was excavated between 11/06/2012 and 12/07/2012.

The installation of the TAMs was carried out between 06/08/2012 and 20/09/2012.

Pre-treatment injections were carried out over 10 shifts between 10/10/2012 and 01/11/2012. A total of 29,126 litres (or 29.1 m<sup>3</sup>) of grout was injected during the pre-treatment phase.

### 2.2. Construction works

The dates of the main construction activities potentially generating settlement within the Zone of Influence (ZoI) of Fisher Street Shaft and the associated grouting arrays are given in Table 1.

Activity	Start	Finish	Comments
Shaft & OSD piling	26/09/2012	16/11/2012	
Shaft excavation within piles	30/05/2013	12/07/2013	Ring beam from 20/06/13
Shaft excavation - SCL	15/07/2013	06/09/2013	Stopped for WB TBM 24 & 25/07/2013
WB TBM	08/07/2013	28/07/2013	TBM stopped 11/07/13 to 23/07/13
EB TBM	01/10/2013	05/10/2013	
IA1	27/03/2014	03/04/2014	
IA2	13/12/2013	12/01/2014	

Table 1 Main construction activities at FIS

It is noteworthy that refurbishment of 2-6 Southampton Row commenced prior to the end of construction in late 2013 and continued after completion of BFK works. The refurbishment included underpinning of some internal foundations which generated some further movement of the building.

### 2.3. Concurrent Grouting and Grout Jacking

No concurrent grouting or grout jacking episodes were carried out from the Grout Shaft. As at Bond Street and Tottenham Court Road, concurrent grouting was not carried out with the TBM drives, with an alternative strategy adopted with pre- and post- grout jacking episodes to be undertaken as required. The measured settlements and the calculated volume loss settlements were used to determine the likelihood of any exceedance of the Compensation Grouting Performance Requirements. These assessments were presented and agreed at CTC meetings. Due to the good volume loss performance of the TBMs and the small movements generated by the shaft excavation, no grout jacking either before or after the TBM drives was necessary to maintain slopes and deflection ratios below the Compensation Grouting Performance Requirement values.



### 3. Summary of the observed settlements

#### 3.1. Predicted and Observed Movements

The settlements used to assess the impact of the excavation works in the Fisher Street Shaft area have been re-produced as a contour in Figure 2. The settlements were calculated using simple empirical methods.

The maximum settlement from the TBM drives is about -13mm and in combination with the shaft just under -40mm.

The monitored settlements are summarised in a comparable contour plot in Figure 3: the maximum settlement is approximately -22mm adjacent to the shaft over the WB TBM tunnel. At the western edge of the grouting arrays, the maximum settlement is -7mm.

The actual movements recorded are significantly less than the predicted values, particularly adjacent to the shaft. The Green trigger outside the Compensation Grouting area of 35mm settlement has not been exceeded anywhere. As noted in Section 2.3, no concurrent or grout jacking was required since slopes and deflection ratios were significantly less than the associated trigger values.

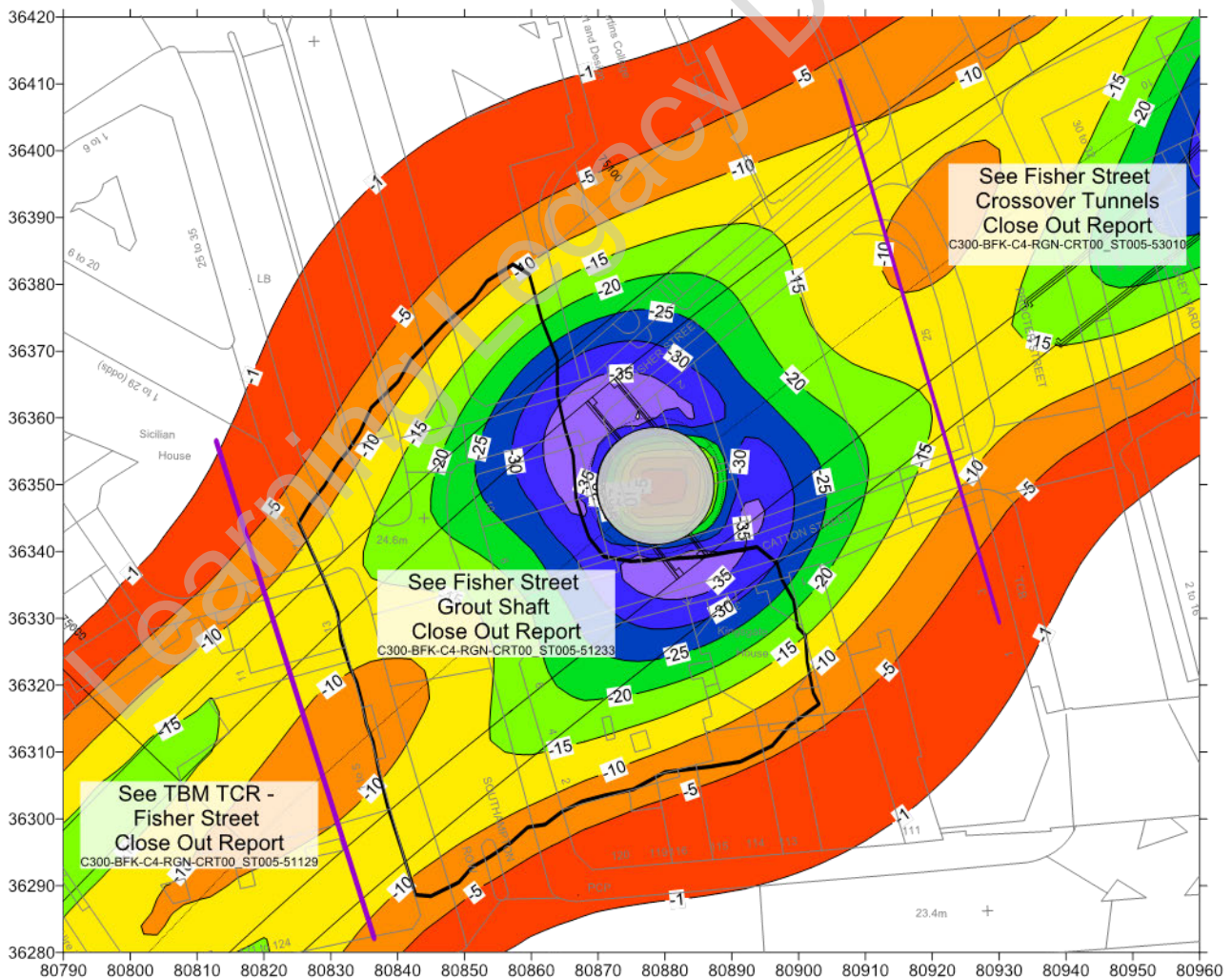


Figure 2 Volume loss and shaft sinking predicted settlement contours

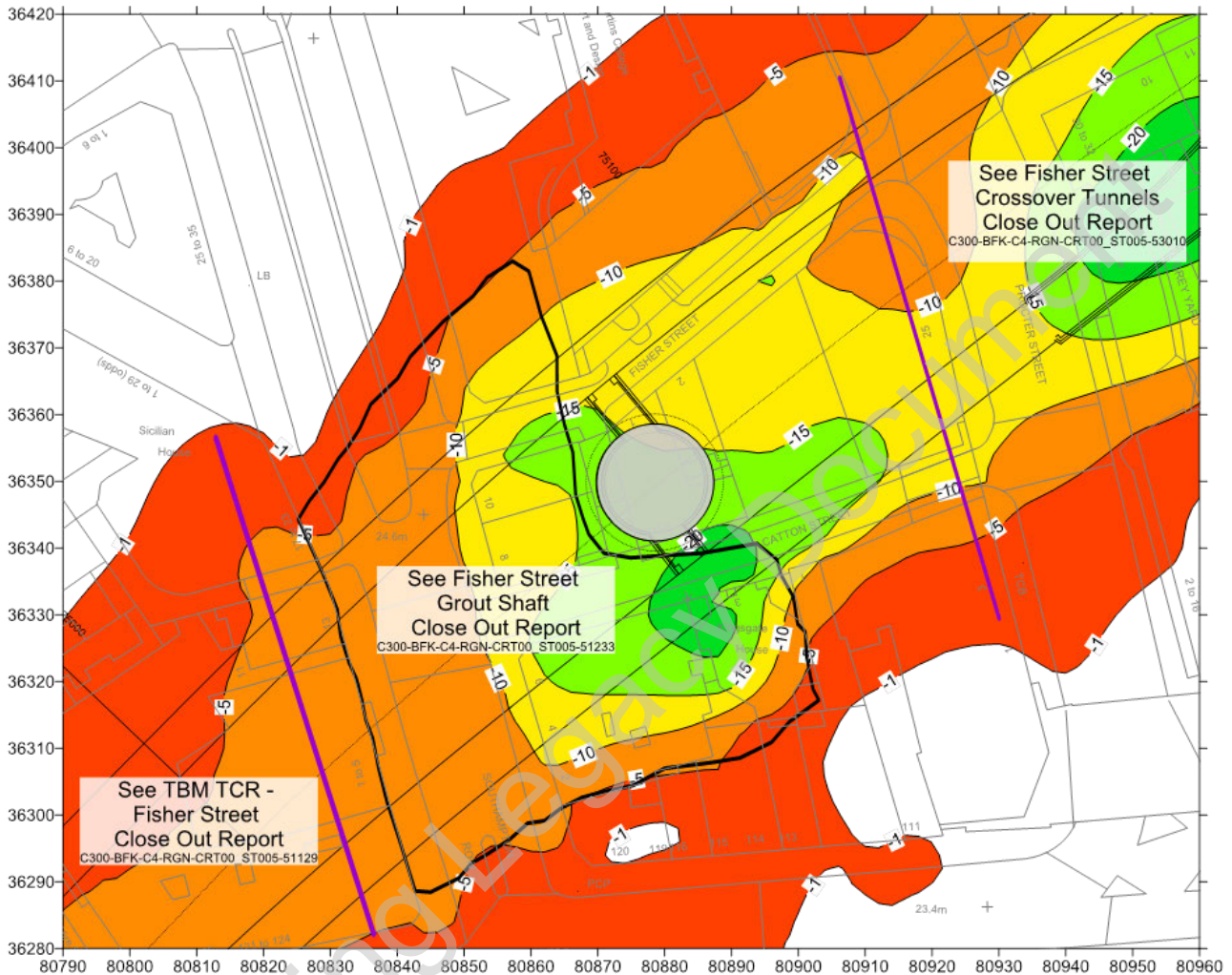


Figure 3 Observed total settlement contours following completion of construction

### 3.2. Post Construction Movements

The change in settlement over a period of 1 year from November 2013 to November 2014 is shown in Figure 4. The start of this period is approximately 1 month after the EB TBM but includes excavation of the small passages connecting the running tunnels to the shaft (IA1 and IA2), as well as the ongoing refurbishment of 2-6 Southampton Row. The Crossover tunnels below Proctor Street, at the eastern end of the area, were also constructed during this interval.

Settlements are generally less than 4mm except locally around the shaft. No particular local impact from IA1 and IA2 is evident. A local area with settlement over 8mm is recorded in 2-6 Southampton Row considered to be related to the works to that building by Others. The effect of the Crossover tunnels on the settlements on and to the east of Proctor Street is clearly evident in the contour.

Figure 5 shows a contour over a 6 month period ending at the same date (November 2014). The settlements are only greater than 1mm within the shaft area on isolated points and in a limited area at the east end of Fisher Street: given the tolerances on the readings, this equates to an overall settlement rate of less than 2mm/year.



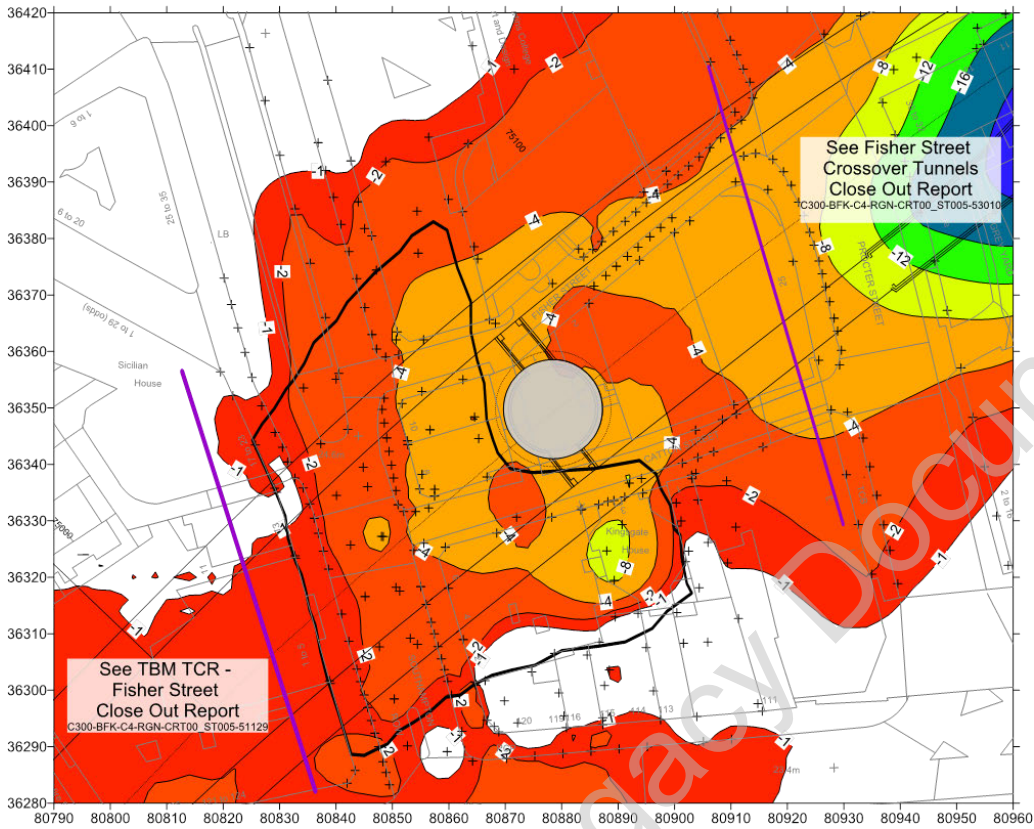


Figure 4 Settlement contour 06/11/13 to 06/11/14

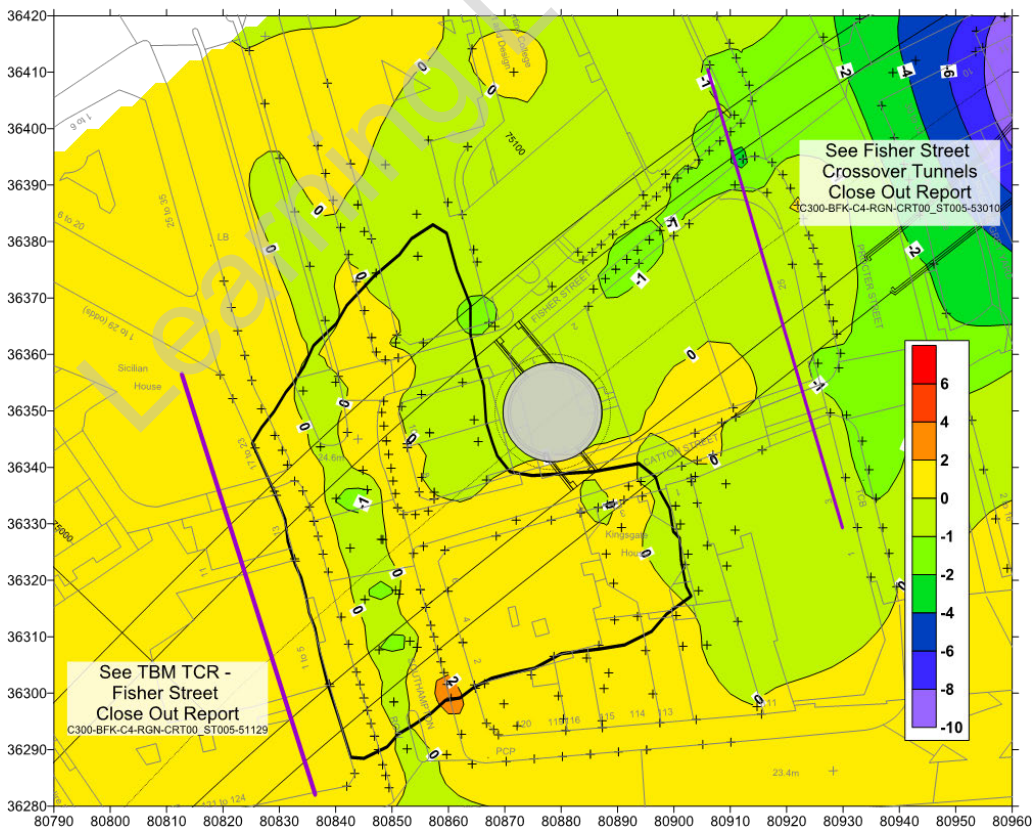


Figure 5 Settlement contour 06/05/14 – 06/11/14

### 3.3. Catton Street BREs and PLPs

#### 3.3.1. Data

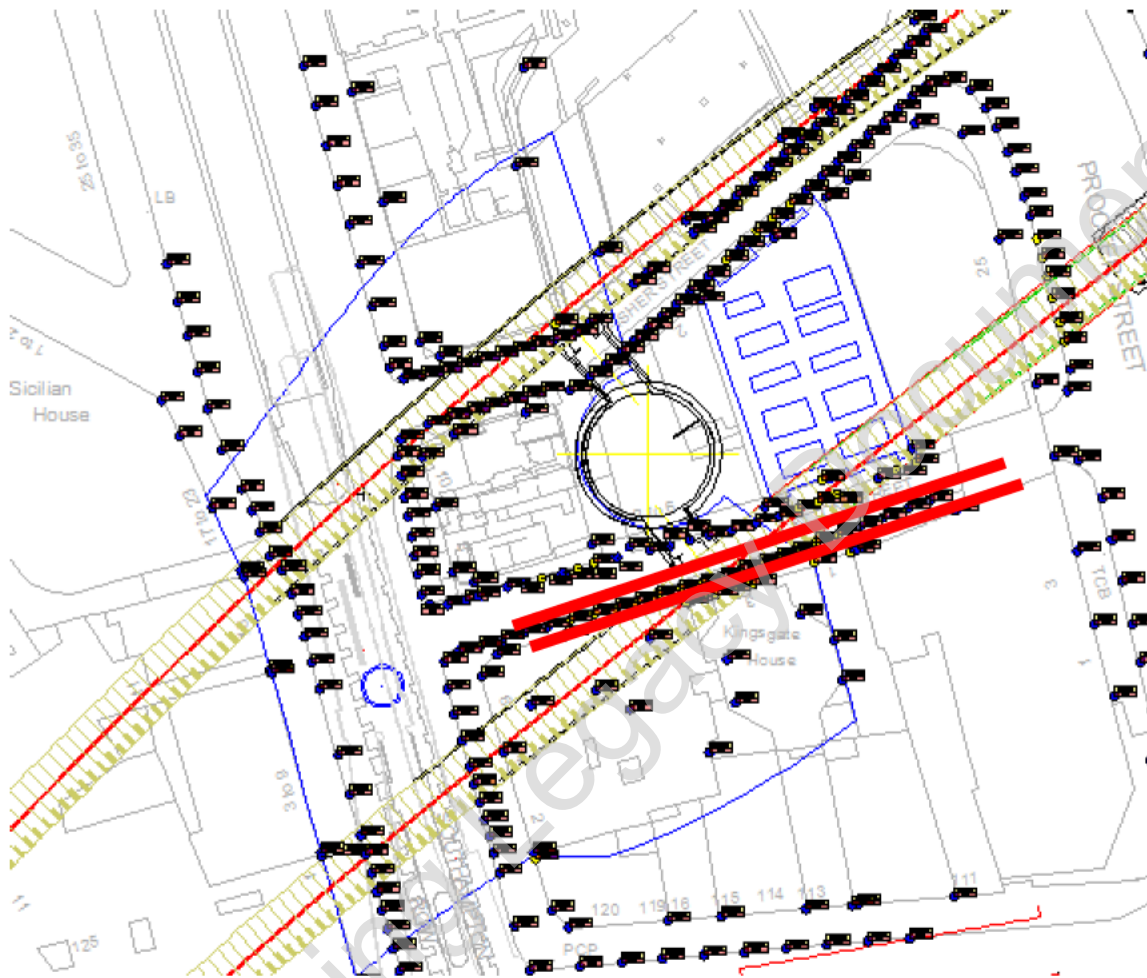
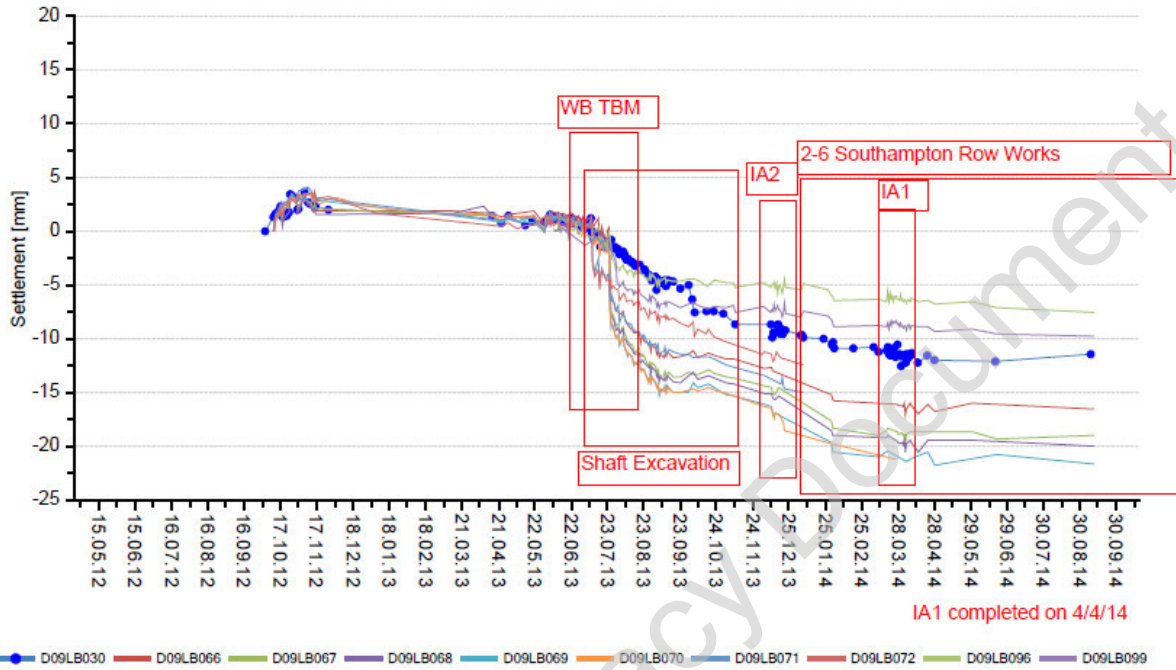


Figure 6: Location

**BRE - CATTON STREET**

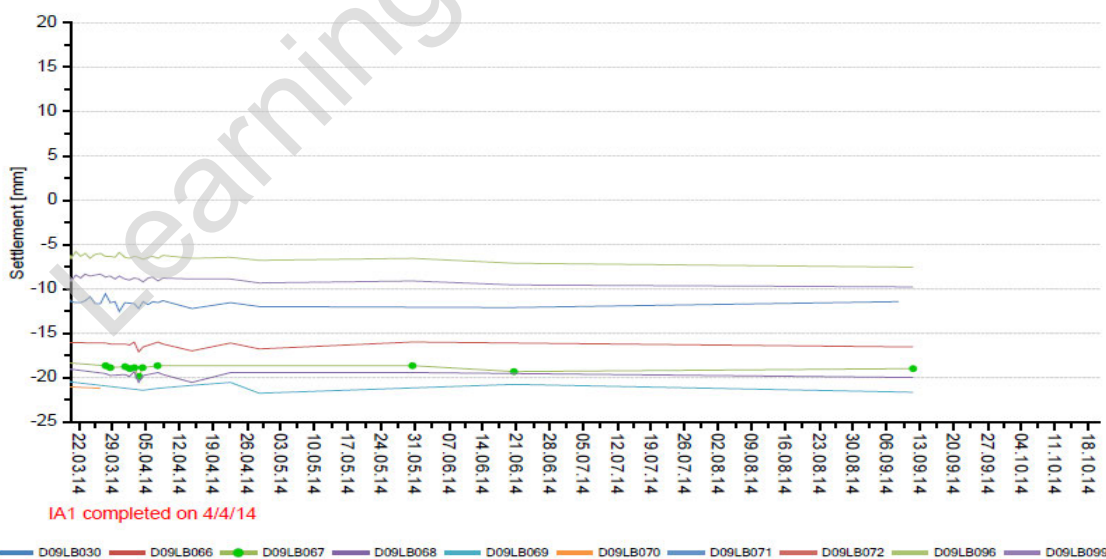


Project: Routewide: TCR-FAR  
 Reference Date: none Date of Measurement: 20.10.2014 18:40

Figure 7: data time-plots (general)

**BRE - CATTON STREET**

From 20/03/14

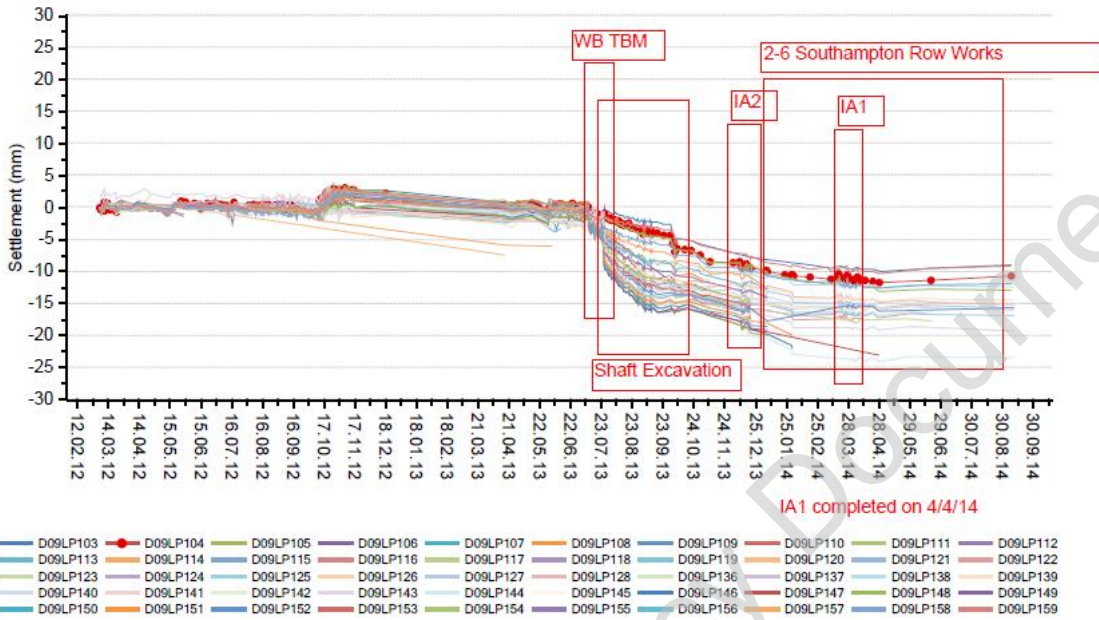


Project: Routewide: TCR-FAR  
 Reference Date: none Date of Measurement: 20.10.2014 18:40

Figure 8: data time-plots (long-term period)



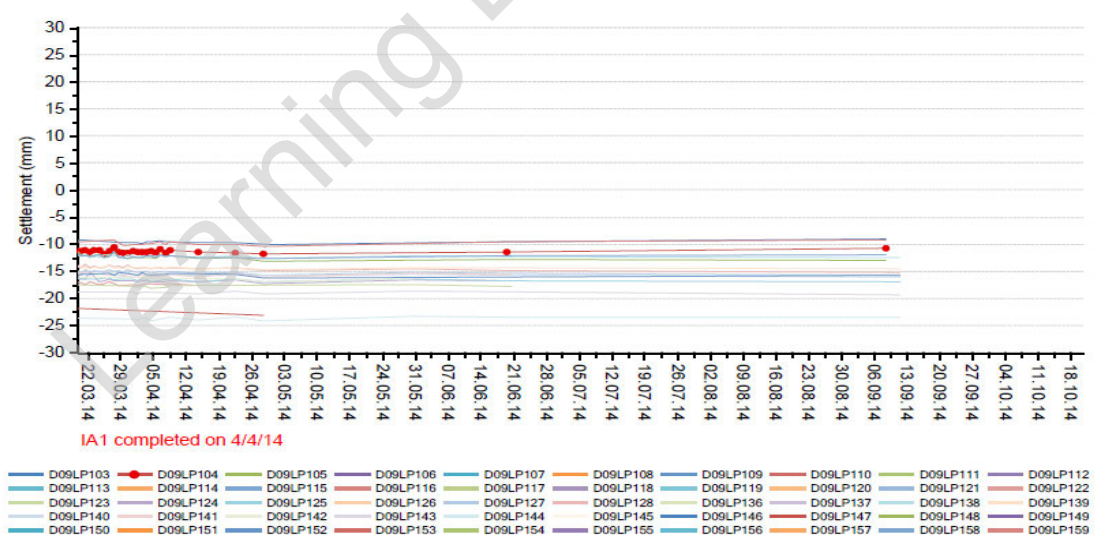
PLPs Along Catton Street



Project: Routewide: TCR-FAR  
etec Reference Date: none Date of Measurement: 21.10.2014 14:55

Figure 9: data time-plots (general)

PLPs Along Catton Street From 20/03/14



Project: Routewide: TCR-FAR  
Getec Reference Date: none Date of Measurement: 21.10.2014 14:55

Figure 10: data time-plots (long-term period)

3.3.2. Comments

The points along Catton Street settled up to approx. 22mm. This resulted from a number of works in the area, whose effects are clearly visible as highlighted in the figures.

The time-plots are generally showing stability on the long term readings. The associated risk is considered negligible.

### 3.4. Fisher Street PLPs and BREs

#### 3.4.1. Data

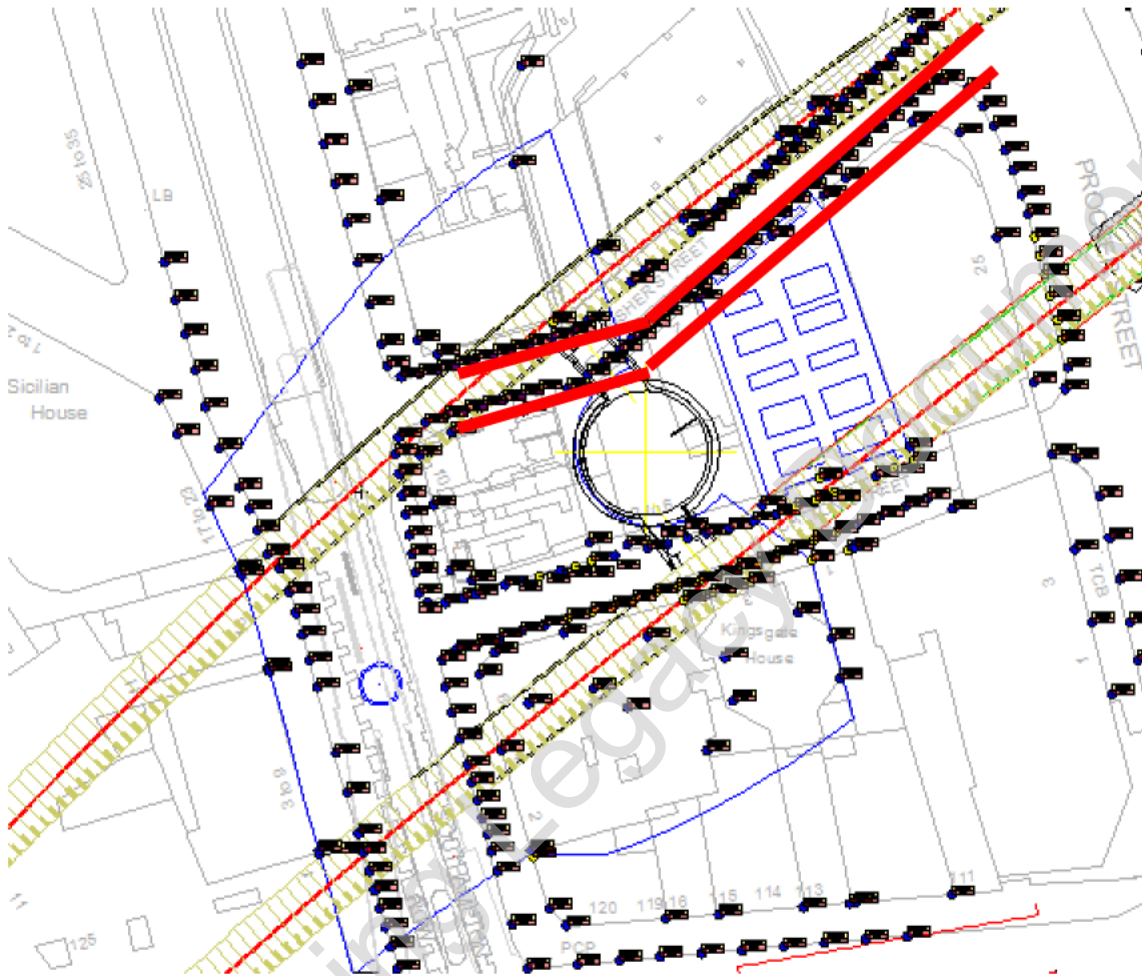


Figure 11: Location

**BRE - FISHER STREET**

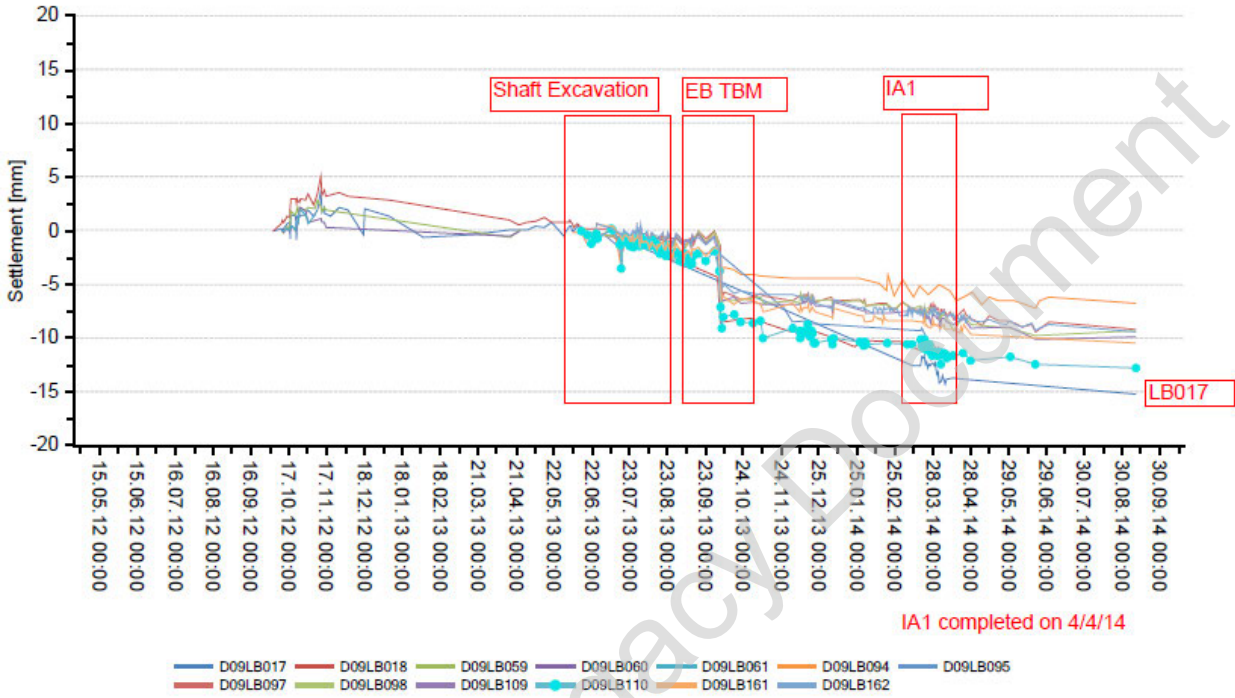


Figure 12: data time-plots (general)

**BRE - FISHER STREET**

From 20/03/14

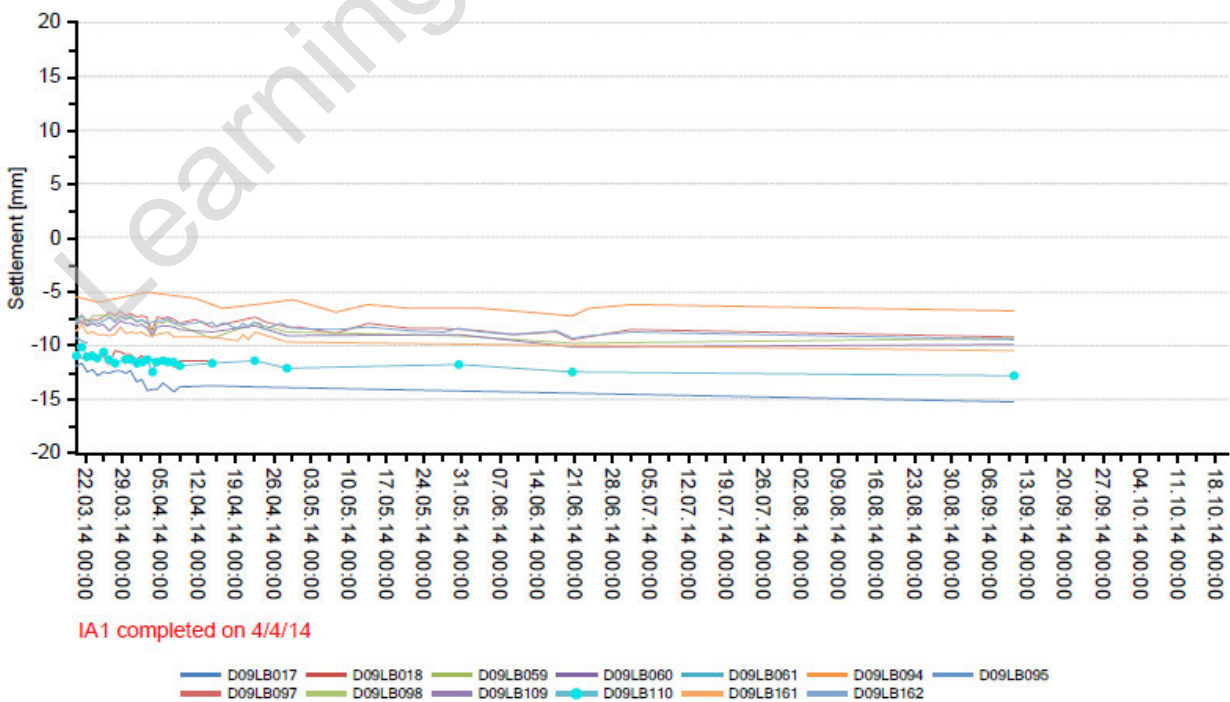


Figure 13: data time-plots (long-term period)



PLPs Along Fisher Street

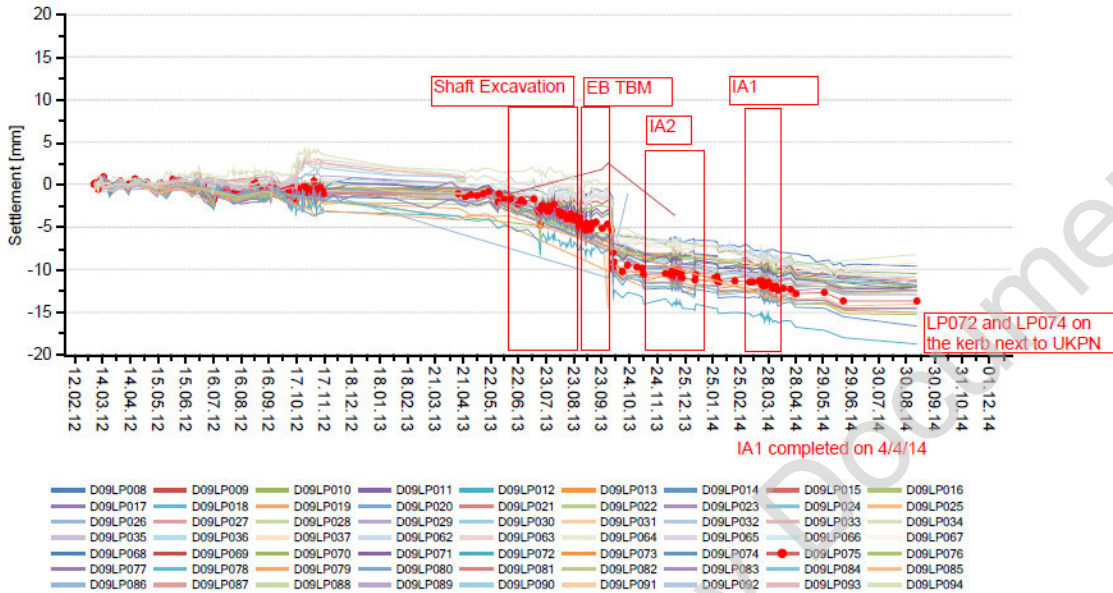


Figure 14: data time-plots (general)

PLPs Along Fisher Street

From 20/03/14

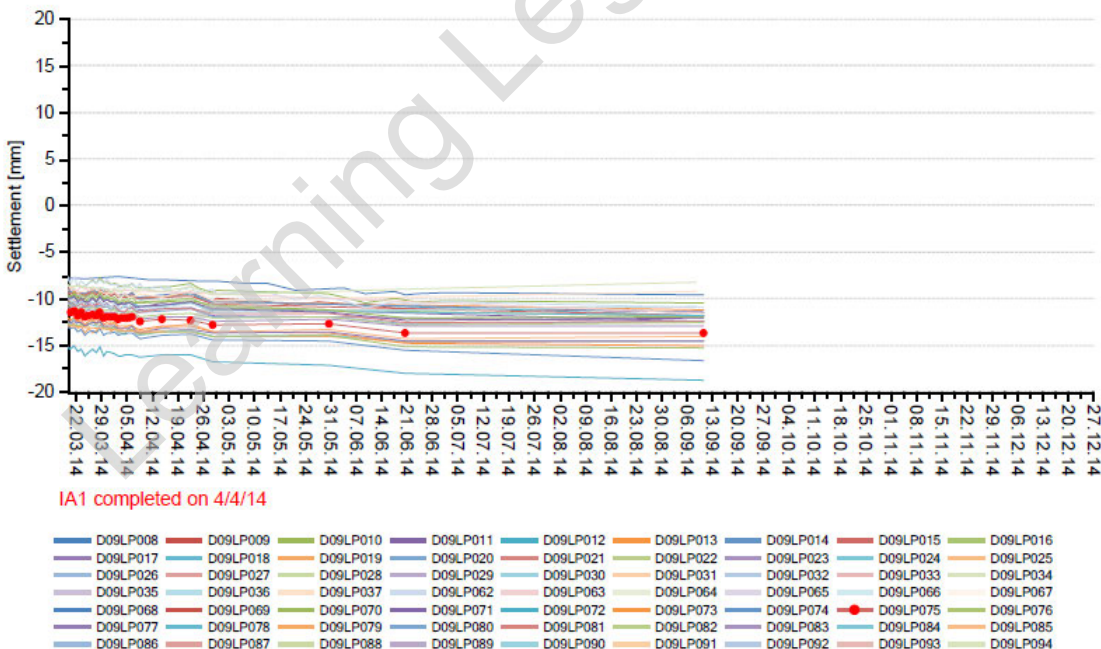


Figure 15: data time-plots (long-term period)

3.4.2. Comments

The points along Fisher Street settled up to approx. 20mm. This results from a number of works in the area, whose effects are clearly visible as highlighted into the charts. There was no effect from the WB TBM passage.

The time-plots are generally showing stability on the long term readings. The associated risk is considered negligible.

### 3.5. High Holborn PLPs and BREs

#### 3.5.1. Data

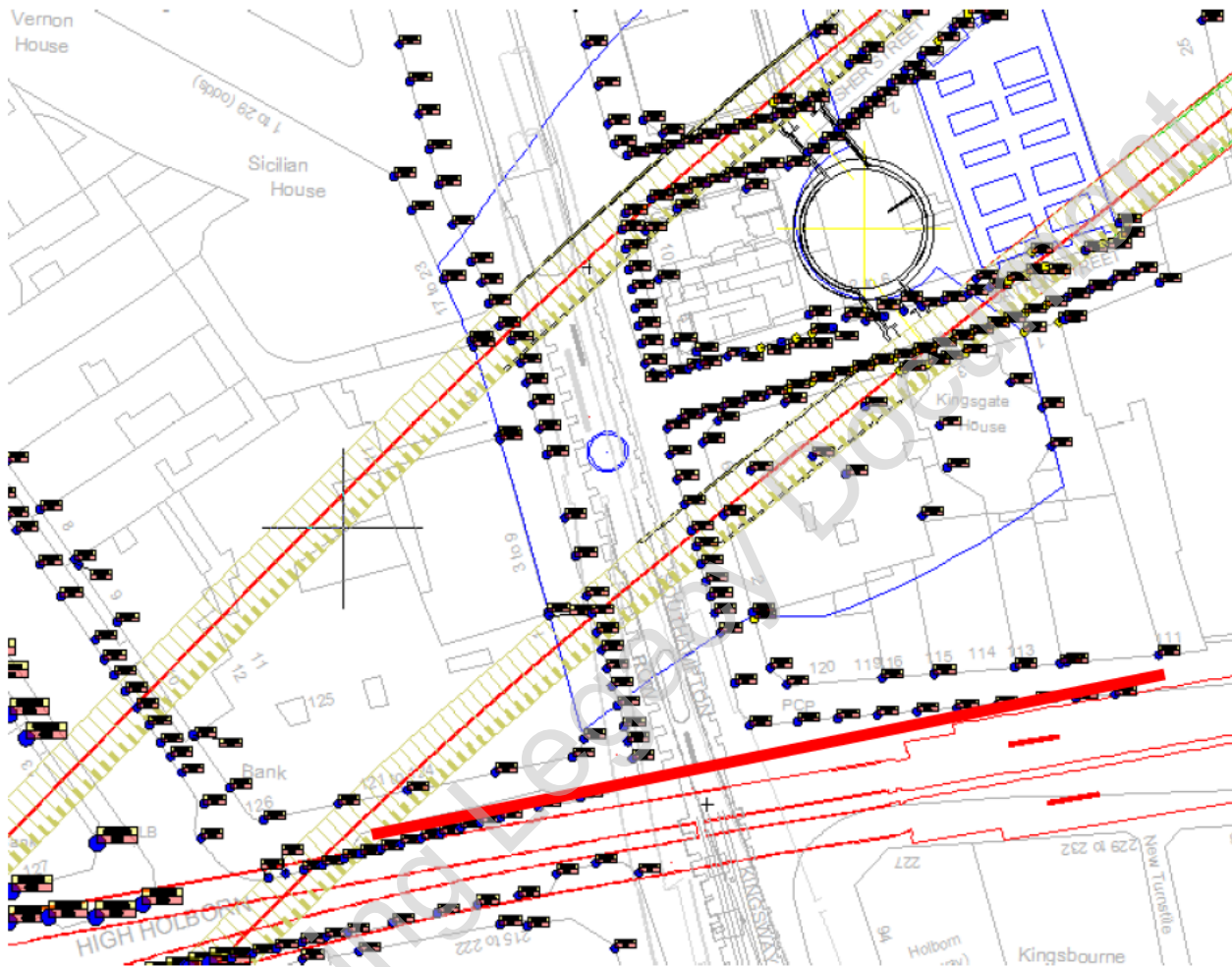


Figure 16: Location



**BRE - HIGH HOLBORN**

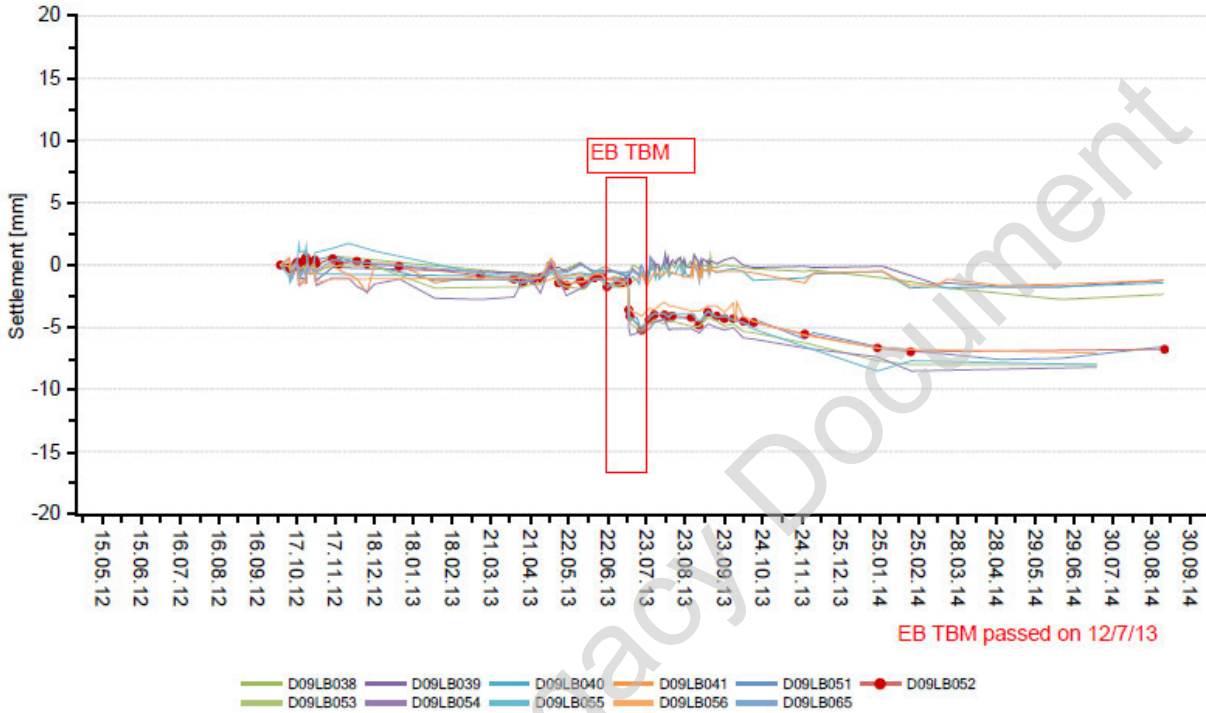


Figure 17: data time-plots (general)

**BRE - HIGH HOLBORN**

From 01/07/13

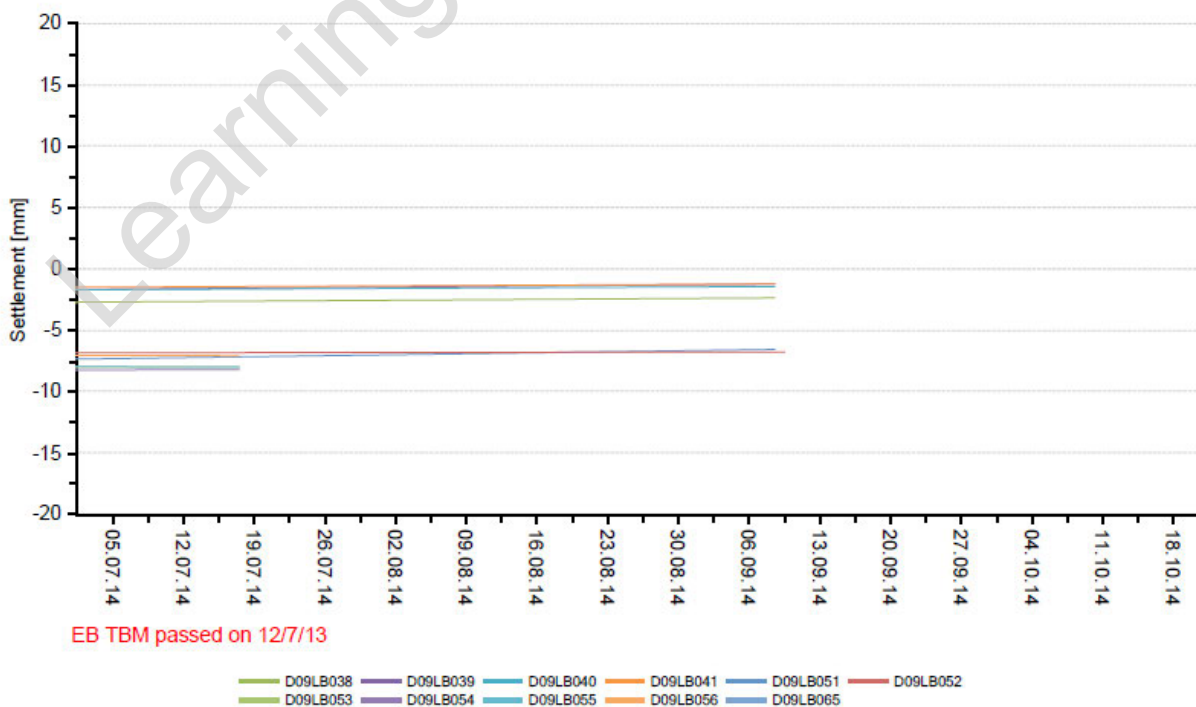


Figure 18: data time-plots (long-term period)

PLP High Holborn

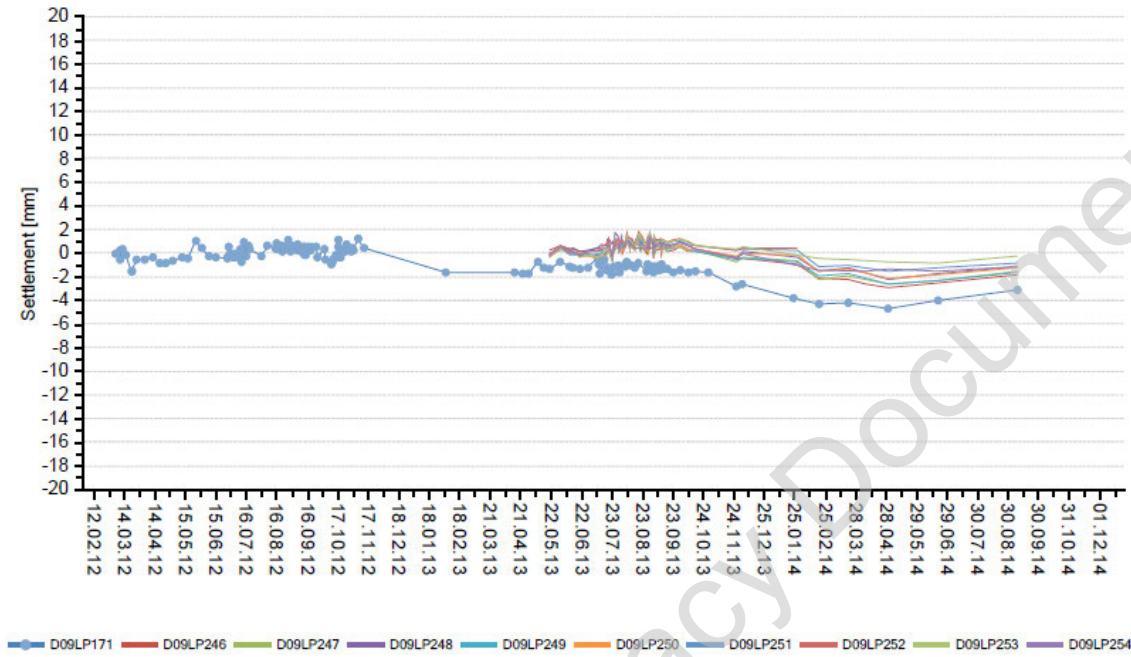


Figure 19: data time-plots (general)

PLP High Holborn

From 01/07/14

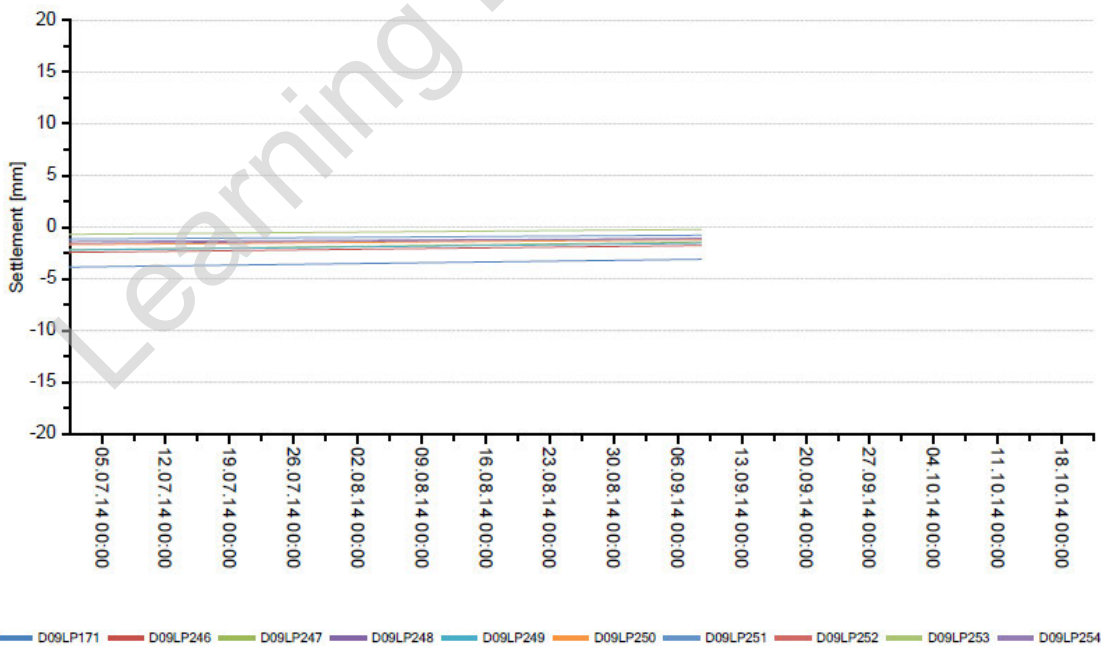


Figure 20: data time-plots (long-term period)

3.5.2. Comments

The points along High Holborn settled up to approx. 7mm, with a noticeable influence only from the EB TBM.

The time-plots are generally showing stability on the long term readings. The associated risk is considered negligible.

### 3.6. Kingsway Tram Tunnel (KTT) BREs

#### 3.6.1. Data

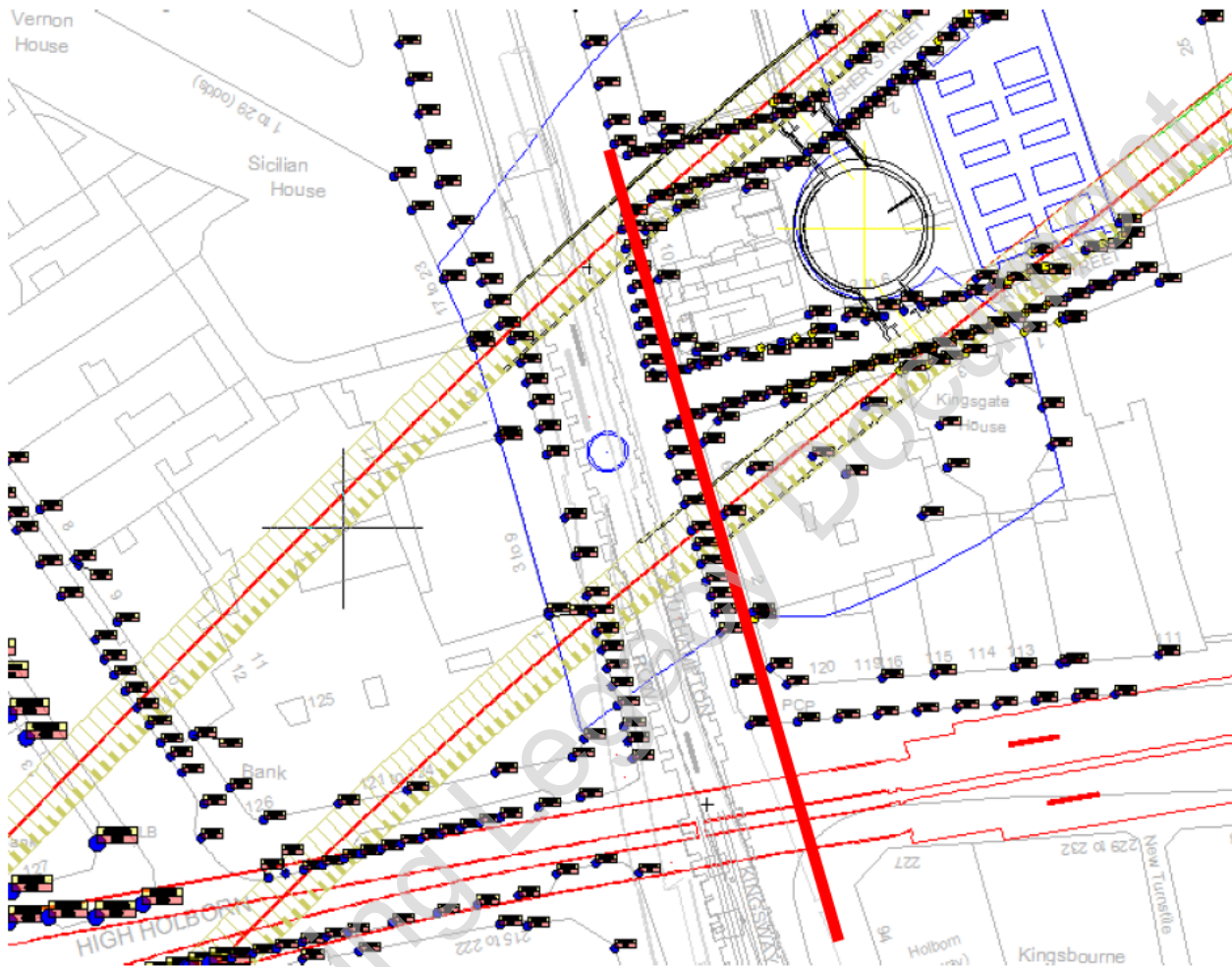


Figure 21: Location

BREs in the Kingsway Tram Tunnel

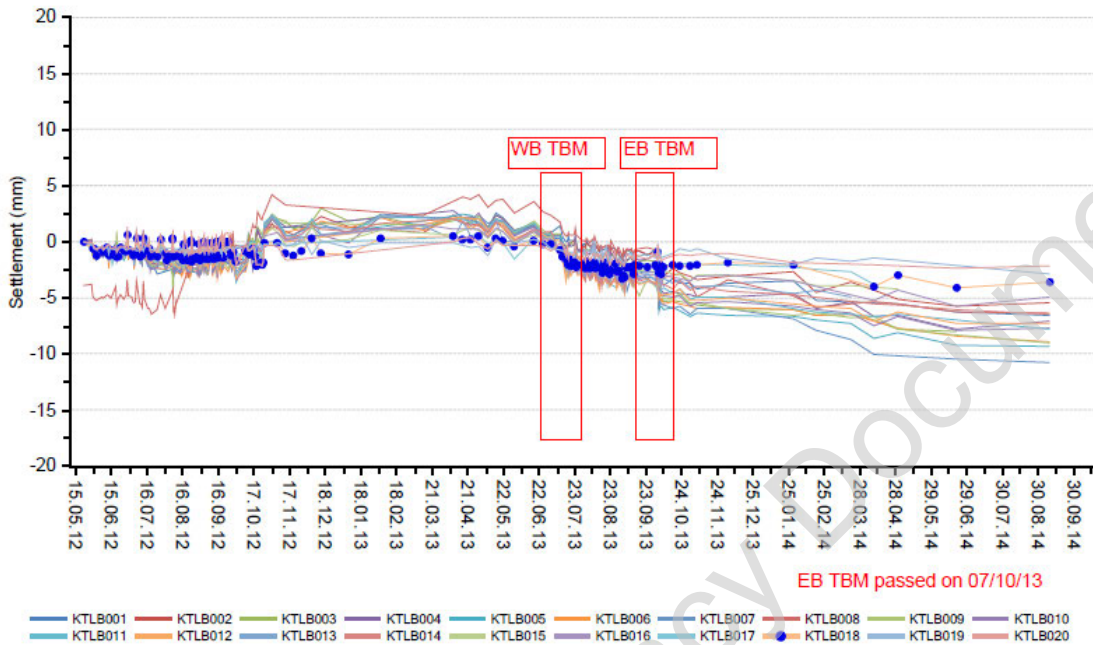


Figure 22: data time-plots (general)

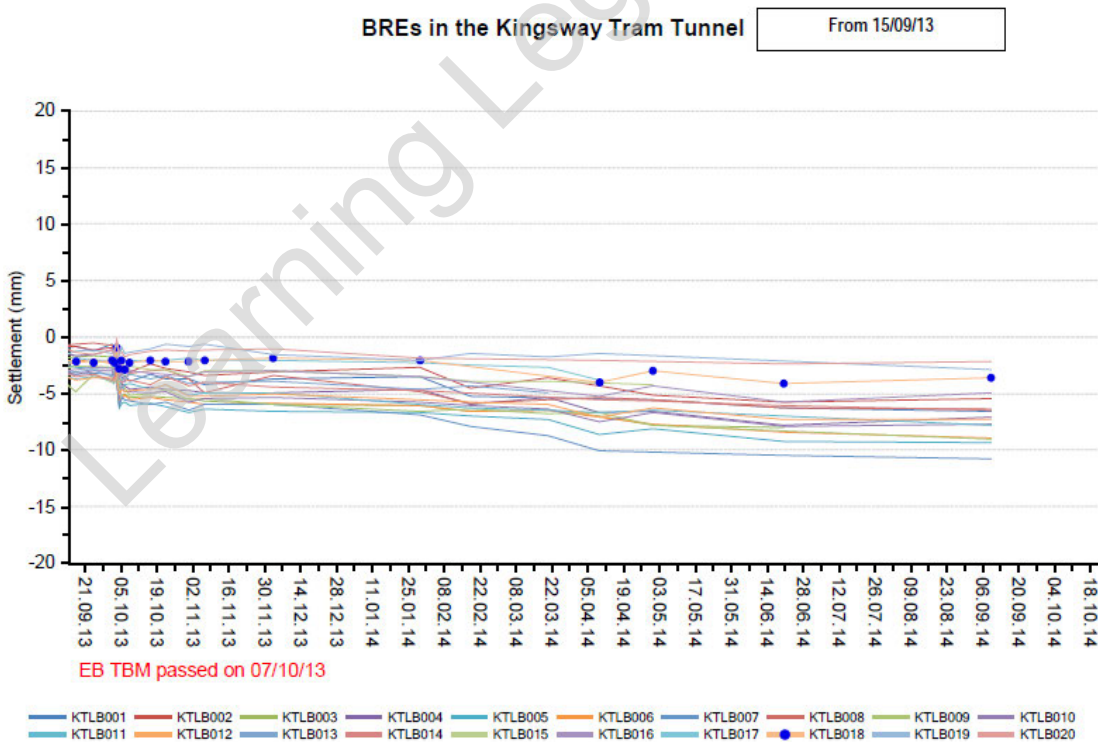


Figure 23: data time-plots (long-term period)

3.6.2. Comments

The points (BREs) inside the KTT settled up to approx. 11mm. The effects of both WB and EB TBMs are visible from the settlement time-plots. The time-plots are generally showing stability on the last readings. The associated risk is considered negligible.



### 3.7. Southampton Row BREs and PLPs

#### 3.7.1. Data

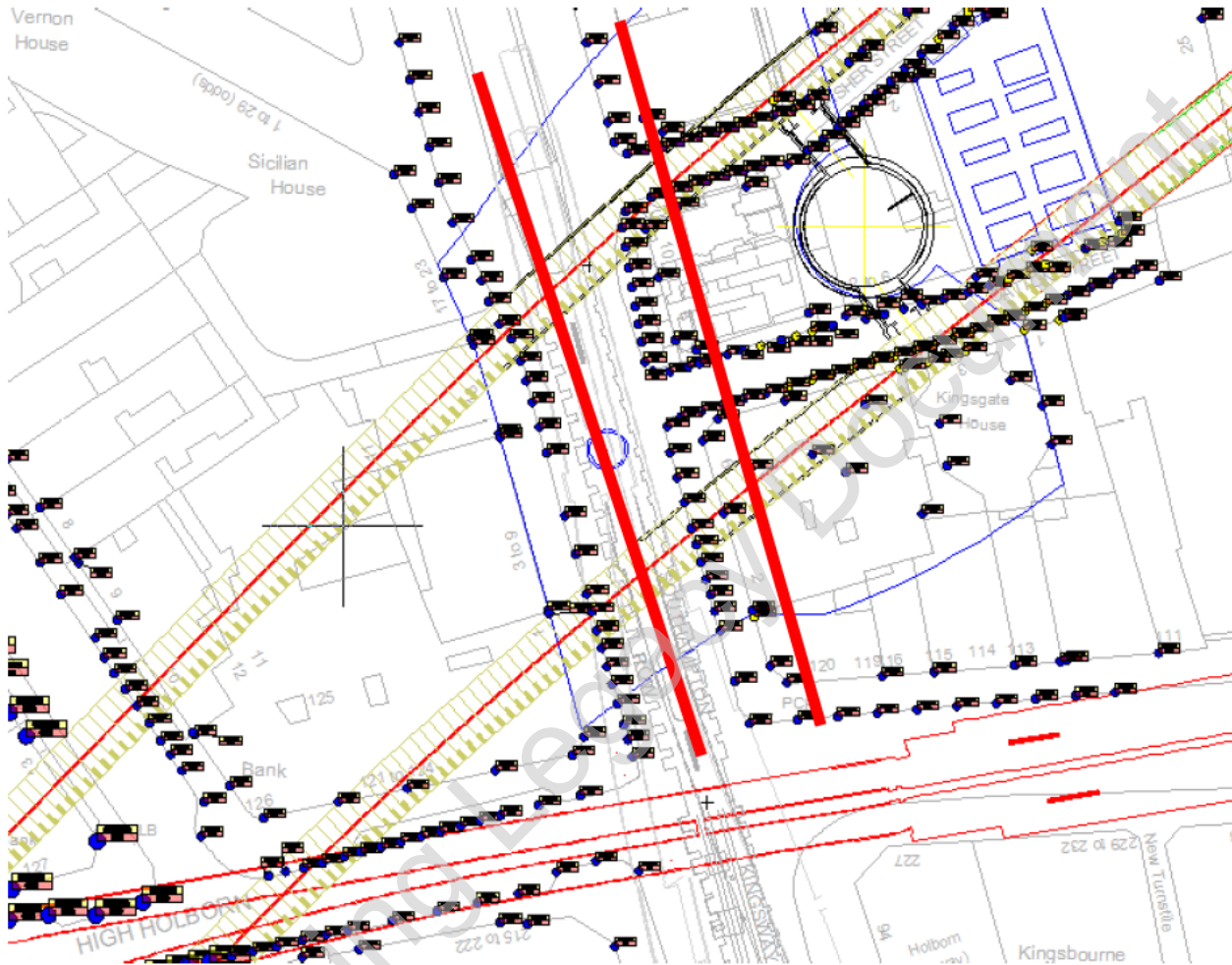


Figure 24: Location



BRE- SOUTHAMPTON ROW WEST

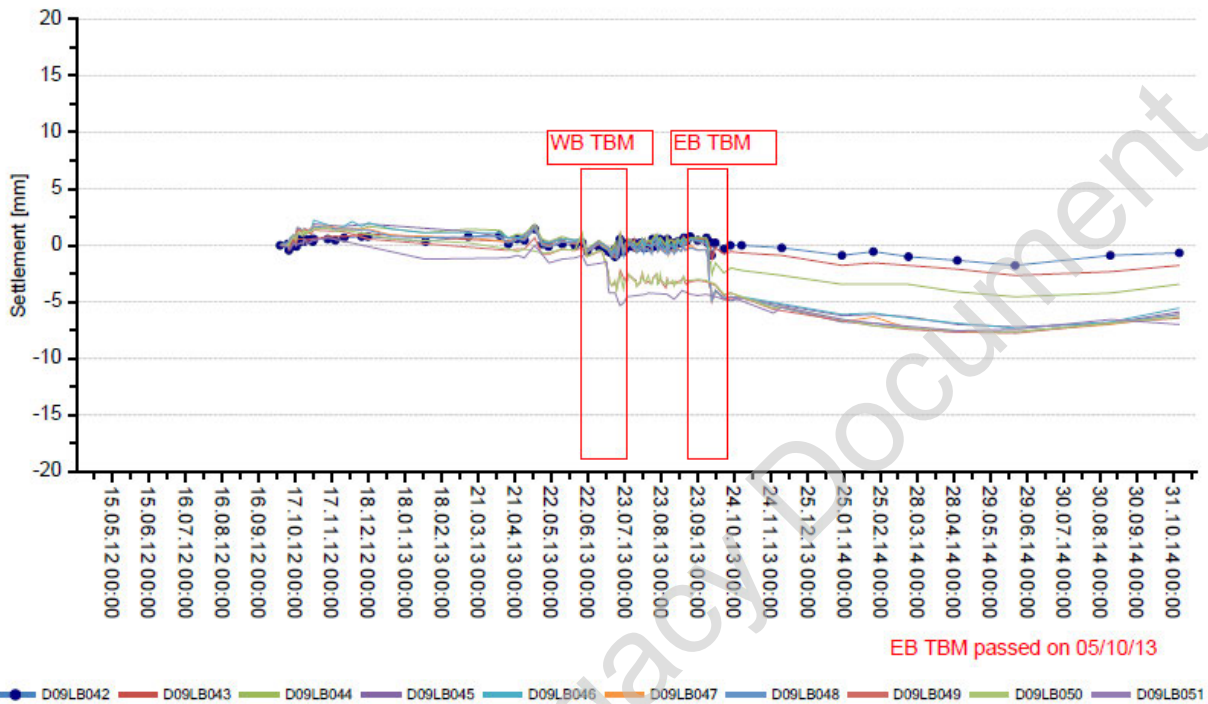


Figure 25: data time-plots (general)

BRE- SOUTHAMPTON ROW WEST

From 01/07/14

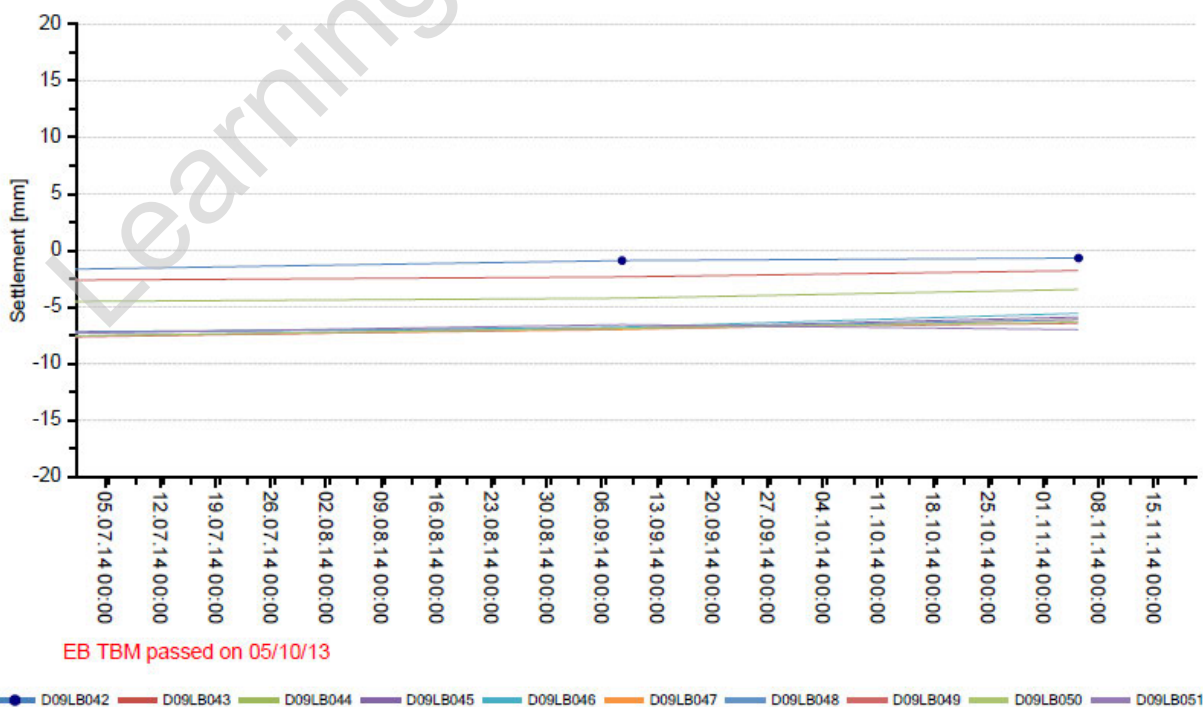


Figure 26: data time-plots (long-term period)

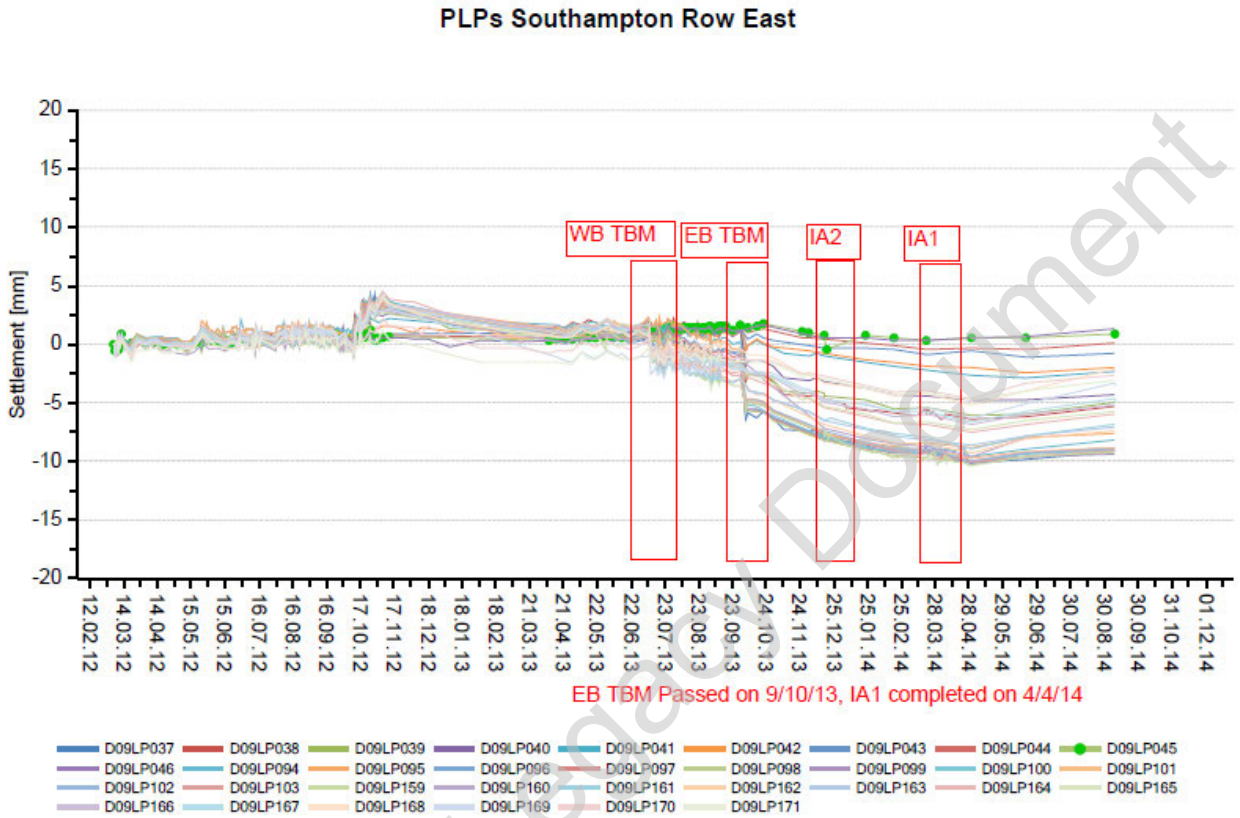


Figure 27: data time-plots (general)

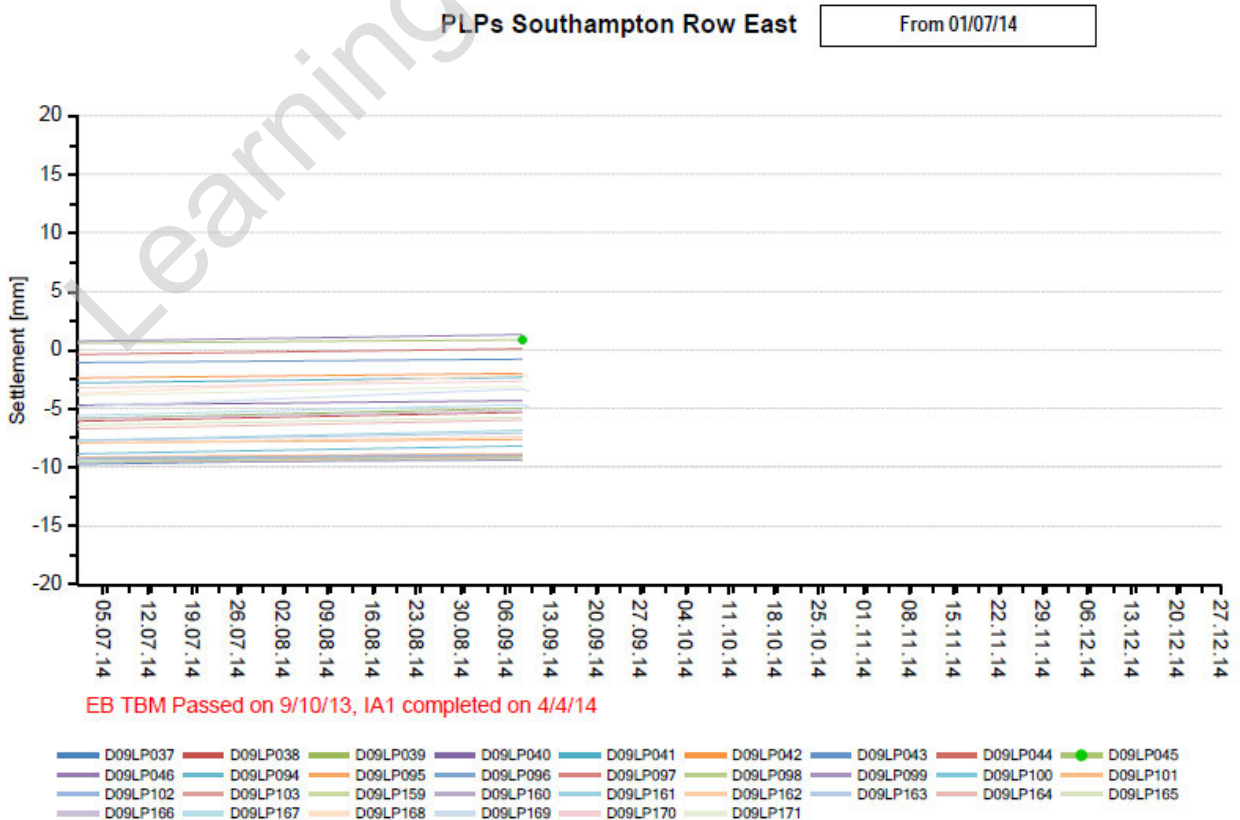


Figure 28: data time-plots (long-term period)

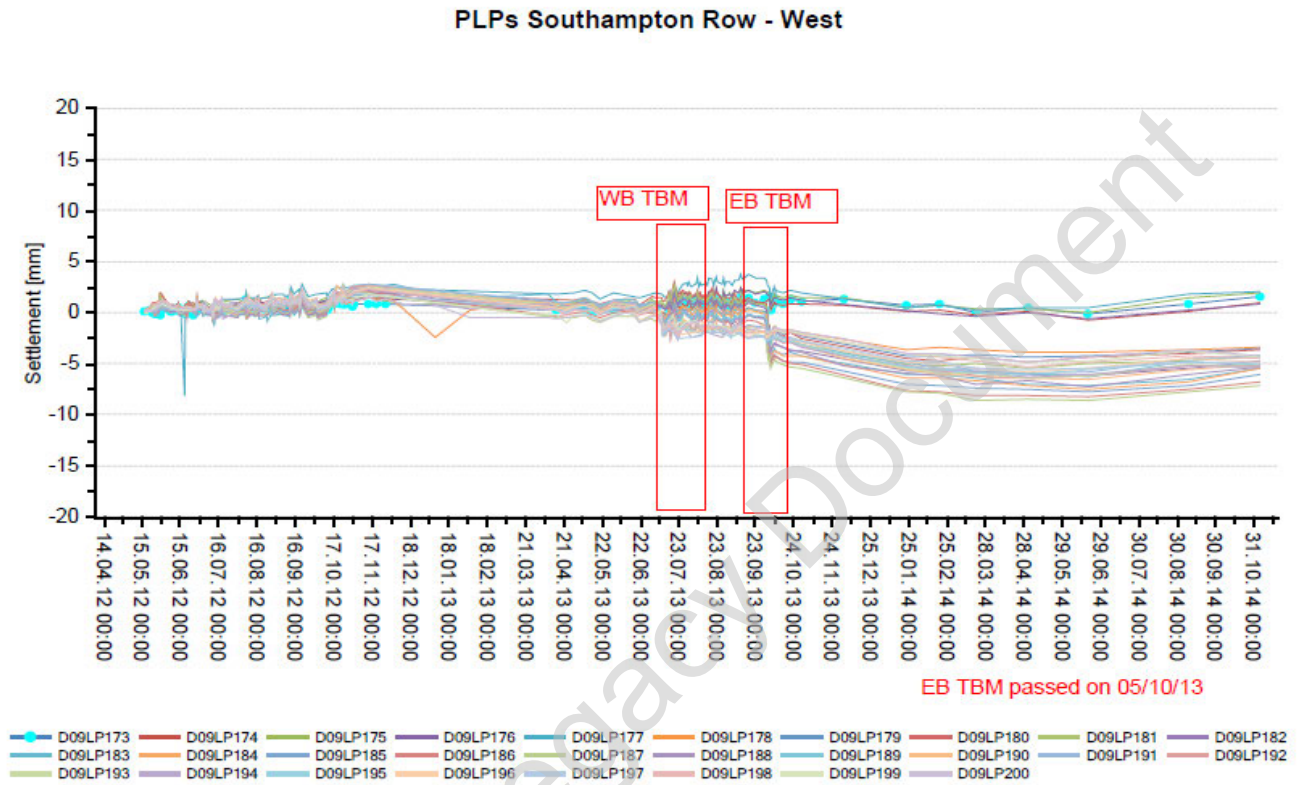


Figure 29: data time-plots (general)

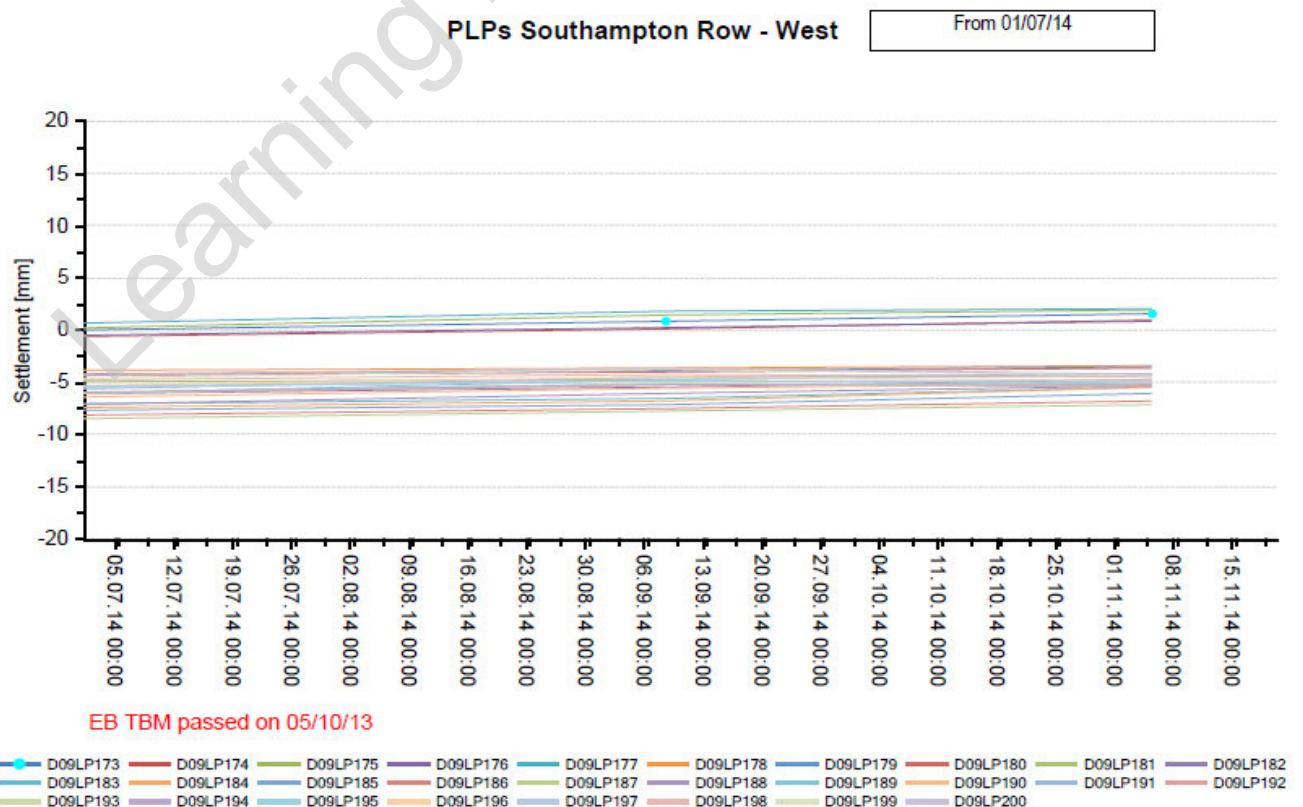


Figure 30: data time-plots (long-term period)



Southampton Row East PLPs

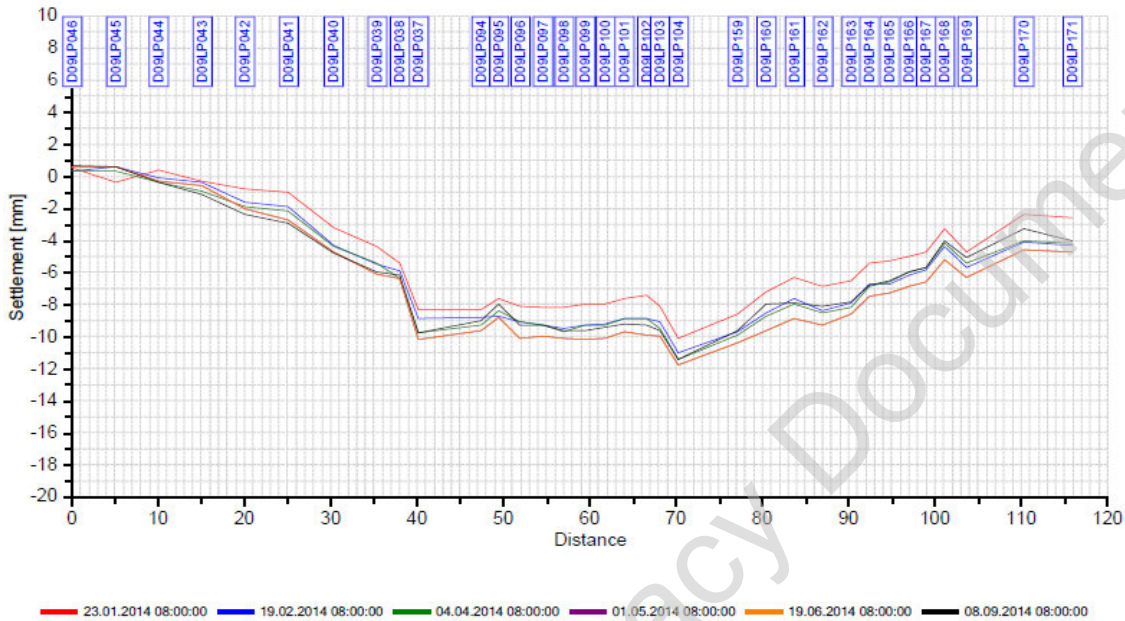


Figure 31: Cut

Southampton Row West PLPs

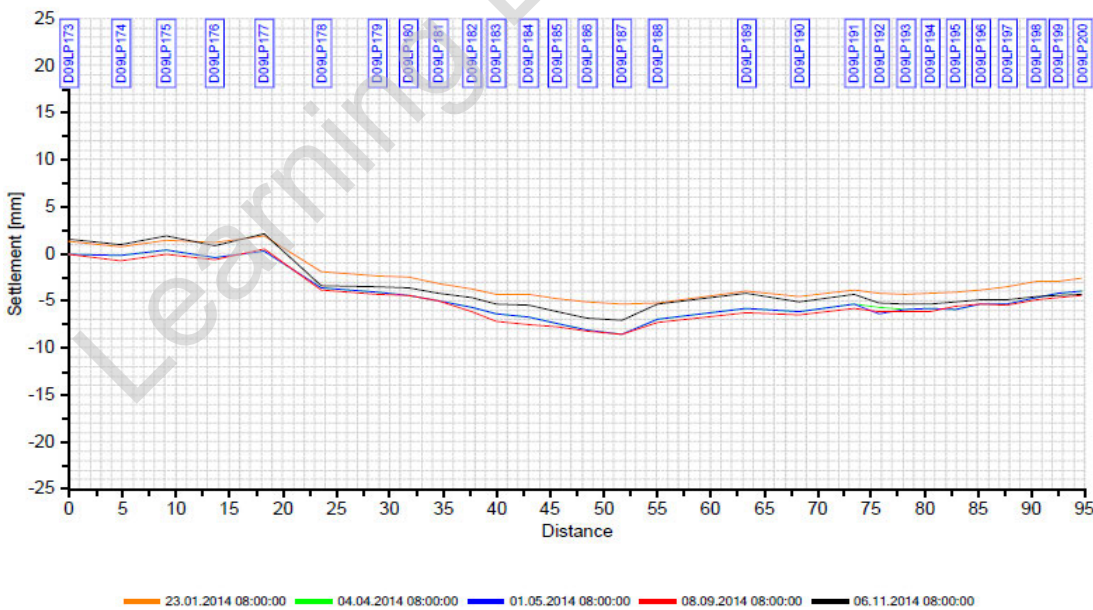


Figure 32: Cut

3.7.2. Comments

The points along Southampton Row settled up to approx. 10mm. The effects of both WB and EB TBMs are visible from the settlement time-plots, with little apparent influence from the shaft sinking.

The time-plots are generally showing stability on the last readings. The associated risk is considered negligible.

### 3.8. Tiltmeters in 12-16 Southampton Row

The locations of the two tiltmeters installed in 12-16 Southampton Row are shown in Figure 33.

Sketch provided to KGI through C122-OVE-C2-RGN-CR001-50027 (with cable routes)

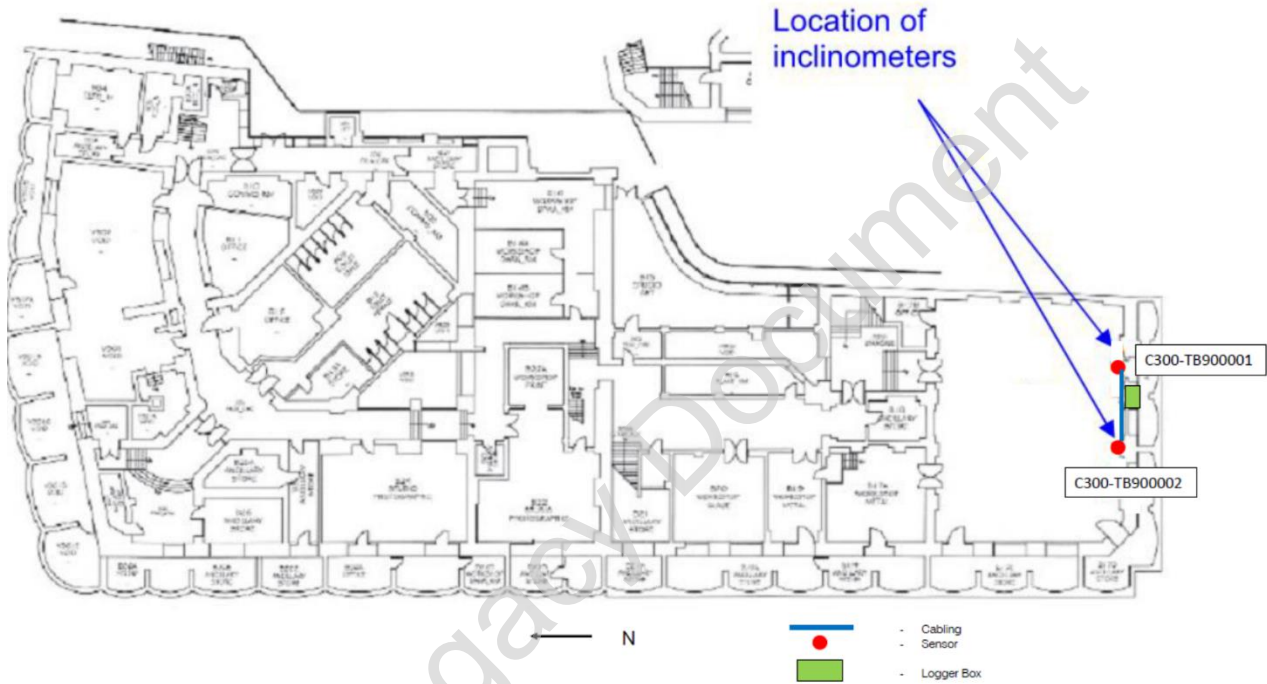
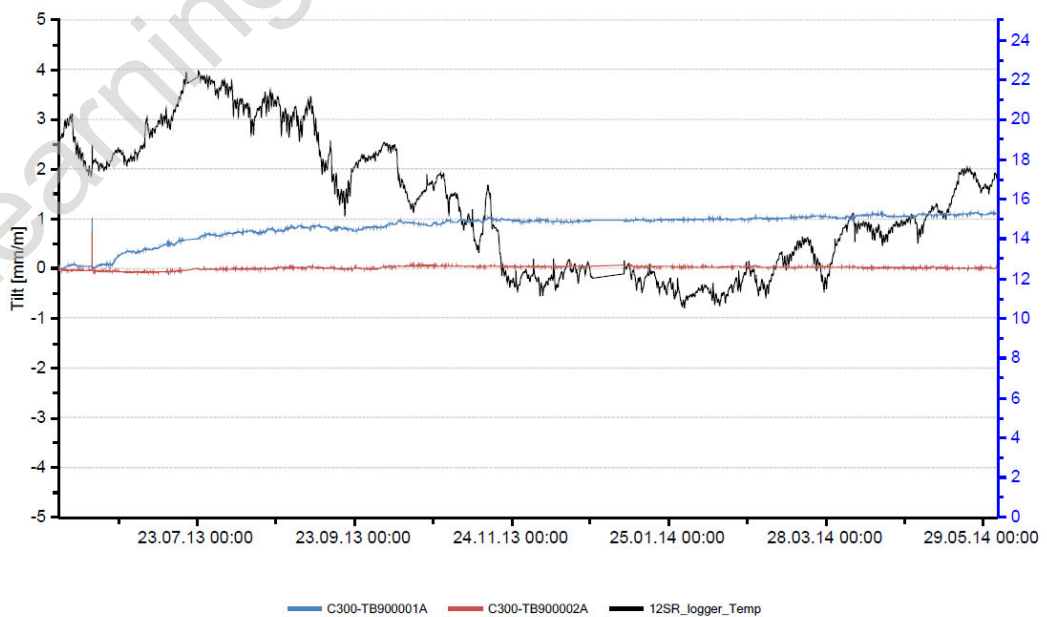


Figure 33 Location of tiltmeters in 12-16 Southampton Row

TILT 1A/ 2A 12-16 Southampton Row

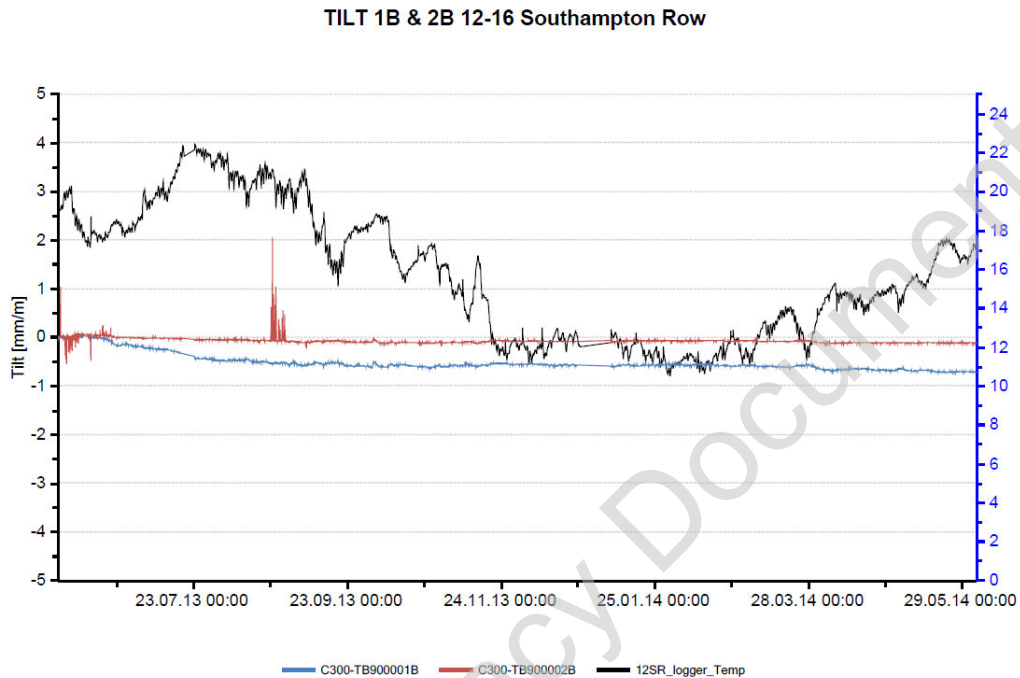


Project: Routewide: TCR-FAR  
 Reference Date: none Date of Measurement: 03.06.2014 15:04  
 Version: 03.06.2014 15:29

A direction: +ve east



Figure 34 Tiltmeter data – East - west



Project: Routewide: TCR-FAR  
 Reference Date: none Date of Measurement: 03.06.2014 15:04  
 Version: 03.06.2014 15:29

B direction: +ve south

Figure 35 Tiltmeter data – North - south

Tilt changed on one instrument (C300-TB00001) in both in directions between June and September 2013, but has remained essentially stable subsequently. The rotation is indicated to the east (+ve A direction) and to the north (-ve B direction). There has been no significant change in either direction on the other sensor.



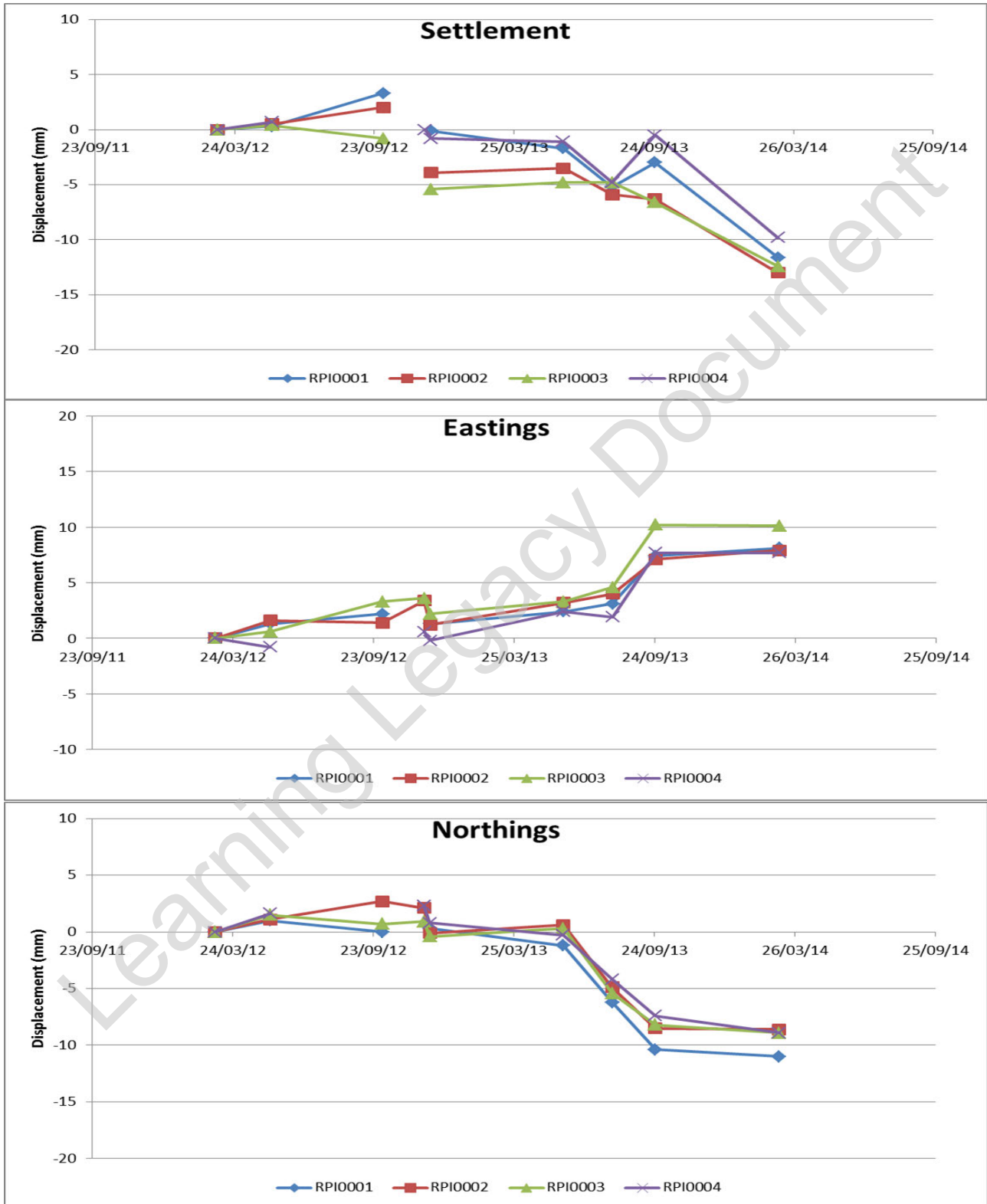


Figure 38 Internal prism data

All four prisms show similar behaviour within the accuracy of this type of monitoring, indicating negligible differential movements.

### 3.10. Sub-surface Instruments

This section includes the monitoring data from inclinometers, extensometers and deep pins within the Fisher Street Shaft area. A plan showing the position of these instruments is given in Figure 39.

The sign convention for the shaft inclinometer data is that the X direction is the primary axis with positive values indicating movement into the shaft. The Y or secondary axis is 90° anticlockwise from the X direction.

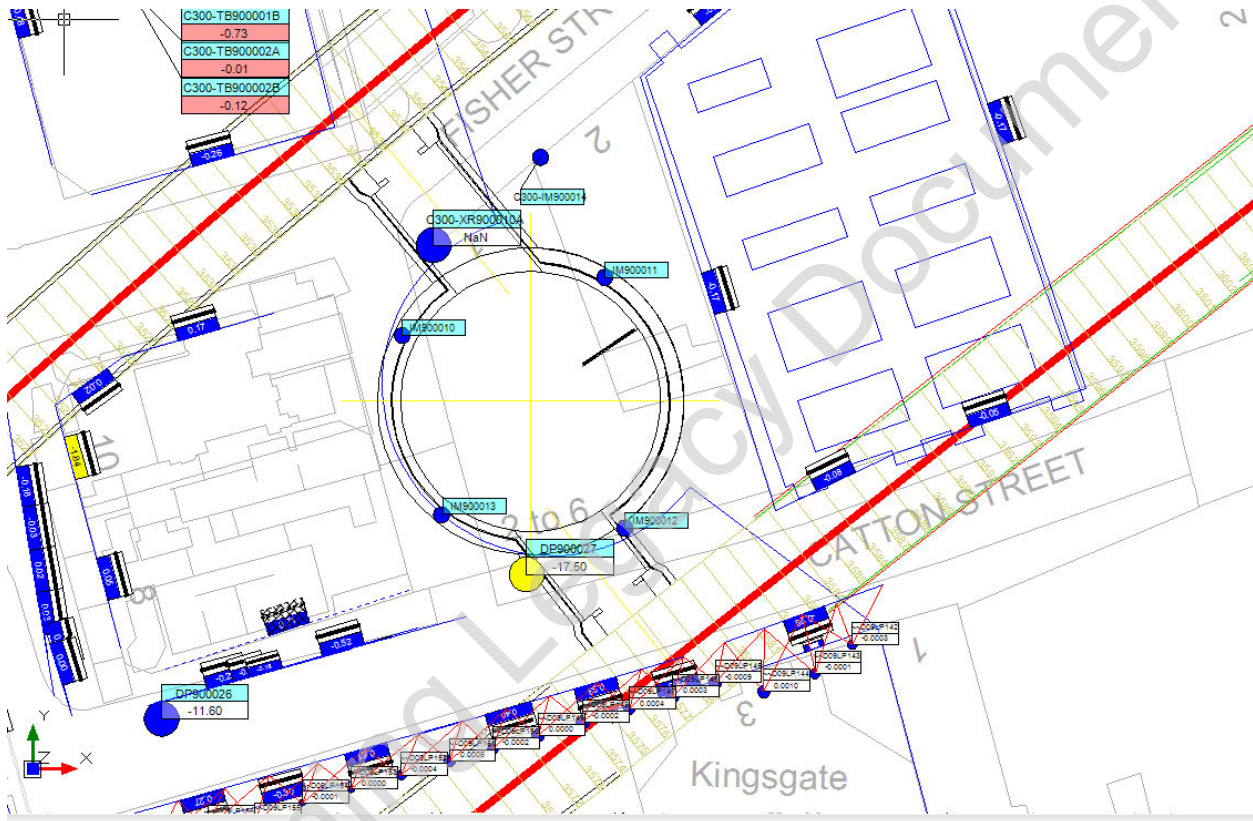
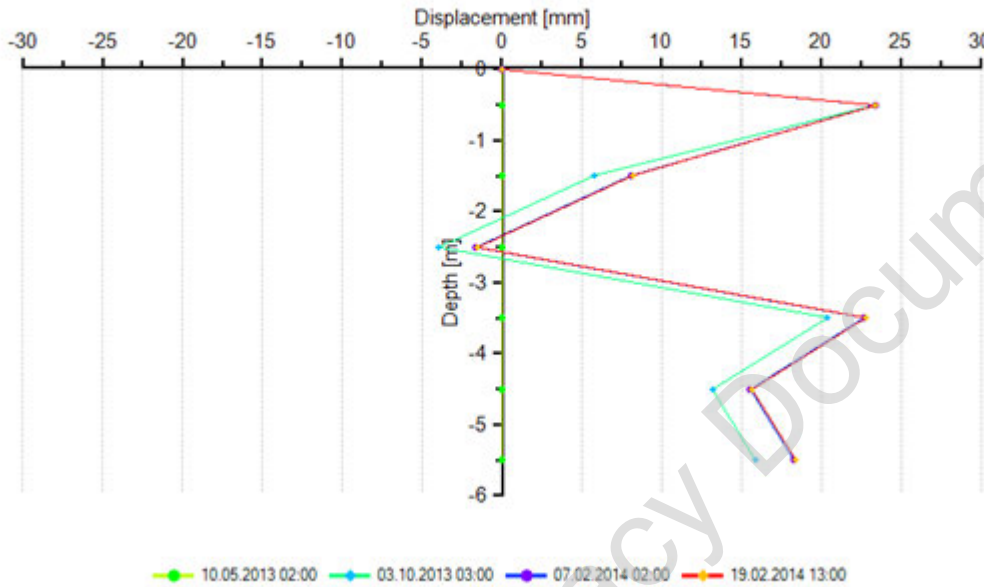


Figure 39

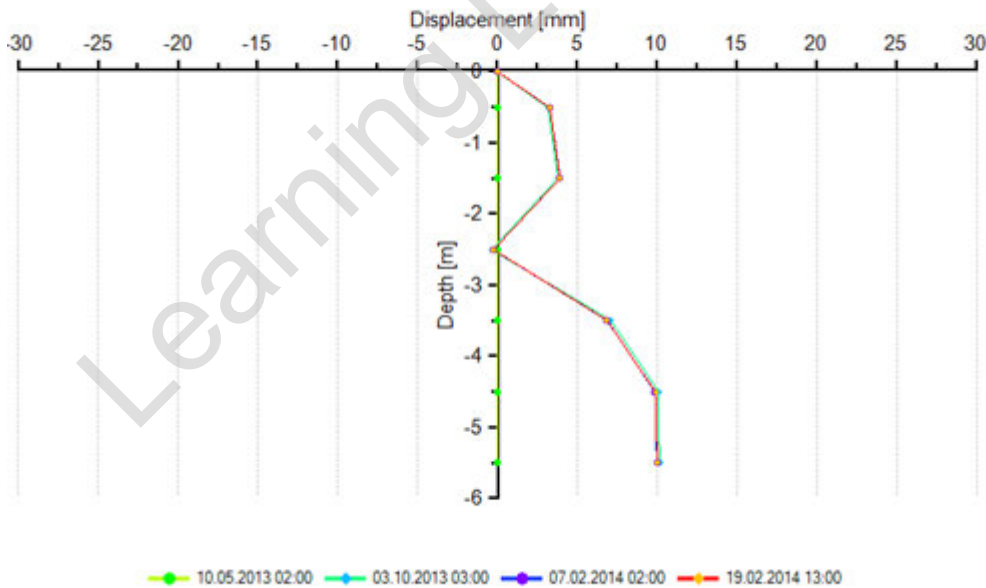


3.10.1. Shaft Inclinator data

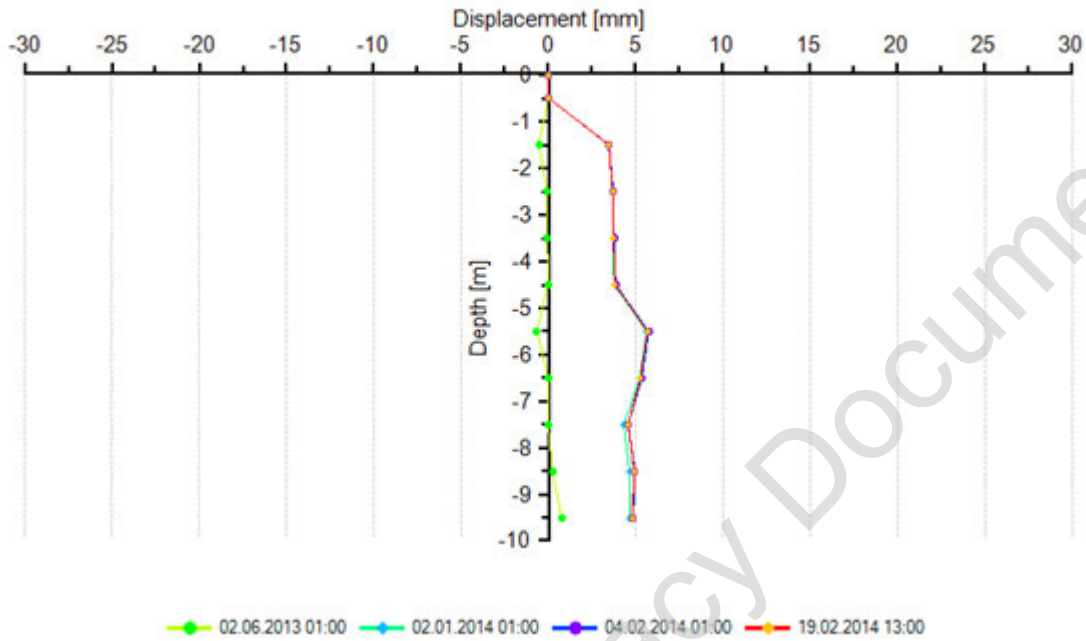
Inclinometer: IM900010 Dir. X 100.0 Grad



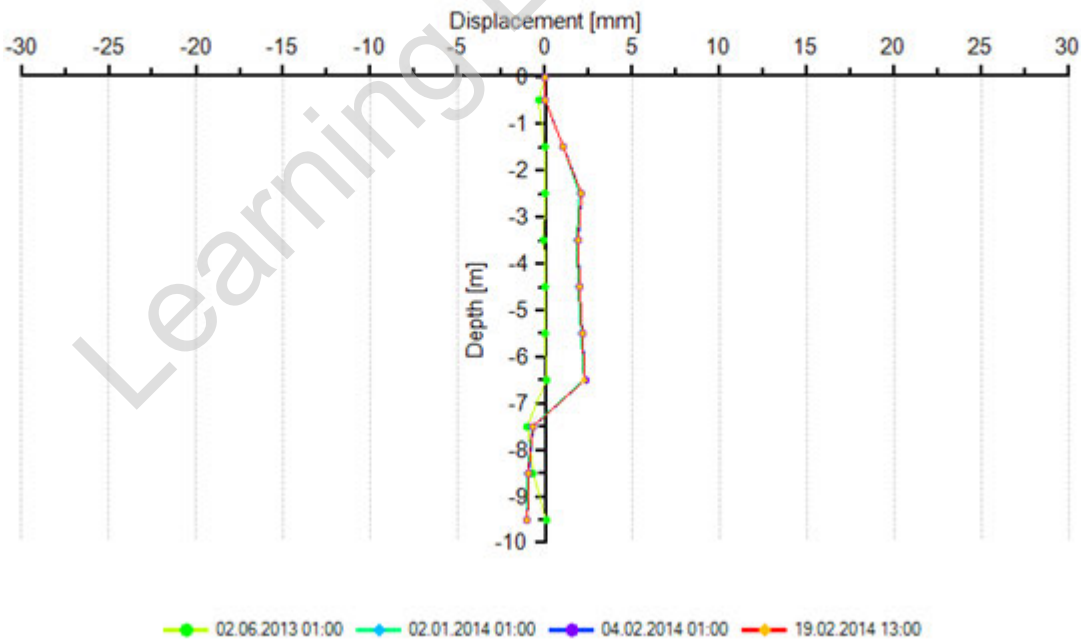
Inclinometer: IM900010 Dir. Y 0.0 Grad



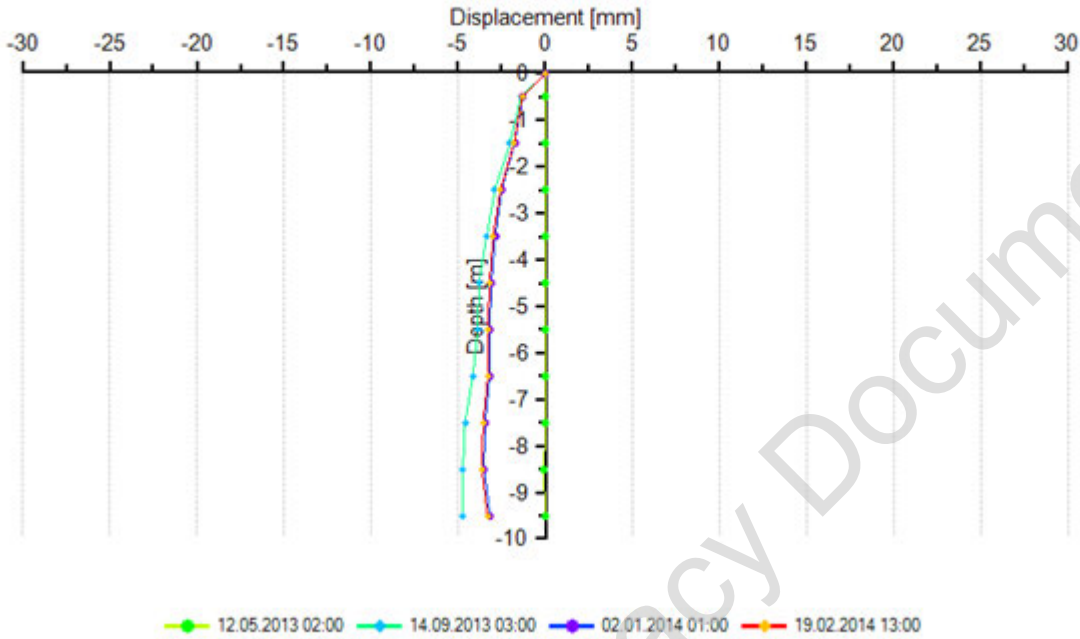
### Inclinometer: IM900011 Dir. X 100.0 Grad



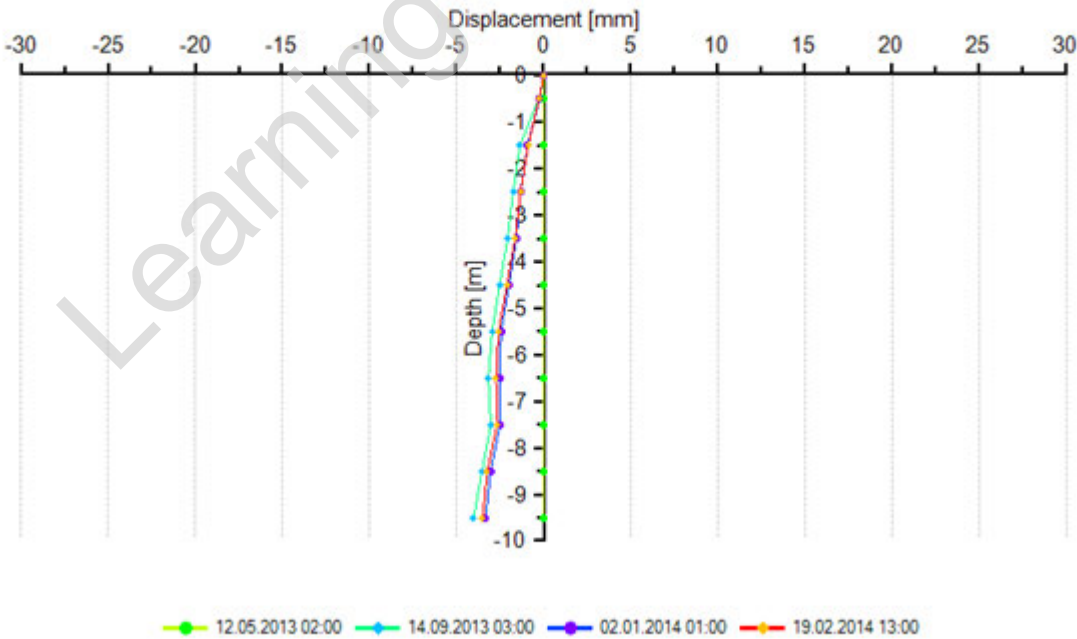
### Inclinometer: IM900011 Dir. Y 0.0 Grad



### Inclinometer: IM900012 Dir. X 100.0 Grad

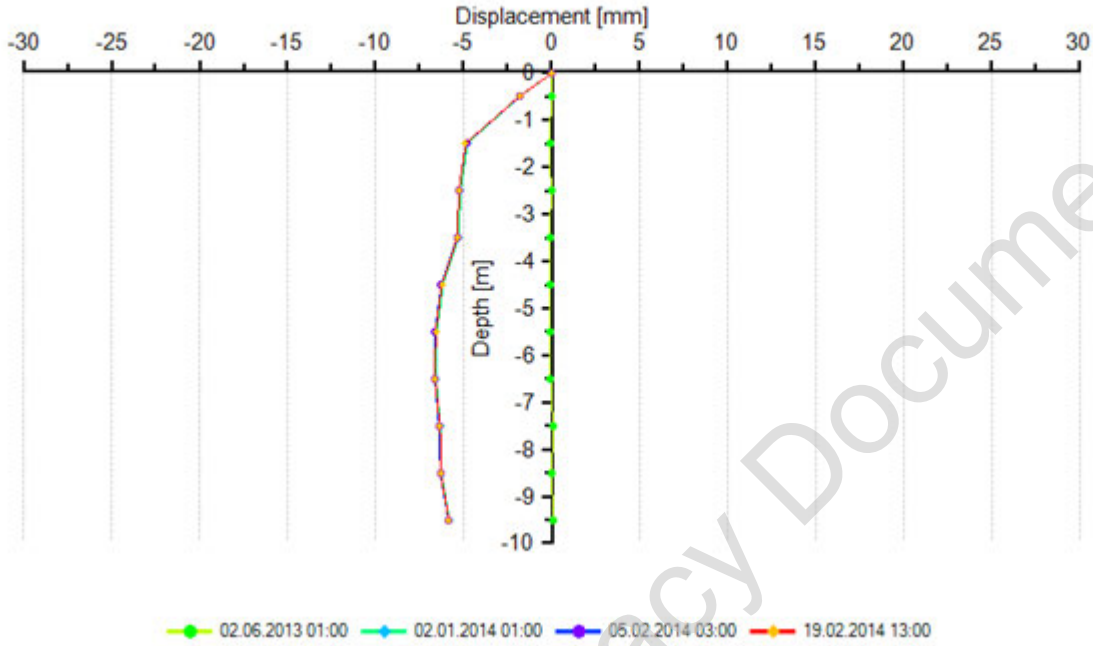


### Inclinometer: IM900012 Dir. Y 0.0 Grad

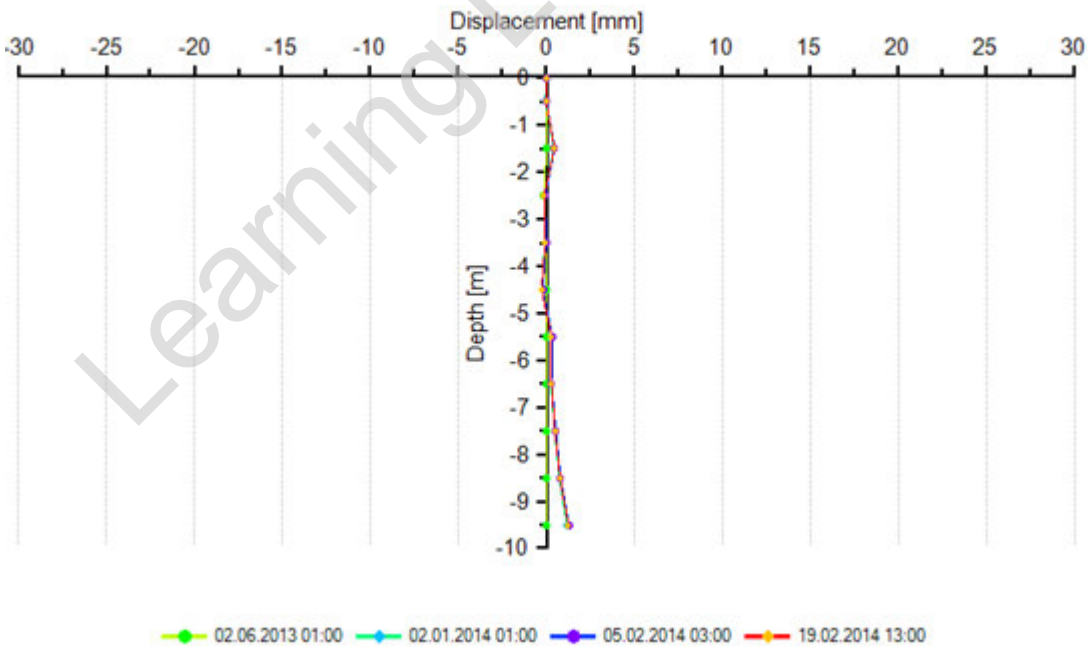




### Inclinometer: IM900013 Dir. X 100.0 Grad

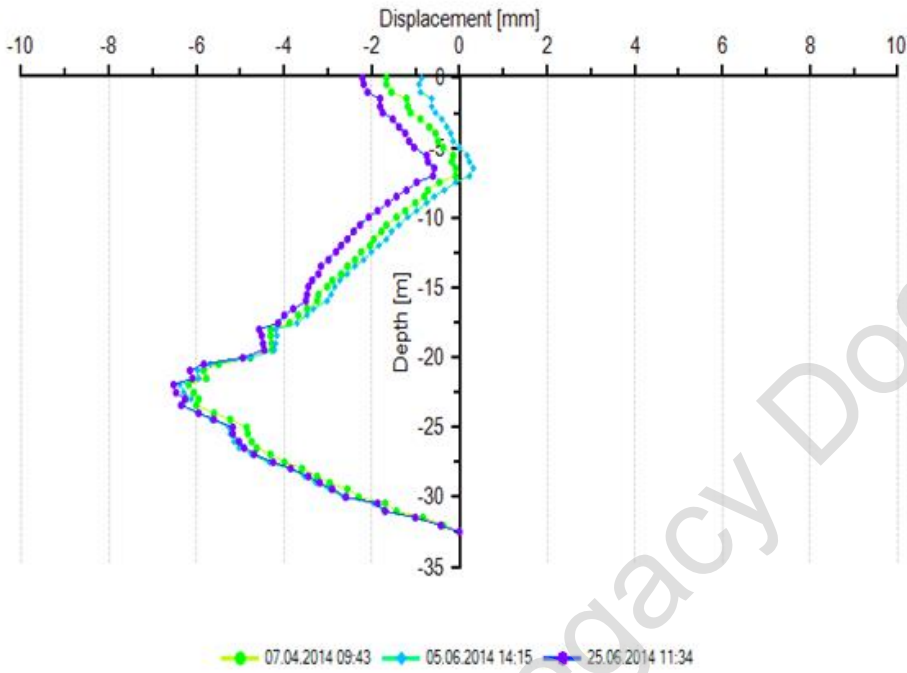


### Inclinometer: IM900013 Dir. Y 0.0 Grad

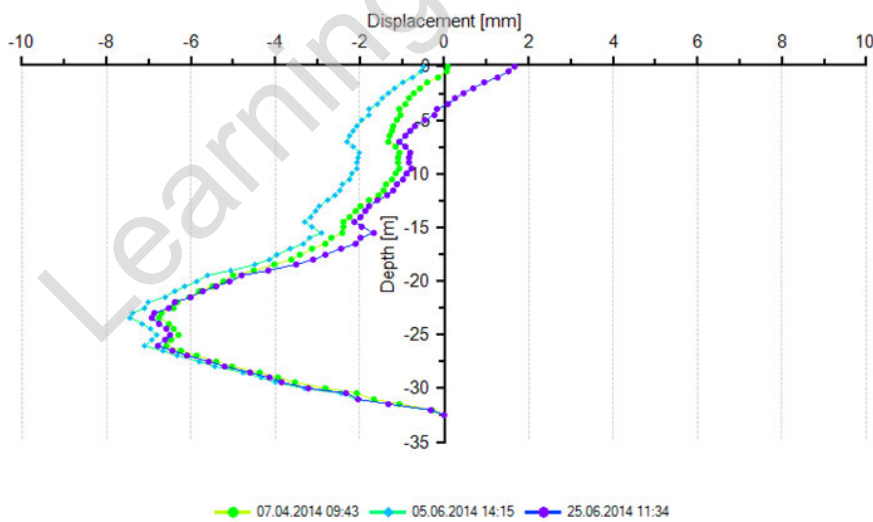


### 3.10.2. In-ground Inclinator data

Inclinometer: C300-IM900014 Dir. Y 0.0 Grad



Inclinometer: C300-IM900014 Dir. X 100.0 Grad

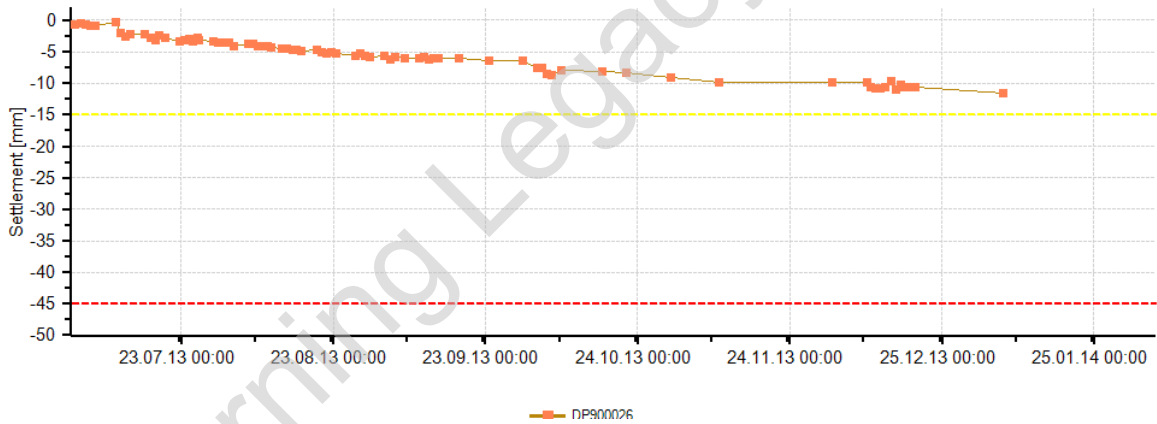


3.10.3. Deep Pins data

Profile: Measurement Point DP900027



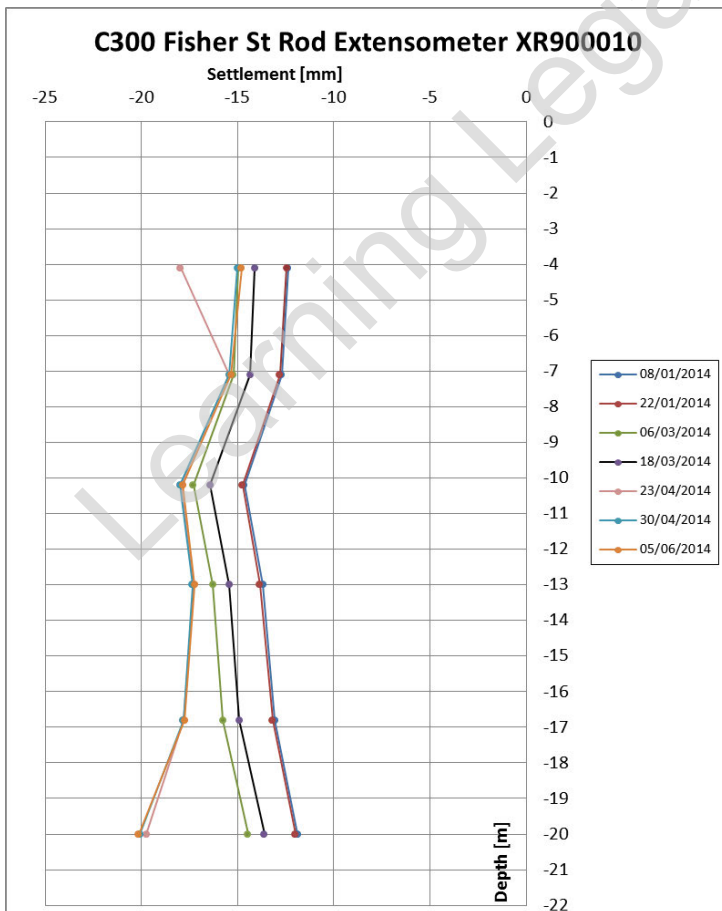
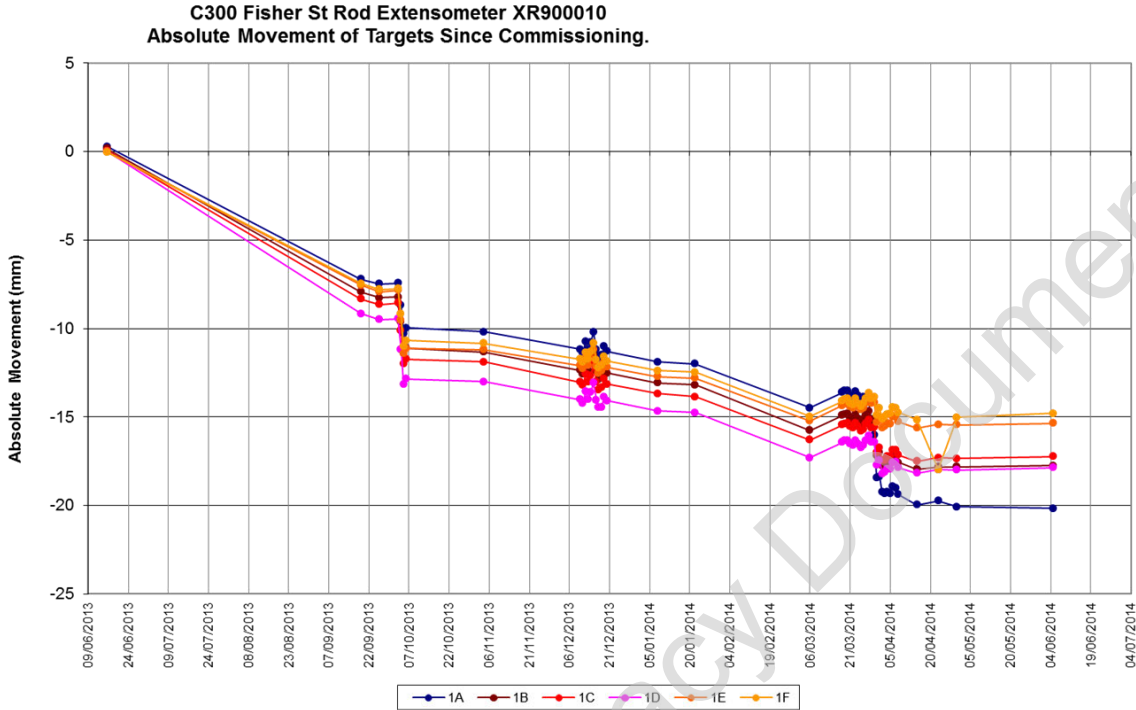
Profile: Measurement Point DP900026



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3.10.4. Extensometer data



3.10.5. Comments

In general, all the monitoring data from the deep instruments are showing stable behaviour or very slow movement trends after the works.

### 3.11. Prism data

Settlement contours from prism data from the end of construction is shown in Figure 40. Comparison with Figure 3 shows a similar overall distribution albeit with somewhat smaller magnitude.

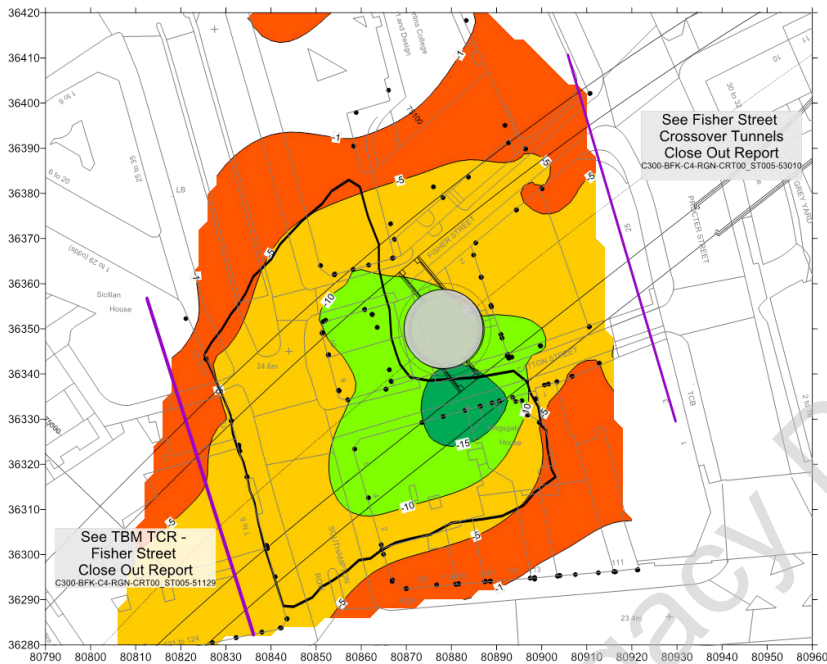


Figure 40 Settlement contour from prism data

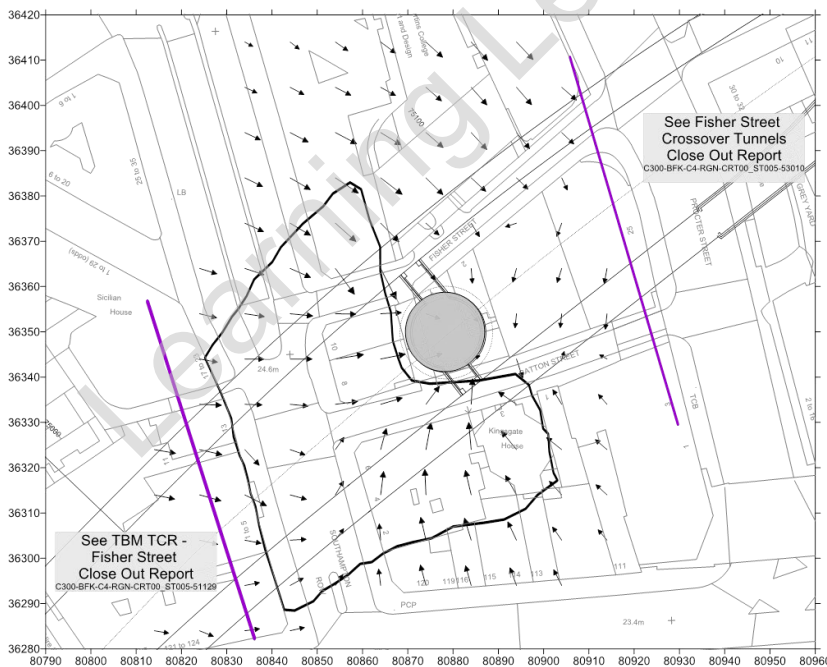


Figure 41 Horizontal displacement vectors

Figure 41 shows vectors of horizontal displacement. These are an approximate indication of the distribution of horizontal movement over the whole of the Fisher Street Shaft zone of influence. The prisms are located at varying elevations and the magnitude of horizontal movements will vary with elevation due to any rotation associated with settlement either associated with rigid body tilting or with bending.

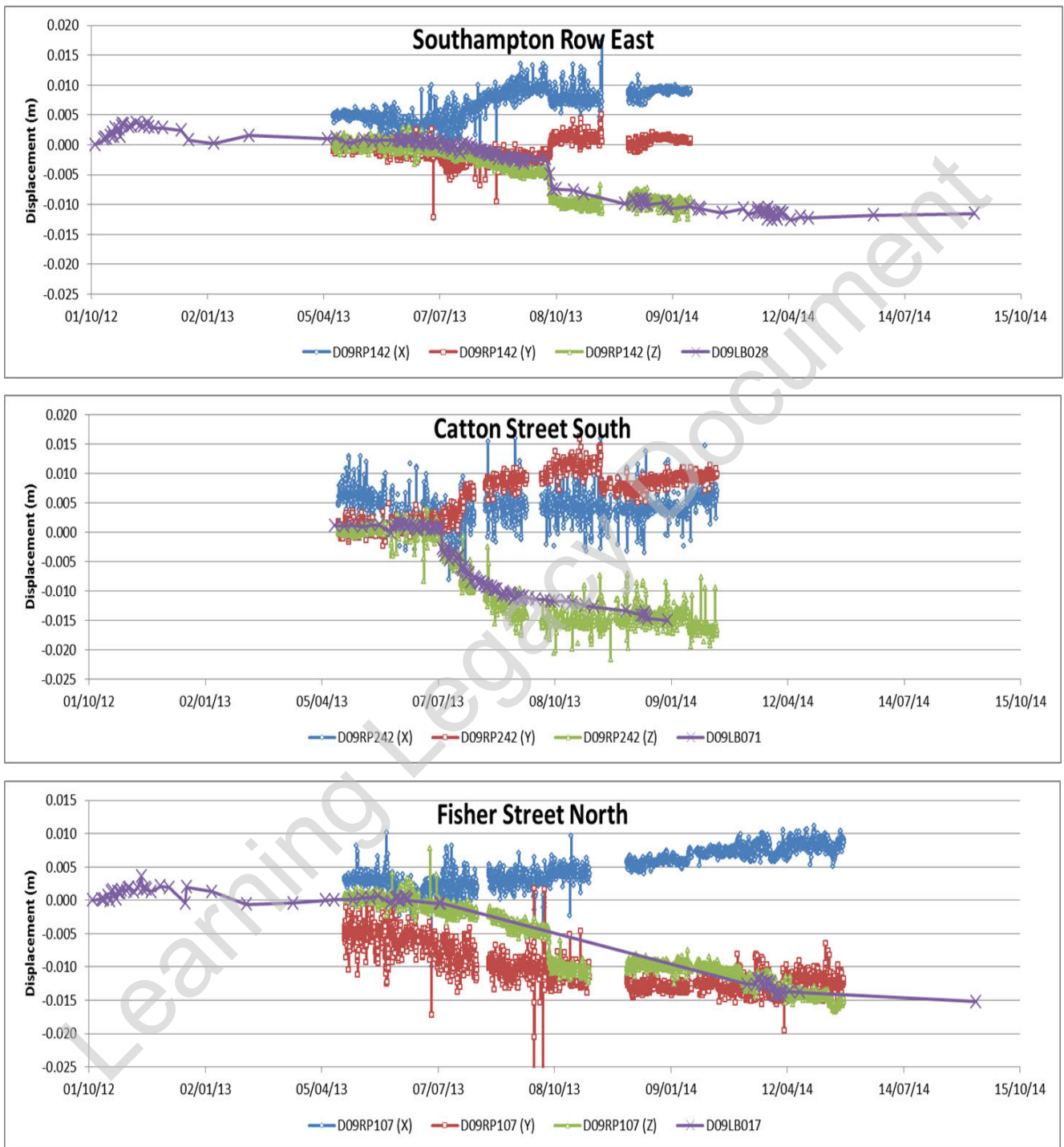


Figure 42 Examples of prism data and comparison with BRE data

Figure 42 shows examples of prism data from the building facades around the shaft for Eastings (X), Northings (Y) and settlement (Z). The settlement data is compared to that from the closest BRE socket and shows overall good agreement. It is noted that the Eastings and Northings have finite values at the start of the data set even though settlement at that time is negligible – it is considered that their initial displacements are not reliable.



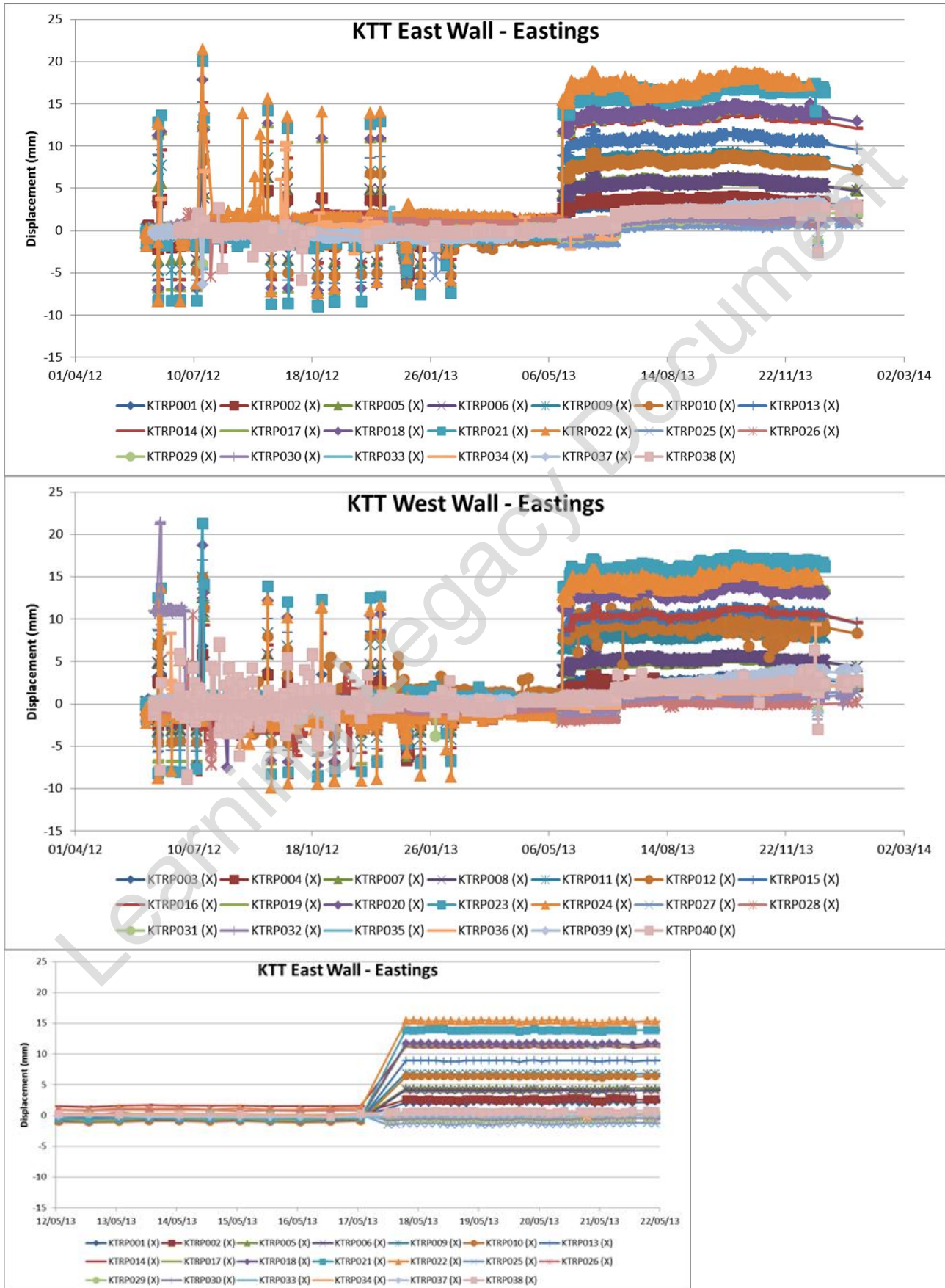


Figure 43 Kingsway Tram Tunnel Prisms – Eastings (X)

Figures 43, 44 and 45 show data from the prism installed in the Kingsway Tram Tunnel (KTT) for Eastings (X), Northings (Y) and settlement (Z). All of the plots show a “step” in some of the data at the same time in May 2013. An enlarged plot shows that this occurred between consecutive reading on 17<sup>th</sup> / 18<sup>th</sup> May 2013 with stable readings before and after the step. The values subsequent to the step do not represent real movement.

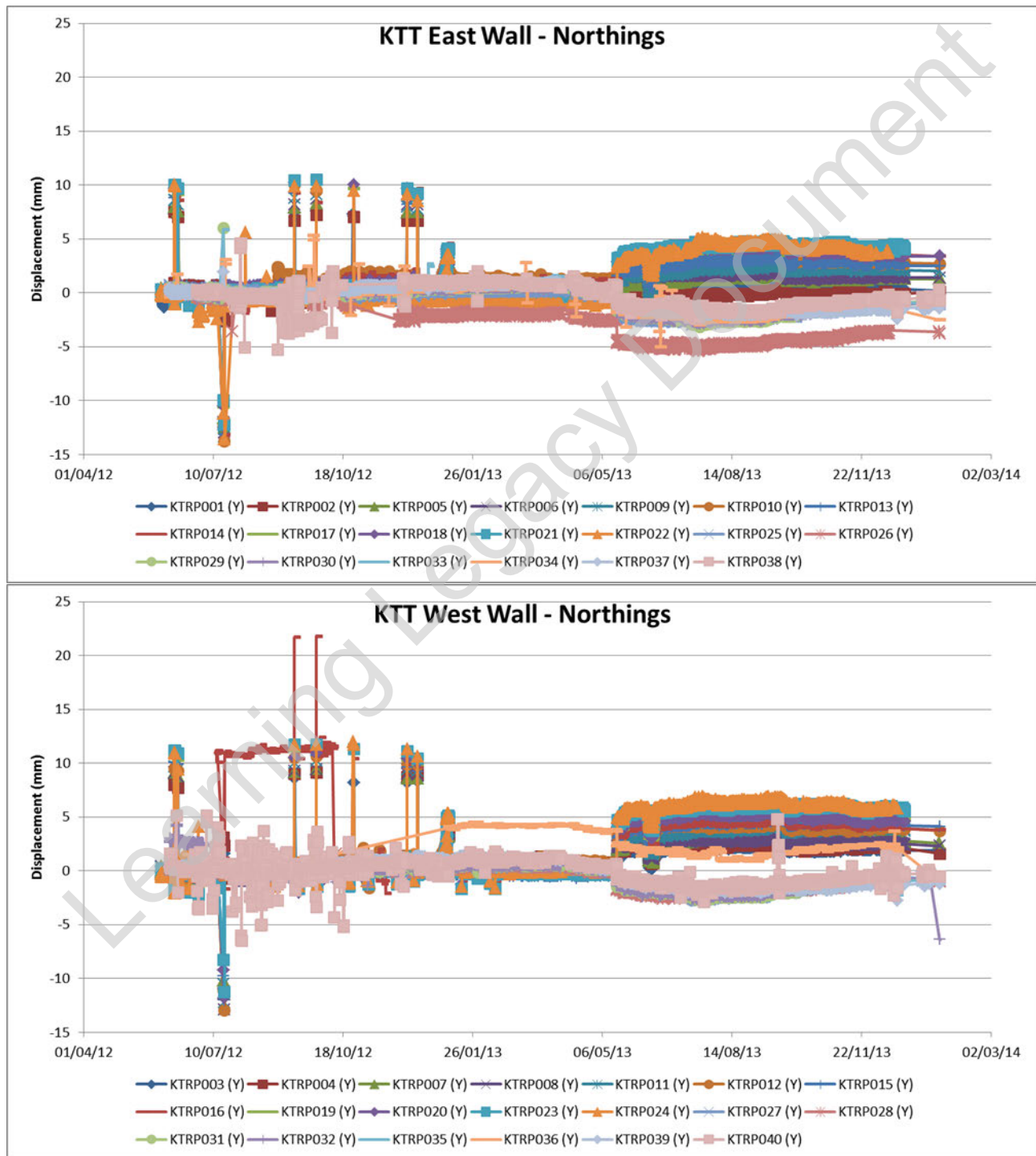


Figure 44 Kingsway Tram Tunnel Prisms – Northings (Y)

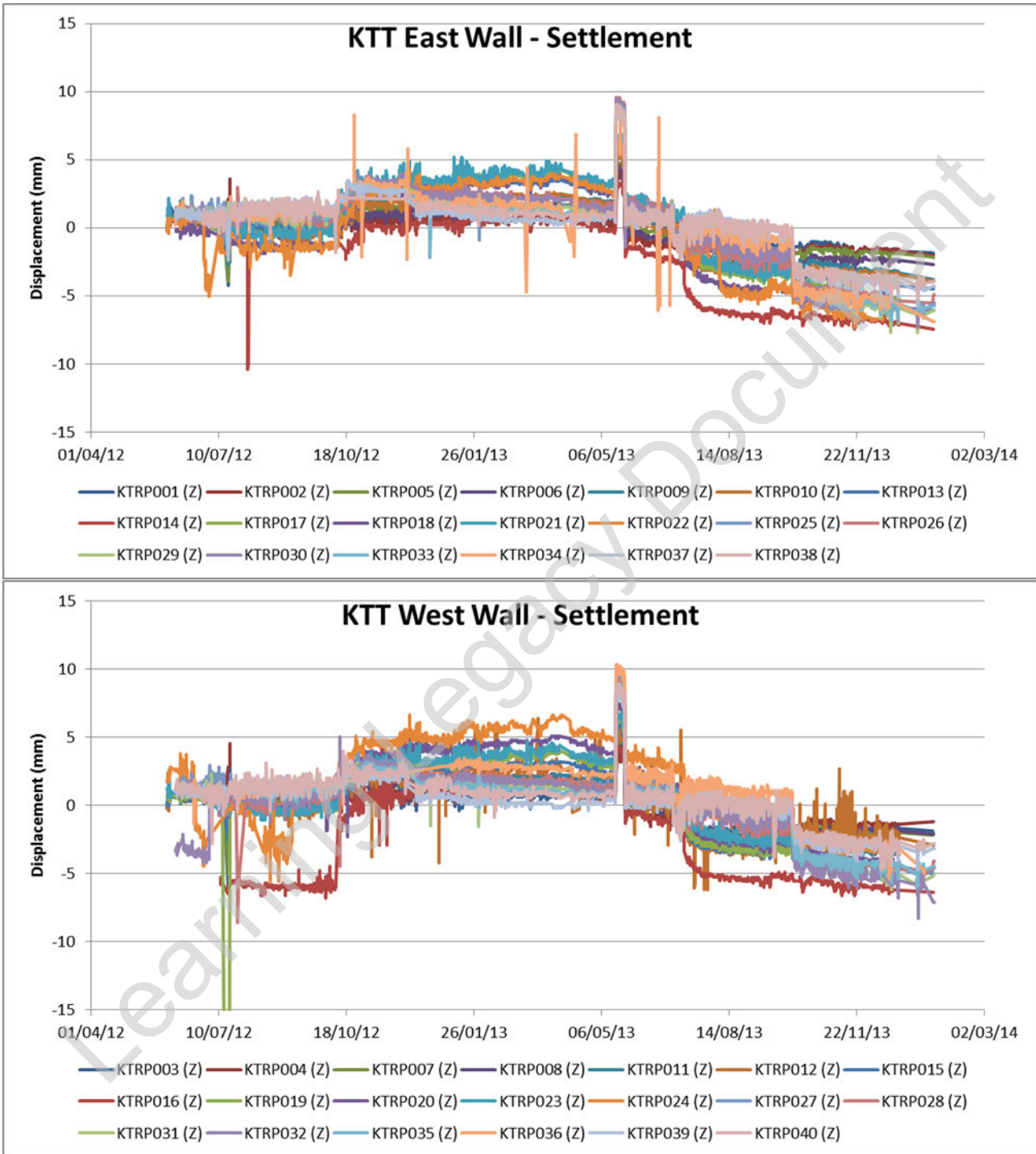


Figure 45 Kingsway Tram Tunnel Prisms – Settlement (Z)

## Appendix 1. Reference Documents

Code	Document
C300-BFK-C4-STP-CRT00_ST005-50166	MANAGEMENT PLAN FOR THE CONTROL OF GROUND MOVEMENTS: ADDENDUM 37 TBM DRIVE 9 - Fisher Street
C300-BFK-C4-STP-CRT00_ST005-50155	MANAGEMENT PLAN FOR THE CONTROL OF GROUND MOVEMENTS: ADDENDUM 34 Fisher Street Shaft and Crossover: Shaft and Adit Excavation
C122-OVE-C2-RGN-CRG086_SH003-50011	Instrumentation & Monitoring Plan Fisher Street Shaft and Crossover Ground Movement And Asset Protection
C122-OVE-U-RGN-CRG01-50003	Instrumentation and Monitoring Plans: Thames Water Assets: Drive X (C300) Instrumentation Plan for large or Deep Sewers
C300-BFK-C-DWG-CRT00_ST005-50961	Instrumentation and Monitoring – As-Built Chainage 1620 to 1980 (Eastbound)

## Appendix 2. Thames Water Assets summary table

No Alert or Trigger breaches on TWUL assets were identified at SRG and CTC reviews.

Area	Type	Sewer Name	Address	Alert Value (mm)	Deflection Alert Value	Deflection Amber Trigger Value
	Sewer	TW26 Northumberland Street & Shaftsbury Avenue Sewers	Monmouth Street	-	1 in 4100	-
	Sewer	TW29 Savoy Street Main Line & High Holborn and Drury Lane Sewer	High Holborn	-	1 in 2100	-
	Sewer	TW29 Savoy Street Main Line & High Holborn and Drury Lane Sewer	Endell Street/Savoy Street	-	1 in 4100	
	Sewer	TW29 Savoy Street Main Line & High Holborn and Drury Lane Sewer	Grape Street			
	Sewer	TW29 Savoy Street Main Line & High Holborn and Drury Lane Sewer	Museum Street			
	Sewer	Essex Street Sewer West Branch (TW29)	Dury Lane	-	1 in 4100	-



Area	Type	Sewer Name	Address	Alert Value (mm)	Deflection Alert Value	Deflection Amber Trigger Value
	Sewer	Essex Street Sewer East Branch	High Holborn	-	1 in 4300	
	Sewer	TW29 Savoy Street Main Line & High Holborn and Drury Lane Sewer	Smarts Place			
	Sewer	TW26 Shaftsbury Avenue Subway Sewer	Shaftsbury Avenue	-	1 in 2000	-
	Water Main	Shaftsbury Avenue 18in		-	-	1 in 2800
	Water Main	Shaftsbury Avenue 12in		-	-	1 in 2600
	Water Main	High Holborn 12/18in		-	1 in 2600	-
	Sewer	Southampton Road Subway Sewer Eastside	Southampton Row		1 in 3700	
	Sewer	Southampton Road Subway Sewer Westside	Southampton Row		1 in 3800	
	Sewer	Kingsway Subway Sewer Westside	Kingsway/High Holborn		1 in 3000	
	Sewer	TW31 Essex Street Sewer east and High Holborn	Newton Street		1 in 4100	-

### Appendix 3. C300 Buildings Claims

The following sketches show the locations of the buildings for which damages claims were raised. The building addresses are reported in the yellow boxes and the position on the plan is indicated with a red arrow. This information was provided by C122.













C300/410

Western Tunnels & Caverns Project



Close-Out Monitoring Report: C300-BFK-C4-RGN-CRT00\_ST005- FISHER STREET WORKS ~ Page 43 of 43  
51234 Rev 3.0 Fisher Street Shaft

## Appendix 4. ATS close out

Learning Legacy Document



The automated monitoring system consists of 6 Automated Topcon Total Station instruments (ATS), 19 reference prisms (including 360° prisms), 213 monitoring prisms and the ancillary equipment.

These were installed to monitor the movements around Fisher Street grout shaft relating to the Crossrail tunnelling works alongside Fisher Street Area.

Full details of the installed instrumentation can be found in the installation report referenced below.

Document Reference	Document Title
Method Statement for Installation of Automated Total Stations	C300-BFK-C-GMS-CRG03-50004
Fisher Street ATS Network Installation Report	C300-BFK-C4-RGN-CRT00_ST005-50694

Table 1 - Related Documents

The total of six ATSs was installed in the network between 08/2012 and 01/2013:

- On the eastern façade of 13 Southampton Row (ATS F);
- On the CCTV camera pole at the Theobald's Road and Southampton Row intersection (ATS G);
- On the northern façade of 94 Kingsway (ATS H);
- On the western façade of 119-120 High Holborn (ATS I);
- On the north-eastern corner of 1 Catton Street (ATS J);
- On the north-eastern corner of 3 Fisher Street (ATS K).

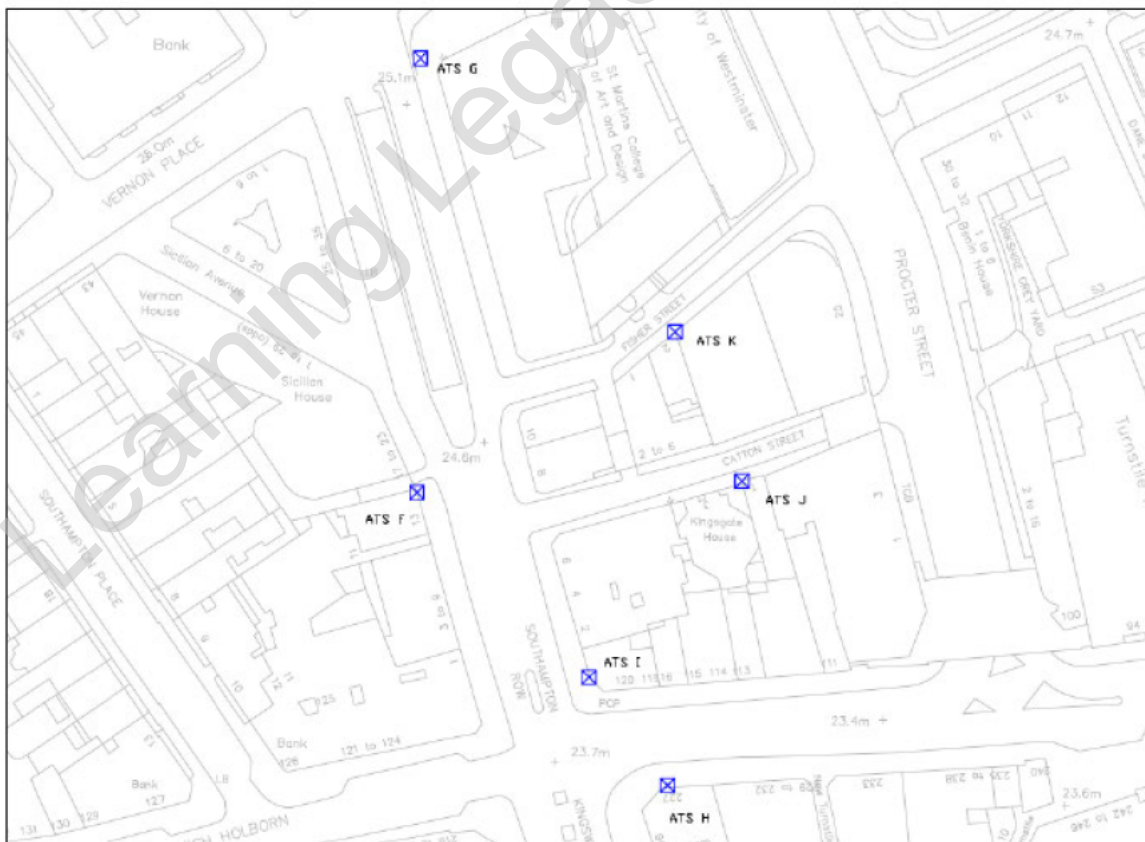


Figure 1- Location ATSs

C300/C410 Western Tunnels & Caverns Project

ATS Monitoring system - FISHER STREET



General Information

Name	CRL Name	Address	X	Y	Z
ATS F	FIS_F	13 Southampton Row	80830.7069	26335.0938	130.8897

FIS F

Installation/Maintenance

Serial #	Date	Type	Comments
102012	14/11/2012	Topcon MS1AX	Installation
102042	20/03/2013	Topcon MS1AX	Faulty ATS
101636	04/12/2013	Topcon MS1AX	Faulty ATS

Monitoring period

Start	08/03/2013 12:00
end	29/01/2014 13:00

C300/C410 Western Tunnels & Caverns Project

ATS Monitoring system - FISHER STREET



General Information

Name	CRL Name	Address	X	Y	Z
ATS G	FIS_G	CCTV pole, corner Theobald's Road and Southampton Row	80828.3790	36432.2857	129.2751

FIS G

Installation/Maintenance

Serial #	Date	Type	Comments
101640	19/02/2013	Topcon MS1AX	Installation
101639	08/04/2013	Topcon MS1AX	Faulty ATS
102152	12/11/2013	Topcon MS1AX	Faulty ATS

Monitoring period

Start	08/03/2013 12:00
end	29/01/2014 13:00

C300/C410 Western Tunnels & Caverns Project

ATS Monitoring system - FISHER STREET



General Information

Name	CRL Name	Address	X	Y	Z
ATS H	FIS_H	90 Kingsway Road	80880.9540	36272.1327	129.4645

FIS H

Installation/Maintenance

Serial #	Date	Type	Comments
102014	18/10/2012	Topcon MS1AX	Installation
101432	20/03/2013	Topcon MS1AX	Faulty ATS

Monitoring period

Start	08/03/2013 12:00
end	29/01/2014 14:00

C300/C410 Western Tunnels & Caverns Project

ATS Monitoring system - FISHER STREET



General Information

Name	CRL Name	Address	X	Y	Z
ATS I	FIS_I	119-120 High Holborn	80865.9771	36295.0081	128.0324

FIS I

Installation/Maintenance

Serial #	Date	Type	Comments
101468	17/10/2012	Topcon MS1AX	Installation
101564	20/03/2013	Topcon MS1AX	Faulty ATS
102133	10/09/2013	Topcon MS1AX	Faulty ATS
102096	30/10/2013	Topcon MS1AX	Faulty ATS

Monitoring period

Start	27/03/2013 16:00
end	29/01/2014 14:00

C300/C410 Western Tunnels & Caverns Project

ATS Monitoring system - FISHER STREET



General Information

Name	CRL Name	Address	X	Y	Z
ATS J	FIS_J	1 Catton Street	80698.9576	96397.8881	196.2112

FIS J

Installation/Maintenance			
Serial #	Date	Type	Comments
101565	21/08/2012	Topcon MS1AX	Installation
102013	21/03/2013	Topcon MS1AX	Faulty ATS
101450	21/07/2013	Topcon MS1AX	Faulty ATS
102259	15/09/2013	Topcon MS1AX	Faulty ATS
101471	04/12/2013	Topcon MS1AX	Faulty ATS

Monitoring period	
Start	22/03/2013 16:00
end	27/05/2014 08:00

C300/C410 Western Tunnels & Caverns Project

ATS Monitoring system - FISHER STREET



General Information

Name	CRL Name	Address	X	Y	Z
ATS K	FIS_K	8 Fisher Street	80883.4962	96368.1857	133.871

FIS K

Installation/Maintenance			
Serial #	Date	Type	Comments
101472	23/08/2012	Topcon MS1AX	Installation
102077	21/03/2013	Topcon MS1AX	Faulty ATS
102152	19/04/2013	Topcon MS1AX	Faulty ATS
102013	26/09/2013	Topcon MS1AX	Faulty ATS
102096	10/04/2014	Topcon MS1AX	Faulty ATS

Monitoring period	
Start	08/03/2013 12:00
end	27/05/2014 08:00